

GREGG COUNTY PARKING GARAGE AND OFFICE

100 E. METHVIN ST., LONGVIEW, TX 75601

SHA Project Number: 20011

February 18, 2022



PROJECT MANUAL

**SECTION 00 01 10
TABLE OF CONTENTS**

PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

- 00 01 10 - Table of Contents
- 00 01 10-1 - Sealed Table of Contents by Discipline
- 00 21 16 - Instructions to Proposers
- 00 40 00 - Procurement Forms and Supplements
- 00 42 00 - Proposal Form
- 00 52 00 - Agreement Form
- 00 72 00 - General Conditions

DC - DESIGN CRITERIA

- DC 99 7 - Geotechnical Testing Report
- DC 99 8 - Energy Compliance Reprots

SPECIFICATIONS

DIVISION 01 -- GENERAL REQUIREMENTS

- 01 10 00 - Summary
- 01 20 00 - Price and Payment Procedures
- 01 25 00 - Substitution Procedures
- 01 30 00 - Administrative Requirements
- 01 32 16 - Construction Progress Schedule
- 01 33 00 - Submittals
- 01 35 53 - Security Procedures
- 01 40 00 - Quality Requirements
- 01 41 00 - Regulatory Requirements
- 01 42 16 - Definitions
- 01 45 00 - Quality Control
- 01 45 23 - Testing Services
- 01 50 00 - Temporary Facilities and Controls
- 01 51 00 - Temporary Utilities
- 01 52 13 - Field Offices and Sheds
- 01 55 00 - Vehicular Access and Parking
- 01 55 26 - Barricades, Signs and Traffic Handling
- 01 57 13 - Temporary Erosion and Sediment Control
- 01 57 23 - Storm Water Pollution Prevention
- 01 58 13 - Temporary Project Signage
- 01 60 00 - Product Requirements
- 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions
- 01 70 00 - Execution and Closeout Requirements
- 01 78 00 - Closeout Submittals
- 01 79 00 - Demonstration and Training
- 01 91 13 - General Commissioning Requirements

01 91 14 - Commissioning Authority Responsibilities

DIVISION 02 -- EXISTING CONDITIONS

02 00 10 - Work Items

02 41 00 - Demolition

02 41 01.01 - Preparing Right-of-Way

DIVISION 03 -- CONCRETE

03 15 21 - Termite Barrier

03 30 00 - Cast-in-Place Concrete

03 35 11 - Concrete Floor Finishes

03 38 16 - Unbonded Post-Tensioned Concrete

03 45 00 - Precast Architectural Concrete

DIVISION 04 -- MASONRY

04 22 00 - Concrete Unit Masonry

04 23 13 - Thin Brick

04 72 00 - Cast Stone Masonry

DIVISION 05 -- METALS

05 12 00 - Structural Steel Framing

05 12 13 - Architecturally-Exposed Structural Steel Framing

05 15 17 - Strand Guardrail

05 31 00 - Steel Decking

05 50 00 - Metal Fabrications

05 51 33 - Metal Ladders

05 52 13 - Pipe and Tube Railings

DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES

06 10 00 - Rough Carpentry

06 41 00 - Architectural Wood Casework

DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

07 11 13 - Bituminous Dampproofing

07 14 16 - Cold Fluid-Applied Waterproofing

07 18 00 - Traffic Coatings

07 19 00 - Water Repellents

07 21 00 - Thermal Insulation

07 21 19 - Foamed-In-Place Insulation

07 25 00 - Weather Barriers

07 42 13 - Metal Wall Panels

07 52 00 - Modified Bituminous Membrane Roofing

07 62 00 - Sheet Metal Flashing and Trim

07 72 00 - Roof Accessories

07 84 00 - Firestopping

07 91 06 - Deck And Parking Joint Seals

07 92 00 - Joint Sealants

- 07 92 33 - Concrete Joint Sealants
- 07 95 00 - Expansion Joint Assemblies

DIVISION 08 -- OPENINGS

- 08 11 13 - Hollow Metal Doors and Frames
- 08 11 16 - Aluminum Doors and Frames
- 08 14 16 - Flush Wood Doors
- 08 31 00 - Access Doors and Panels
- 08 33 23 - Overhead Coiling Doors
- 08 43 13 - Aluminum-Framed Storefronts
- 08 56 59 - Service and Teller Window Units
- 08 71 00 - Door Hardware
- 08 80 00 - Glazing
- 08 83 00 - Mirrors

DIVISION 09 -- FINISHES

- 09 21 16 - Gypsum Board Assemblies
- 09 22 16 - Non-Structural Metal Framing
- 09 30 00 - Tiling
- 09 51 00 - Acoustical Ceilings
- 09 54 26 - Suspended Wood Ceilings
- 09 65 00 - Resilient Flooring
- 09 68 13 - Tile Carpeting
- 09 72 00 - Wall Coverings
- 09 91 13 - Exterior Painting
- 09 91 20 - Pavement Marking
- 09 91 23 - Interior Painting
- 09 96 00 - High-Performance Coatings

DIVISION 10 -- SPECIALTIES

- 10 14 00 - Signage
- 10 14 00.01 - Signage
- 10 21 13.19 - Plastic Toilet Compartments
- 10 28 00 - Toilet, Bath, and Laundry Accessories
- 10 44 00 - Fire Protection Specialties
- 10 56 17 - Wall Mounted Standards and Shelving
- 10 82 13 - Exterior Grilles and Screens

DIVISION 11 -- EQUIPMENT

- 11 12 26.03 - Control Gates & Vehicle Detectors

DIVISION 12 -- FURNISHINGS

- 12 24 00 - Window Shades
- 12 36 00 - Countertops

DIVISION 13 -- SPECIAL CONSTRUCTION

DIVISION 14 -- CONVEYING EQUIPMENT

14 24 00 - Hydraulic Elevators

DIVISION 21 -- FIRE SUPPRESSION

21 05 00 - Common Work Results for Fire Suppression

21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping

21 05 53 - Identification for Fire Suppression Piping and Equipment

21 12 00 - Fire-Suppression Standpipes

21 13 00 - Fire-Suppression Sprinkler Systems

DIVISION 22 -- PLUMBING

22 05 00 - Plumbing Scope of Work

22 05 01 - Common Work Results for Garage Area Plumbing

22 05 19 - Meters and Gauges for Plumbing Piping

22 05 53 - Identification for Plumbing Piping and Equipment

22 07 19 - Plumbing Piping Insulation

22 10 05 - Plumbing Piping

22 10 06 - Plumbing Piping Specialties

22 11 16 - Garage Domestic Water Piping

22 14 13 - Garage Drainage Piping

22 30 00 - Plumbing Equipment

22 40 00 - Plumbing Fixtures

DIVISION 23 -- HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 05 53 - Identification for HVAC Piping and Equipment

23 05 93 - Testing, Adjusting, and Balancing for HVAC

23 07 13 - Duct Insulation

23 07 19 - HVAC Piping Insulation

23 08 00 - Commissioning of HVAC

23 09 93 - Sequence of Operations for HVAC Controls

23 23 00 - Refrigerant Piping

23 31 00 - HVAC Ducts and Casings

23 33 00 - Air Duct Accessories

23 34 23 - HVAC Power Ventilators

23 37 00 - Air Outlets and Inlets

23 40 00 - HVAC Air Cleaning Devices

23 54 00 - Furnaces

23 62 13 - Packaged Air-Cooled Refrigerant Compressor and Condenser Units

23 81 26.13 - Small-Capacity Split-System Air Conditioners

DIVISION 26 -- ELECTRICAL

26 05 00 - Common Work Results for Electrical

26 09 24 - Occupancy Sensors

26 09 27 - Lighting Control System

26 20 00 - Low Voltage Electrical Transmission

26 24 16 - Panelboards

26 32 13 - Engine Gas Generating System - Standby

26 50 00 - Lighting

DIVISION 27 -- COMMUNICATIONS

DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY

28 31 12 - Fire Alarm

DIVISION 31 -- EARTHWORK

31 05 01 - Foundation Material for Unsuitable Subgrade

31 05 13 - Soil Materials

31 05 16 - Aggregate Materials

31 23 01 - Excavation Backfill for Structures

31 23 02 - Excavation Backfill for Utilities

31 23 03 - Excavation Backfill for Roads

31 41 33 - Trench Safety

31 63 29 - Drilled Concrete Piers and Shafts

DIVISION 32 -- EXTERIOR IMPROVEMENTS

32 01 00 - Pavement Repair

32 13 00 - Portland Cement Concrete Paving

32 16 00 - Concrete Curb and Gutter

32 17 23 - Pavement Markings

32 31 19 - Decorative Metal Fences and Gates

DIVISION 33 -- UTILITIES

33 05 13 - Manholes and Covers

33 11 00 - Water Systems

33 12 16 - Valves and Couplings

33 31 00 - Sanitary Sewer Systems

33 41 00 - Storm Drainage Systems

DIVISION 46 -- WATER AND WASTEWATER EQUIPMENT

END OF SECTION

00 01 10-1

SEALED TABLE OF CONTENTS BY DISCIPLINE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Architectural Sealed Table of Contents
- B. Structural / Parking & Signage / Electrical & Plumbing / Mech& Fire Sealed Table of Contents
- C. Civil Sealed Table of Contents

END OF SECTION

**SECTION 00 01 10 - 1
TABLE OF CONTENTS**

PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

- 00 01 10 - Table of Contents
- 00 01 10-1 - Sealed Table of Contents by Discipline
- 00 21 16 - Instructions to Proposers
- 00 40 00 - Procurement Forms and Supplements
- 00 42 00 - Proposal Form
- 00 52 00 - Agreement Form
- 00 72 00 - General Conditions

DC - DESIGN CRITERIA

- DC 99 7 - Geotechnical Testing Report
- DC 99 8 - Energy Compliance Reprots

SPECIFICATIONS

DIVISION 01 -- GENERAL REQUIREMENTS

- 01 10 00 - Summary
- 01 20 00 - Price and Payment Procedures
- 01 25 00 - Substitution Procedures
- 01 30 00 - Administrative Requirements
- 01 32 16 - Construction Progress Schedule
- 01 35 53 - Security Procedures
- 01 40 00 - Quality Requirements
- 01 41 00 - Regulatory Requirements
- 01 42 16 - Definitions
- 01 50 00 - Temporary Facilities and Controls
- 01 51 00 - Temporary Utilities
- 01 52 13 - Field Offices and Sheds
- 01 55 00 - Vehicular Access and Parking
- 01 57 13 - Temporary Erosion and Sediment Control
- 01 58 13 - Temporary Project Signage
- 01 60 00 - Product Requirements
- 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions
- 01 70 00 - Execution and Closeout Requirements
- 01 78 00 - Closeout Submittals
- 01 79 00 - Demonstration and Training

DIVISION 02 -- EXISTING CONDITIONS

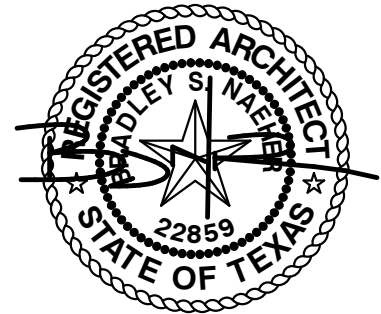
- 02 41 00 - Demolition

DIVISION 03 -- CONCRETE

- 03 15 21 - Termite Barrier
- 03 35 11 - Concrete Floor Finishes

DIVISION 04 -- MASONRY

- 04 23 13 - Thin Brick
- 04 72 00 - Cast Stone Masonry



02-18-2022

DIVISION 05 -- METALS

- 05 12 13 - Architecturally-Exposed Structural Steel Framing
- 05 51 33 - Metal Ladders

DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES

- 06 10 00 - Rough Carpentry
- 06 41 00 - Architectural Wood Casework

DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

- 07 19 00 - Water Repellents
- 07 21 00 - Thermal Insulation
- 07 21 19 - Foamed-In-Place Insulation
- 07 25 00 - Weather Barriers
- 07 42 13 - Metal Wall Panels
- 07 52 00 - Modified Bituminous Membrane Roofing
- 07 62 00 - Sheet Metal Flashing and Trim
- 07 72 00 - Roof Accessories
- 07 84 00 - Firestopping
- 07 91 06 - Deck And Parking Joint Seals
- 07 92 00 - Joint Sealants

DIVISION 08 -- OPENINGS

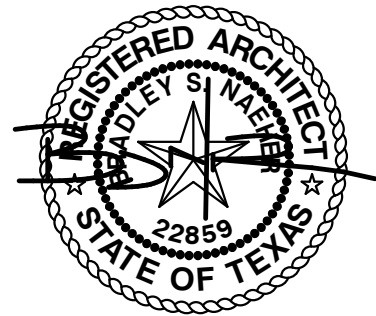
- 08 11 13 - Hollow Metal Doors and Frames
- 08 11 16 - Aluminum Doors and Frames
- 08 14 16 - Flush Wood Doors
- 08 31 00 - Access Doors and Panels
- 08 33 23 - Overhead Coiling Doors
- 08 43 13 - Aluminum-Framed Storefronts
- 08 56 59 - Service and Teller Window Units
- 08 71 00 - Door Hardware
- 08 80 00 - Glazing
- 08 83 00 - Mirrors

DIVISION 09 -- FINISHES

- 09 21 16 - Gypsum Board Assemblies
- 09 22 16 - Non-Structural Metal Framing
- 09 30 00 - Tiling
- 09 51 00 - Acoustical Ceilings
- 09 54 26 - Suspended Wood Ceilings
- 09 65 00 - Resilient Flooring
- 09 68 13 - Tile Carpeting
- 09 72 00 - Wall Coverings
- 09 91 13 - Exterior Painting
- 09 91 23 - Interior Painting
- 09 96 00 - High-Performance Coatings

DIVISION 10 -- SPECIALTIES

- 10 14 00.01 - Building Signage



02-18-2022

20011 Gregg County - Parking Garage & Office

- 10 21 13.19 - Plastic Toilet Compartments
- 10 28 00 - Toilet, Bath, and Laundry Accessories
- 10 44 00 - Fire Protection Specialties
- 10 56 17 - Wall Mounted Standards and Shelving
- 10 82 13 - Exterior Grilles and Screens

DIVISION 11 -- EQUIPMENT

DIVISION 12 -- FURNISHINGS

- 12 24 00 - Window Shades
- 12 36 00 - Countertops

DIVISION 13 -- SPECIAL CONSTRUCTION

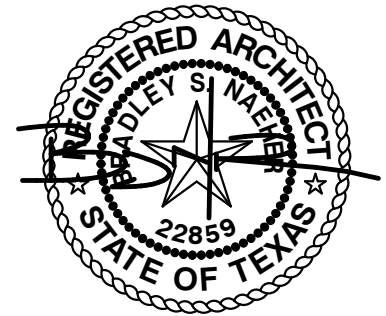
DIVISION 14 -- CONVEYING EQUIPMENT

- 14 24 00 - Hydraulic Elevators

DIVISION 32 -- EXTERIOR IMPROVEMENTS

- 32 31 19 - Decorative Metal Fences and Gates

END OF SECTION



02-18-2022

**SECTION 00 01 10
TABLE OF CONTENTS**

GREGG CO GARAGE SELECT SPECIFICATIONS

The signatures and seals appearing below is limited to the authentication of the indicated specification sections:

STRUCTURAL (Walker)



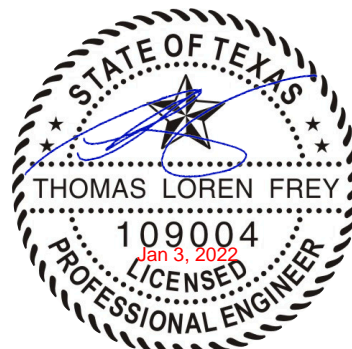
PARKING & SIGNAGE (Walker)



ELECT & PLUM (Walker)



MECH, SELECT PLUM & FIRE (Progressive*)



This item has been electronically signed and sealed by Thomas Loren Frey using a Digital Signature and date. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

DIVISION 01 – GENERAL REQUIREMENTS

019113 General Commissioning Requirements*
019114 Commissioning Authority Responsibilities*

DIVISION 02 – EXISTING CONDITIONS

020010 Work Items

DIVISION 03 – CONCRETE

033000 Cast-In-Place Concrete
033816 Unbonded Post-Tensioned Concrete
034500 Precast Architectural Concrete

DIVISION 04 – MASONRY

042200 Concrete Unit Masonry

DIVISION 05 – METALS

051200 Structural Steel Framing
051517 Strand Guardrail
053100 Steel Decking
055000 Metal Fabrications
055213 Pipe and Tube Railings

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

071113 Bituminous Dampproofing
071416 Cold Fluid-Applied Waterproofing
071800 Traffic Coatings
071900 Water Repellents
079233 Concrete Joint Sealants
079500 Expansion Joint Assemblies

DIVISION 09 – FINISHES

099120 Pavement Marking

DIVISION 10 – SPECIALTIES

101400 Signage

DIVISION 11 – EQUIPMENT

111226.03 Control Gates & Vehicle Detectors

DIVISION 21 – FIRE SUPPRESSION

| | |
|--------|--|
| 210500 | Common Work Results for Fire Suppression* |
| 210523 | General-Duty Valves for Water-Based Fire-Suppression Piping* |
| 210553 | Identification for Fire Suppression Piping and Equipment* |
| 211200 | Fire-Suppression Standpipes* |
| 211300 | Fire-Suppression Sprinkler Systems* |

DIVISION 22 – PLUMBING

| | |
|--------|---|
| 220500 | Plumbing Scope of Work |
| 220501 | Common Work Results for Garage Area Plumbing |
| 220519 | Meters and Gauges for Plumbing Piping* |
| 220553 | Identification for Plumbing Piping and Equipment* |
| 220719 | Plumbing Piping Insulation* |
| 221005 | Plumbing Piping* |
| 221006 | Plumbing Piping Specialties* |
| 221116 | Garage Domestic Water Piping |
| 221413 | Garage Drainage Piping |
| 223000 | Plumbing Equipment* |
| 224000 | Plumbing Fixtures* |

DIVISION 23 – HVAC

| | |
|-----------|---|
| 230553 | Identification for HVAC Piping and Equipment* |
| 230593 | Testing, Adjusting, and Balancing for HVAC* |
| 230713 | Duct Insulation* |
| 230719 | HVAC Piping Insulation* |
| 230800 | Commissioning of HVAC* |
| 230993 | Sequence of Operations for HVAC Controls* |
| 232300 | Refrigerant Piping* |
| 233100 | HVAC Ducts and Casings* |
| 233300 | Air Duct Accessories* |
| 233423 | HVAC Power Ventilators* |
| 233700 | Air Outlets and Inlets* |
| 234000 | HVAC Air Cleaning Devices* |
| 235400 | Furnaces* |
| 236213 | Packaged Air-Cooled Refrigerant Compressor and Condenser Units* |
| 238126_13 | Small-Capacity Split-System Air Conditioners* |

DIVISION 26 – ELECTRICAL

| | |
|--------|--|
| 260500 | Common Work Results for Electrical |
| 262000 | Low Voltage Electrical Transmission |
| 263213 | Engine Gas Generating System - Standby |
| 265000 | Lighting |

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

283112 Fire Alarm

DIVISION 31 – EARTHWORK

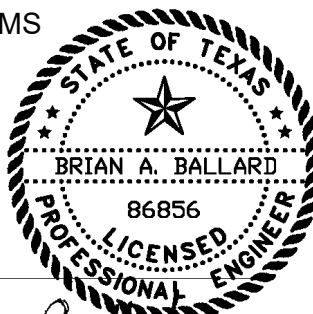
316329 Drilled, Concrete Piers & Shafts

END OF TABLE OF CONTENTS

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers Inc.

CIVIL TABLE OF CONTENTS

| | |
|---|------------|
| SECTION 01 33 00 - SUBMITTALS | PAGES 1-4 |
| SECTION 01 45 00 - QUALITY CONTROL | PAGES 1-3 |
| SECTION 01 45 23 - TESTING SERVICES | PAGES 1-4 |
| SECTION 01 55 26 - BARRICADES, SIGNS, AND TRAFFIC HANDLING | PAGE 1 |
| SECTION 01 57 23 - STORM WATER POLLUTION PREVENTION | PAGES 1-4 |
| SECTION 02 41 00 - PREPARING RIGHT-OF-WAY | PAGES 1-6 |
| SECTION 31 05 01 - FOUNDATION MATERIAL FOR UNSUITABLE SUBGRADE | PAGES 1-2 |
| SECTION 31 05 13 - SOIL MATERIALS | PAGES 1-4 |
| SECTION 31 05 16 - AGGREGATE MATERIALS | PAGES 1-4 |
| SECTION 31 23 01 - EXCAVATION, BACKFILLING, AND COMPACTING FOR STRUCTURES | PAGES 1-7 |
| SECTION 31 23 02 - EXCAVATION, BACKFILLING, AND COMPACTING FOR UTILITIES | PAGES 1-7 |
| SECTION 31 23 03 - EXCAVATION, BACKFILLING, AND COMPACTING FOR ROADWAYS AND CHANNELS | PAGES 1-3 |
| SECTION 31 41 33 - TRENCH AND EXCAVATION SAFETY SYSTEM | PAGES 1-2 |
| SECTION 32 01 00 - PAVEMENT REPAIR | PAGES 1-6 |
| SECTION 32 13 00 - PORTLAND CEMENT CONCRETE PAVING | PAGES 1-6 |
| SECTION 32 16 00 - CONCRETE CURB AND GUTTER | PAGES 1-3 |
| SECTION 32 17 23 - PAVEMENT MARKINGS | PAGES 1-2 |
| SECTION 33 05 13 - MANHOLE AND COVERS | PAGES 1-7 |
| SECTION 33 11 00 - WATER SYSTEMS | PAGES 1-13 |
| SECTION 33 12 16- VALVES AND COUPLINGS | PAGES 1-8 |
| SECTION 33 31 00 - SMALL DIAMETER SANITARY SEWER SYSTEMS | PAGES 1-10 |
| SECTION 33 41 00 - STORM DRAINAGE SYSTEMS | PAGES 1-5 |



B. Ballard 01/05/2022

00 21 16

INSTRUCTIONS TO PROPOSERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Request for Proposals follows in this section.

END OF SECTION



REQUEST FOR PROPOSALS

The enclosed REQUEST FOR PROPOSALS (RFP) and accompanying documents are for your convenience in submitting an offer for the enclosed referenced services for:

RFP 2022-09

***Construction Manager at Risk (CMAR)
For
Gregg County Parking Facility Project***

Gregg County, Texas

**CLOSING DAY AND TIME: Sealed response will be received no later than:
2:00 P.M. CST Tuesday, March 15, 2022**

RETURN RESPONSE TO:
*Gregg County Purchasing Office
101 East Methvin Street, Suite 205
Longview, Texas 75601*

QUESTIONS regarding this solicitation should be directed to Kelli Davis at (903) 237-2686 kelli.davis@co.gregg.tx.us on or before 2:00 P.M. March 15, 2022. Information in response to any inquiry may be published as an addendum. Addendums can be found on the Gregg County website www.co.gregg.tx.us on the Purchasing Department page.

TABLE OF CONTENTS

| | | |
|------------------------|---|-------------|
| PROPOSAL SCHEDULE | PAGE 3 | |
| NOTICE OF INTENT | PAGE 4 | |
| PROJECT IDENTIFICATION | PAGE 5 | |
| PART I | GENERAL INFORMATION | PAGES 6-9 |
| | PUBLIC BID OPENING INFORMATION | PAGE 9 |
| PART II | LAWS REGULATIONS & MANDATORY REQUIREMENTS | PAGES 10-13 |
| PART III | INSTRUCTIONS | PAGES 10-18 |
| | PRE-PROPOSAL CONFERENCE INFORMATION | PAGE 18 |
| PART IV | PROJECT DESCRIPTION/SCOPE | PAGES 19-25 |
| PART V | BEST VALUE, QUALIFICATIONS & EVALUATIONS | PAGES 25-28 |
| PART VI | PROPOSAL SUBMISSION REQUIREMENTS | PAGES 28-30 |

GREGG COUNTY RFP-22-09
CONSTRUCTION OF A PARKING GARAGE AND OFFICE
Anticipated Proposal Schedule

| | |
|---|--|
| Issue First Advertisement: | February 16, 2022 |
| Issue Second Advertisement: | February 20, 2022 |
| Issue Third Advertisement: | February 26, 2022 |
| Documents Available to Proposers: | February 21, 2022 |
| Pre-proposal Conference: | March 01, 2022 10:00 A.M. CST |
| Deadline for Written Questions: | March 03, 2022 at 5:00 P.M. CST |
| Issue Responses to Questions/Final Addendum: | March 08, 2022 |
| Proposals Due/Open Proposals: | March 15, 2022 at 2:00 P.M. CST |
| Proposed Award Approval Date: | April 11, 2022 |

NOTICE OF INTENT

Issue Date: February 21, 2022 8:30am CST

Title: RFP# 2022-09 CMAR for Gregg County Parking Facility Project
(Garage and Offices)

Issuing and Using Agency: Gregg County, Texas
Attn: Purchasing Agent Kelli Davis, NIGP-CPP, CPPB
101 East Methvin, Suite 205
Longview, Texas 75601

Gregg County desires to engage a qualified and experienced construction manager at risk (CMAR) to provide professional construction services for the Gregg County Parking Facility Project and additional services as necessary to build the County's Parking Facility. This document is issued in compliance with the County Purchasing Act, Texas Local Government Code 262.030, and section 2269.251 Subchapter F of the Government Code.

Proposal documents are now posted on the Gregg County Website www.co.gregg.tx.us on the Purchasing Department webpage. Please click on the **Current Bids Tab** to download the RFP document. Only paper responses are allowed for this RFP; facsimiles will not be accepted. Paper documents may also be obtained from the office of the Purchasing Agent.

All documents relating to this Request for Proposals including but not limited to, the RFP document, questions and responses, addenda and special notices will be posted on the Gregg County Purchasing Department website under the **addendums tab** and available for download by bidders and other interested parties. **It is the Respondents' sole responsibility to review this site and retrieve all related documents prior to the RFP due date.**

PROJECT IDENTIFICATION: Parking Garage & Offices (Gregg County Parking Facility)

PROJECT ADDRESS: 100 East Methvin Street
Longview, Texas 75601

PROJECT OWNER: Gregg County, Texas
101 East Methvin
Longview, Texas 75601

ARCHITECT: Schwarz Hanson Architects
Architect Tod Hanson
Project Manager Brad Naehr
2570 River Park Plaza, Suite 100
Ft. Worth, Texas 76116
Phone: 817-377-3600

CIVIL: Ballard & Broughton Engineering
3815 Old Bullard Road
Tyler, Texas 75701
Phone: 903-531-8900

MEP: Walker Consultants
2525 Bay Area Blvd, Suite 400
Houston, Texas
Phone: 281-280-0068

STRUCTURE: Walker Consultants
2525 Bay Area Blvd, Suite 400
Houston, Texas
Phone: 281-280-0068

PART I GENERAL

1. **PURPOSE:** Gregg County, hereinafter “Owner”, is seeking proposals from construction firms and/or contractors, hereinafter “Respondent,” “for the construction of a Parking Facility (Garage and Offices) in Longview, Texas, hereinafter “Construction.” The Owner has developed plans and specifications for the Construction to serve the growing needs of its County. It is the intention of Owner to identify a successful Respondent who best meets the requirements of this procurement, as a Best Value Procurement.

2. **DEFINITIONS:** By submitting a response to this solicitation, the Respondent agrees that Owner’s standard Definitions shall govern unless specifically provided otherwise in a separate agreement. Said Definitions are subject to change without notice. It is the sole responsibility of Respondents to stay apprised of changes.
 - 2.1 **Addenda** – Written or graphic instruments issued by the Architect prior to the execution of the Contract that modify or interpret the Proposal Documents by additions, deletions, clarifications or corrections.

 - 2.2 **Contractor** – The successful Respondent, who has been awarded a contract under an Owner solicitation.

 - 2.3 **Owner** – Gregg County.

 - 2.4 **Deliverables** – Goods, products, materials, and/or services to be provided to Owner by Contractor.

 - 2.5 **Proposal** – A complete and properly signed proposal to do the Work or designated portion thereof for the sums stipulated therein, submitted in accordance with the Proposal Documents.

 - 2.6 **Base Proposal** – The sum stated in the Proposal for which the Respondent offers to perform the Work described in the Proposal Documents as the base, to which work may be added or from which work may be deleted for sums stated in Alternate Proposals.

 - 2.7 **Alternate Proposal (or Alternate)** – An amount stated in the Proposal to be added to or to be deducted from the amount of the Base Proposal if the corresponding change in the Work, as described in the Proposal Documents, is accepted.

- 2.8 Respondent** – Includes any person or entity who submits a response to an Owner solicitation including a Request for Proposals.
- 2.9 RFP Coordinator** – Gregg County Purchasing Agent Kelli Davis - Sole point of contact for Owner for this procurement.
- 2.10 State** – State of Texas.
- 2.11 Unit Price** – An amount stated in the Proposal as a price per unit of measurement for materials or services as described in the Proposal Documents.
- 3. INSURANCE:** The Respondent shall meet or exceed ALL insurance requirements set forth in **EXHIBIT A**, Minimum Insurance Requirements.
- 4. EXHIBITS:** Attachments A through I herein are made a part of this solicitation.

Exhibit A – Minimum Insurance Requirements

Exhibit B - Form 1295 - Certificate of Interested Parties

Exhibit C – Conflict of Interest Questionnaire

Exhibit D - Non-Collusion Affidavit

Exhibit E – Respondent Contractor Pre-Award Certification

Exhibit F – Cost Proposal Form

Exhibit G – Respondent Qualifications Form

Exhibit H – Acknowledgement of Addenda

Exhibit I – Change Form

- 5. QUESTIONS:** The RFP Coordinator is the sole point of contact for this procurement from advertisement through award. All communication between the Respondent and Owner upon release of this RFP shall be with the RFP Coordinator as follows:

Respondents shall be solely responsible for examining the RFP Documents, including any and all addenda or vendor questions and answers that may be issued. Any addenda or Q&A's will be posted on the Gregg County website at www.co.gregg.tx.us – Click

Departments, Click Purchasing, Click Bids/Addendums, then scroll to this RFP and click on it. Bidders are solely responsible for checking this site regularly throughout the bid process to review any addenda.

It is the Respondent's responsibility to:

- a. Examine and carefully read the RFP documents, including any addenda, attachments, drawings and other information or data identified in all the RFP documents.
- b. Attend the pre-bid conference (not mandatory), visit the project site and become familiar with the conditions that may affect the fees required to be submitted with the Respondents proposal.
- c. Be familiar with and aware of all Federal, State and Local laws and regulations that may affect the cost, progress or performance of work.
- d. Notify Owner in writing of conflicts, errors, ambiguities, or discrepancies that Respondent discovers in the RFP document and attachments.

Kelli Davis, NIGP-CPP, CPPB
Gregg County Purchasing Agent
101 East Methvin, Suite 205
Longview, Texas 75601

Email: kelli.davis@co.gregg.tx.us

Phone: 903-237-2686

- 6. OTHER COMMUNICATION:** Any other communication will be considered unofficial and non-binding on Owner. No authority is intended or implied that specifications may be amended or alterations accepted prior to proposal opening without written approval of the RFP Coordinator. Respondents are to rely on written statements issued by the RFP Coordinator only.
- 7. UNSOLICITED COMMUNICATION:** To ensure the fair evaluation of a solicitation, Owner prohibits unsolicited communication initiated by the Respondent to an Owner representative evaluating or considering the solicitations prior to the time a decision has been made. Communication between the Respondent and Owner will be initiated by the RFP Coordinator in order to obtain information or clarification needed to develop an accurate evaluation of the solicitation. Unsolicited communication may be grounds for disqualifying the offending Respondent from consideration for award.
- 8. PROPOSAL SUBMISSION REQUIREMENTS:** Respondents shall send (7) seven sets of SEALED proposals: one with original signatures and six (6) copies. Respondent shall also submit one flash drive (jump, thumb) with a copy of their proposal packet downloaded. All shall be sealed, labeled and mailed/hand delivered to the address below

by the closing date specified. A facsimile transmission is not an acceptable response to this RFP Process and will not be considered.

Gregg County Purchasing Department
Kelli Davis, NIGP-CPP, CPPB, Purchasing Agent
101 East Methvin, St. 205
Longview, Texas 75601
Located on the 2nd floor of the Gregg County Courthouse

9. **PUBLIC BID OPENING:** Gregg County will open proposals at the Gregg County Courthouse in the Gregg County Sheriff's Office, Training Room 5th floor, 101 E. Methvin Suite 559, Longview, TX 75601 at 2:00PM CST March 15, 2022. Respondents, their representatives and interested persons may be present. **Gregg County will not accept any proposals that have proposal pricing changes, notes, or any information on the outside of the envelope. Contractors shall not make any last minutes changes by noting them on the outside of the envelope. In the event this happens, Gregg County will not consider and will reject the Contractors entire proposal.**
10. **LATE BIDS/SUBMITTALS/PROPOSALS:** Any responses received after the date and/or hour set for in this RFP document will not be accepted. The late Respondent will be notified and will advise the Gregg County Purchasing Agent as to the disposition by either pick up, return at bidder's expense, or destroyed with written authorization.
11. **MAIL & DELIVERY OF BIDS/SUBMITTALS/PROPOSALS:** If responses are sent by mail to the Purchasing Department, the Respondent shall be responsible for actual delivery of the RFP to the Purchasing Department before the advertised due date and time. If mail is delayed either in the postal service or in the internal mail system of Gregg County beyond the date and hour set for the RFP opening, responses thus delayed will not be considered and will be disposed of as authorized.

PART II
LAWS, REGULATIONS, AND MANDATORY REQUIREMENTS

1. FUNDING

1.1 The Construction is being facilitated by governmental funds. Project Funding will be provided by the use of a mix of cash reserves with possible tax notes and/or Grant funding. Use of these funds requires the Owner and the successful Respondent to administer the program within the guidelines and comply with all applicable government regulations and requirements including all grant requirements.

1.2 Any contract awarded as a result of this procurement is contingent upon the availability of funding.

1.3 Estimated budget is \$12,500,000.00 (Twelve million five hundred thousand dollars).

2. LAWS, PERMITS AND LICENSES: The successful Respondent shall comply with all federal, state, county and municipal laws, ordinances, rules, regulations, and orders of any public authority bearing on the performance of the Contract, including, but not limited to, the laws referred to in the Contract and other Contract documents. Upon request, the successful Respondent shall furnish to Owner certificates of compliance with all such laws, ordinances, rules, regulations and orders. The successful Respondent shall be responsible for obtaining and keeping current all necessary federal, state and local permits and licenses required for performance under the Contract.

3. CONFLICT OF INTEREST: Effective January 1, 2006, Chapter 176 of the Texas Local Government Code (House Bill 914) requires that any vendor or person considering doing business with a local government entity disclose the vendor or person's affiliation or business relationship that might cause a conflict of interest with a local government entity. The Conflict of Interest Questionnaire form is **EXHIBIT C**. Any attempt to intentionally or unintentionally conceal or obfuscate a conflict of interest may automatically result in the disqualification of the vendor's offer.

4. ACCESS TO RECORDS: In special circumstances, the successful Respondent may be required to allow duly authorized representatives of Owner access to contracts, books, documents, and records necessary to verify the nature and extent of the cost of services provided by firm.

5. **ASSIGNMENT:** The successful Respondent shall not sell, assign, transfer or convey any contract resulting from this RFP, in whole or in part, without the prior written consent of Owner.
6. **PROCUREMENT PRINCIPLES AND STANDARDS OF CONDUCT:** Prohibited Acts of Contractors include:
 - 7.1 A Contractor, and its officers and employees, must arrive at its response to any Owner procurement independently and without consultation, communication, or agreement for the purposes of restricting competition.
 - 7.2 A Contractor, and its officers and employees, may not have a relationship with any person, at the time of submitting its response to any Owner procurement or during the contract term, that may interfere with fair competition.
 - 7.3 A Contractor, and its officers and employees, may not participate in the development of specific criteria for award of the contract, nor participate in the selection of the response to be awarded the contract.
7. **SALES TAX:** Owner is exempt from all federal excise, state and local taxes unless otherwise stated in this document. Owner claims exemption from all sales and/or use taxes under Texas Tax Code §151.309, as amended. Tax Exemption Certificates will be furnished upon request. Respondents shall not include said taxes in their proposal.
8. **CONTRACTOR STATUS:** Contractor is an independent contractor of the Owner, and all persons employed to furnish services or to perform work hereunder are employees, agents or sub-contractors of Contractor and not of Owner. No provision of this agreement shall be construed to give rise to a partnership, joint venture, agency, employer/employee relationship, or any relationship between contractor and Owner other than that of principal and independent contractor.
9. **SUCCESSFUL RESPONDENT:** Successful respondents shall defend, indemnify, save and hold harmless Owner or its designee and its officers, directors and employees from any and all suits, claims, actions, losses, damages, liability and expenses, including attorney's fees arising from any negligent or willful act, error, omission or misrepresentation of Contractor or his employees, agents (including subagents) or servants. The provisions of the subparagraph shall continue and be ongoing in any contract resulting from this RFP.
10. **CONTRACTING AUTHORITY:** Only the Commissioners Court of Gregg County, Texas acting as a body may enter into any type of agreement or contract on behalf of Owner. Department heads, other elected or appointed officials, are not authorized to enter into any type of agreement or contract on behalf of Owner, or to agree to any type of

supplemental agreements or contracts for goods or services. Contracts are subject to review by the Owner's attorney prior to signature by the authorized County official.

- 11. DISADVANTAGED BUSINESS ENTERPRISES (DBE):** Owner is wholly committed to developing, establishing, maintaining, and enhancing minority business involvement in the total procurement process. The Owner, its contractors, their suppliers and sub-contractors, vendors of goods, equipment, services, and professional services, shall not discriminate on the basis of race, color, religion, national origin, age, handicap, or sex in the award and/or performance of contracts. However, competition and quality of work remain the ultimate standards in contractor, sub-contractor, vendor service, professional service, and supplier utilization. All vendors, suppliers, professionals and contractors doing business or anticipating doing business with Owner shall support, encourage and implement steps toward our common goal of establishing equal opportunity for all citizens of Gregg County.
- 12. REQUEST FOR INFORMATION/CLARIFICATIONS:** Owner reserves the right to request clarification of information submitted to one, all or some respondents and to request additional information of one, all or some Respondents. Owner reserves the right to request Best and Final Offers from Respondents.
- 13. CONFIDENTIALITY DURING EVALUATIONS:** All qualification documents submitted as part of the Respondent's offering will be deemed confidential during the evaluation process.
- 14. ETHICS/GRATUITIES:** Owner may, by written notice to the Awarded Respondent, cancel any contract without liability to Awarded Respondent if it is determined by Owner that gratuities, in the form of entertainment, gifts, or otherwise, were offered or given by the Respondent, or any agent or representative of the Respondent, to any officer or employee of Owner with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing of such a contract. In the event this contract is canceled by Owner pursuant to this provision, Owner shall be entitled, in addition to any other rights and remedies, to recover or withhold the amount of the cost incurred by Awarded Respondent in providing such gratuities.
- 15. COMPLIANCE WITH RFP TERMS:** Respondents are cautioned that exceptions to these terms, conditions, and attachments may result in rejection. Any awarded respondent will be expected to execute a contract separate from this document but includes this document as part of the contract.
- 16. NON-RESPONSIVE / PROPOSAL REJECTIONS;** Proposals may be deemed non-responsive, among other reasons, for any of the following reasons:

1. Proposals containing inconsistencies
2. Unbalanced value of terms
3. It is in the best interest of Owner to reject
4. Funding issues
5. Respondents may be disqualified and not considered, among other reasons, for any of the following specific reasons:
 - Reason for believing collusion exists among the Respondents.
 - Reasonable grounds for believing that any Respondent is interested in more than one submission for the work contemplated.
 - The Respondent being interested in any litigation against the county.
 - The Respondent in arrears on any existing contract or having defaulted on a previous contract.
 - Lack of competency as revealed by a financial statement, experience.
 - Respondents shall not owe delinquent property tax in Gregg County.
 - Respondent past performance record with Owner.
 - Limited competition.

PART III INSTRUCTIONS

1. ANTICIPATED PROPOSAL SCHEDULE

| | |
|---|----------------------------------|
| Documents Available to Proposers | February 21, 2022 8:30, CST |
| Pre-proposal Conference | March 01, 2022 at 10:00 A.M. CST |
| Deadline for Written Questions | March 03, 2022 at 5:00 P.M. CST |
| Issue Responses to Questions/Final Addendum | March 08, 2022 |
| Proposals Due/Open Proposals | March 15, 2022 at 2:00 P.M. CST |
| Proposed Award Approval Date | April 11, 2022 |

1.1 Owner reserves the right to revise the above schedule.

1.2 All questions regarding the RFP shall be submitted in writing by 5:00 p.m. by the due date noted above. Questions shall be submitted to Owner’s RFP Coordinator identified in Page Number 3 and 14, of the RFP.

2. PROPOSAL DUE DATE AND TIME

2.1. **Signed and sealed proposals** are due to Owner no later than 2:00 p.m. CST. on the date noted above. The envelope or package must show the return address, project title, "SEALED PROPOSAL” and the following address:

Gregg County
Attn: Purchasing Agent Kelli Davis
101 East Methvin, Suite 205
Longview, Texas 75601

2.2. Any proposal that is received at the address above after the time and date established above is a late proposal and will not be considered. All such proposals will be returned unopened to the Respondent via direct mail. Envelopes received by Owner which do not contain adequate proposal identification information on the outside of the envelope will be opened for the purpose of ascertaining proper proposal identification information and will be processed as any other proposal. If a proposal has incorrect information on the envelope, e.g., wrong opening date, which results in it not being considered in making the award, the proposal will be considered as an invalid proposal and will not be accepted. Any proposal that is not signed is not a

valid proposal and is disqualified from consideration. If a proposal is submitted in which there is a material failure to comply with the specification requirements, such proposal will be rejected.

3. SPECIFICATIONS AND PLANS FOR THE PROJECT: Specification and Construction Documents can be requested by contacting:

Josh Cristy
Schwarz Hanson Architects
josh@schwarz-hanson.com
(817) 377-3600

3.1 When requesting by email please provide: Company Name, GC/Trade, Representative Name, Position/Title, Email, Phone, Address.

3.2 Complete sets only are available. Those who request a set of Proposal Documents will be on the registered plan holders list and are to receive subsequent correspondence and addenda. Documents may also be downloaded directly from the county website at www.co.gregg.tx.us – click departments – click purchasing – click Bids/Addendums and scroll to RFP 2022-09 and click on it.

4. PROPOSALS

4.1 Acceptance/Rejection: Owner reserves the right to accept or reject any or all submittals, with or without cause, to waive technicalities, or to accept the proposal which, in its sole judgment, best serves the interest of the County, or to award a contract to the next most qualified Respondent if a successful Respondent does not execute a contract within 10 business days after approval of the selection by the Gregg County Commissioners Court. Owner makes no warranty or guarantee that an award will be made as a result of this RFP. Owner also reserves the right to waive informalities or defects in proposals, excluding mandatory requirements, or to accept such proposals, as it shall deem to be in the best interest of Owner.

4.2 Addenda: Owner reserves the right to modify, waive any formalities or minor technical inconsistencies and delete any requirement, excluding mandatory requirements, from this RFP prior to the date and time of the proposal deadline. Any modifications, waivers, interpretations, corrections or changes to the RFP shall be made by written addenda. Sole issuing authority of addenda shall be vested in the RFP Coordinator. Addenda shall be sent to all who are known to have received a copy of the RFP and post the addenda on the Gregg County Website. All such addenda become, upon issuance, an inseparable part of

the RFP, and must be met for the Respondent's proposal to be considered. All Respondents shall acknowledge receipt of all addenda by completing EXHIBIT H, Acknowledgement of Addenda, and submitting the acknowledgement with Respondent's proposal. Material or cardinal changes to the RFP after the proposals are opened may result in cancellation to the procurement process without award. No oral representations as to the meaning of the RFP will be made to any Respondent. Any explanation desired by a Respondent must be submitted in writing. (see questions deadline) Any changes, interpretations, or corrections to this document will be made by addenda. Addendums can be found on the Gregg County website at www.co.gregg.tx.us on the Purchasing Department Page under the tab labeled "Bids/Addendums".

4.3 Content: Representations made by Respondent within its proposal will be binding. Any proposal that fails to comply with the requirements contained in this RFP may be rejected by Owner. Respondents taking exception to the specifications, terms and conditions in the RFP and/or offering substitutions shall submit these exceptions and/or substitutions as part of the proposal

4.4 Preparation: Respondents submit proposals at their own risk and expense. All proposals and their accompanying documentation will become the property of Owner. Costs of preparation of a response to this request are solely those of the Respondent including but not limited to any expenses incurred for interviews, presentations or negotiations. Owner assumes no responsibility for any such costs incurred by the Respondent. The Respondent also agrees that Owner assumes no responsibility for any costs associated with any administrative or judicial proceedings resulting from the solicitation process.

4.5 Respondent Changes to RFP Submittal: Respondent may make any corrections, deletions, or additions to proposals in writing prior to the date and time of the proposal deadline. The Respondent shall submit substitute pages in the appropriate number of copies with a letter documenting the changes and the specific pages for substitution. The signature on the letter must be original and of equal authority as the signature on the original proposal. No oral, telephone, fax, e-mail, or other electronically transmitted corrections, deletions, or additions shall be accepted. Respondent may not alter or amend proposals after proposals are opened. A Respondent may reduce its price provided that the Respondent is the lowest and best Respondent and is otherwise entitled to award.

4.6 Withdrawal: A proposal shall not be withdrawn or canceled by the Respondent unless the Respondent submits a letter prior to the date and time of the proposal deadline. The signature on the withdrawal letter must be original and must be of equal authority as the signature of the proposal.

5. PRE-PROPOSAL CONFERENCE (not mandatory)

5.1. Owner shall conduct a pre-proposal conference for all prospective Respondents to ask questions regarding the RFP. Attendance is highly encouraged, but not mandatory. Respondents are encouraged to submit questions, prior to the pre-proposal conference, to RFP Coordinator Kelli Davis at Kelli.Davis@co.gregg.tx.us.

Gregg County Courthouse
Gregg County Sheriff's Office
Training Room 5th floor
101 E. Methvin Suite 559
Longview, TX 75601

5.2. Questions and answers arising at the pre-proposal conference will be documented and Owner will distribute minutes of the meeting to registered attendees of the pre-proposal conference and registered plan holders.

6. RESTRICTIVE OR AMBIGUOUS SPECIFICATIONS: It is the responsibility of the Respondent to review the entire invitation to Proposal packet and to notify the RFP Coordinator if the specifications are formulated in a manner that would restrict competition or appear ambiguous. Respondents are to propose as specified herein or use an approved equal. The mention of any brand name in the features and requirements that Owner is seeking is not intended to restrict other equal materials or products from being used.

EXCEPTIONS/SUBSTITUTIONS: All proposals meeting the intent and requirements of this RFP shall be considered for award. Respondents taking exception to the specifications, terms and conditions or offering substitutions, shall state these exceptions in the section provided or by attachment as part of the proposal. The absence of such a list shall indicate that the Respondent has not taken exceptions and Owner shall hold the successful Respondent responsible to perform in strict accordance with the specifications, terms, and conditions of the contract. Owner reserves the right to accept any and/or none of the exception(s) /substitution(s) as deemed to be in the best interest of Owner.

7. HOLD HARMLESS AGREEMENT: The Respondent shall indemnify and hold Owner harmless from all claims for personal injury, death, and/or property damage resulting directly or indirectly from Respondent's performance. Respondent shall procure and maintain, with respect to the subject matter of this proposal, appropriate

insurance coverage as specified. Certification of such coverage must be furnished with the proposal.

PART IV. PROJECT DESCRIPTION/SCOPE

Owner intends to select a CMAR (Construction Manager at Risk) that has the capabilities and experience to perform comprehensive CMAR services throughout all design and construction phases of this Project. Owner, in its desire to construct a Parking Facility, seeks a firm or qualified professional construction manager at risk to perform the following services, including but not limited to:

GENERAL SERVICES:

The CMAR will be required to work with the Architect, Owner, and other applicable regulatory agencies to advance the design for the Project and to construct the approved design). The CMAR will be required to engage in preconstruction efforts to perform constructability reviews of the design in a manner consistent with Owners goals for the Project (e.g., programmatic, budgetary, schedule and quality); to solicit competitive trade bids for the construction work and to develop an acceptable Guaranteed Maximum Price (GMP) and corresponding scope and schedule for the Work; and to implement the requisite construction and other work necessary.

1. CMAR shall review the drawings and specifications relative to bid packages. Develop bid package requirements in accordance with Sections 2269.255 and 2269.256 of the Texas Government Code. Schedule and conduct pre-bid conferences. Review and analyze bids in accordance with Sections 2269.255 and 2269.256 of the Texas Government Code. Update Project budget and schedule consistent with actual bids. Provide a Guaranteed Maximum Price proposal for the Project that will include all requirements as set forth in the resulting contract. CMAR must possess the ability to foster and facilitate team building/partnering concepts between owner representation, outside agencies, design teams, contractors, and the public which will encourage an open exchange of information and ideas throughout the project.
2. CMAR must be able to attend regular, special and emergency meetings, including but not limited to, bid related meetings and conferences when required or requested by Owner.
3. CMAR should be able to prepare and/or review and evaluate reports and documents as requested by Owner, or any regulatory agency, as required.
4. CMAR should be able to review of all correspondence referred by Owner, and prepare correspondence on behalf of Owner, as required.
5. CMAR will be required to confirm the Construction in accordance with the RFP Documents.
6. CMAR will provide all construction management services necessary to implement the project, inclusive of but not limited to the following: all materials, management, personnel, equipment, hazardous material abatement, supervision, labor and other services necessary to finish the project.
7. At the time the 100% Construction Documents are issued, the CMAR shall develop a comprehensive Guaranteed Maximum Price (GMP) based on competitive bids of all major subcontracts, suppliers, and vendors for approval by Owner.

8. The GMP proposal to the Owner should include a line item construction budget, a detailed schedule, a workforce utilization plan. In the event Owner does not agree with the GMP or schedule presented for this project, Owner shall have the right to terminate the Contract with CMAR. The GMP should include any approved changes due to value engineering.
9. The CMAR shall assist in reviewing Owner's Technology, Security, Equipment and Furnishings procurement and any installation schedule affecting the construction schedule.

PRE-CONSTRUCTION PHASE SERVICES

The CMAR will be required to work with the Architect, Owner, and other applicable regulatory agencies to construct the approved design. The CMAR will be required to engage in preconstruction efforts to perform constructability reviews of the design in a manner consistent with Owner's goals for the Project (e.g., programmatic, budgetary, schedule and quality); to solicit competitive trade bids for the construction work and to develop an acceptable Guaranteed Maximum Price (GMP) and corresponding scope and schedule for the Work; and to implement the requisite construction and other work necessary.

The selected CMAR will also perform the following services (including but not limited to):

1. The CMAR will provide a list of Value Engineering options along with every estimate provided. The CMAR will also include a corresponding value for each item listed. Once the GMP is developed, the CMAR will assist Owner and architect in providing a detailed list of Value Engineering options and associated estimated credits. The CMAR shall participate as a project team member to help drive value Owner thru this process. The CMAR will maintain a Value Engineering Log that will be updated regularly throughout the design and bidding process.
2. Review 100% Schematic Design and prepare estimate of construction costs and schedule.
3. Review preliminary material specifications and design details. Advise in writing to Owner on constructability, availability of materials, long lead times and alternate methods and/or materials. Assist in the preparation of a list of materials that are in Owners best interest to purchase directly.
4. Prepare preliminary project baseline schedule that shows key project milestones, release dates for long lead items, dates for key subcontractors, and substantial and final completion estimations.
5. Prepare Construction Management Plan that includes, but is not limited to, noise control, hours for construction and deliveries, trash and debris removal plan, traffic and parking control, signage, communication procedures, emergency procedures, quality control procedures, dust control, public street repairs, erosion control, tree

- protection plan, temporary fire protection measures, project signage, pest control, and construction staging plan.
6. Recommend in writing alternative methods/materials to enhance the schedule, reduce cost, and facilitate construction including take-offs of any County furnished material or labor.
 7. Identify materials for pre-purchase and make recommendations on schedule and costs.
 8. Based on revisions made to Schematic Design, update construction cost estimates as necessary to ensure the budget is maintained.
 9. The CMAR shall provide such preconstruction services required to advance the project. These services shall include, but are not limited to, archeological studies, geotechnical testing, materials or site testing and or conditions assessments,
 10. The CMAR will be responsible for preparing and submitting trade permit applications that are necessary for the construction of the project. The CMAR shall update Gregg County of each permit.
 11. Review site conditions and make suggestions on observations based on CMAR's experience with projects of similar size and scope.
 12. The CMAR will promote and generate interest of local and regional subcontractors, material suppliers, and other service providers.
 13. At least three (3) potential subcontractors shall be identified for each trade unless Owner has contracted vendors available (ie security vendor).
 14. Owner will review the proposed bidders list and advise the CMAR of its acceptance or rejection of any proposed supplier/subcontractor.
 15. The CMAR shall encourage the participation of Local, Small, and Disadvantaged Business Enterprises including Minority and Women Owned Companies.

CONSTRUCTION PHASE SERVICES (Minimum Required)

1. Manage the GMP DOCUMENTATION, including:
 - a. Detailed quantity surveys, pricing.
 - b. Procurement strategy and implementation.
2. Establish the BUDGET BY BID PACKAGE
 - a. Prepare a detailed SCHEDULE derived from detailed quantities for each bid package to satisfy milestones.
3. SITE UTILIZATION STUDY
 - a. Coordinate mobilization and plan logistical requirements.
 - b. Project office and material staging locations. Ingress, egress.
 - c. Security requirements of Owner.
4. Prepare SUBCONTRACTOR BID OR PROPOSAL PACKAGES, including:
 - a. Project Manual, outlining the requirements of the construction.
 - b. Schedule (by bid or proposal package interface).

- c. Detailed scope of work.
 - d. Detailed document listing.
 - e. Proposal forms for each bid or proposal package.
 - f. Insurance requirements.
 - g. Bonding requirements.
 - h. Other special requirements.
5. CONDUCT PRE-BID MEETINGS for each bid or proposal package, addressing:
- a. Project requirements.
 - b. Document review for specific questions.
 - c. Sequence/schedule review.
 - d. Site restrictions.
 - e. Other questions raised during discussions.
6. RECEIVE BIDS:
- a. Generate interest in vendors/contractors.
 - b. Advertise or solicit for bids/proposals.
 - c. Conduct bid/proposal openings.
 - d. Receive bids on all portions of the work, with the exception of work specifically approved by the Owner in advance when appropriate to schedule or logistics.
 - e. Prepare tabulations for each bid or proposal package.
 - f. Review proposals for compliance with contract documents.
 - g. Review apparent low vendor's qualifications, past experience and liquidity.
7. CONDUCT PROPER AWARD OF CONTRACTS/PURCHASE ORDERS:
- a. Conduct pre-award meetings.
 - b. Review schedule of values.
 - c. Review subcontractors' general conditions.
 - d. Review scope of work.
 - e. Identify shop drawing requirements.
 - f. Perform document review and specifications review.
 - g. Establish quality requirements and standards.
 - h. Review sequence and schedule.
 - i. Identify accounting requirements.
 - j. Review insurance requirements.
 - k. Review safety and security requirements.
 - l. Recommend award of contracts in written form for review and approval to the Owner/Architect indicating both the amount of the subcontract.
8. PROVIDE COORDINATION AND MANAGEMENT OF SUBCONTRACTORS:
- a. Establish site organization, including work and storage areas.
 - b. Establish jobsite management organization and jobsite procedures.

- c. Maintain daily log for jobsite record.
 - d. Monitor construction cost and projections.
 - e. Prepare and maintain cash flow projection for Owner.
 - f. Monitor and maintain quality control.
 - g. Equipment and material control.
 - h. Provide and monitor overall progress and short interval scheduling.
 - i. Prepare billings and progress payments.
 - j. Conduct subcontractor coordination meetings.
 - k. Provide coordination between subcontractors.
 - l. Prepare and receive requests for information.
 - m. Prepare agendas and conduct weekly safety and progress meeting.
 - n. Establish subcontractor progress payment procedure for processing and payment.
 - o. Monitor subcontractor pay applications.
9. MONTHLY REPORT:
- a. Summarize project financial status.
 - b. Review and summarize past month's construction performance.
 - c. Project the coming month's construction activities.
 - d. Present status report on change orders, delays and time extensions.
 - e. Identify problems that threaten construction quality, cost and schedule.
10. CHANGE ORDER CONTROL:
- a. Implement system for change orders.
 - b. Review change order requests from subcontractors.
 - c. Negotiate change orders with subcontractors.
 - d. Submit recommendations to Owner.
 - e. Review change requests from subcontractors that affect contingency and allowance funds.
 - f. Submit recommendations to Owner.
11. Coordinate schedule and assist independent testing and inspection agencies selected by the Owner, involving the following work:
- a. Underground piping, Soils, Concrete, Rebar, Miscellaneous steel, Structural steel, Mechanical systems.
 - b. Electrical.
 - c. Life safety systems.
 - d. Energy management systems
 - e. Others as required
 - f. Work with area superintendents of subcontractors.
 - g. Prepare operations to minimize quality control problems.
 - h. Require formalized quality management program from subcontractors:
 - i. Ensure conformance to Project's quality standards previously established.

- j. Follow-up to assure correction of deficiencies on test reports.

12. AUDITS:

- a. The Owner will retain the right to audit any or all accounting records of this Project upon demand for up to two years after final completion of the work or final acceptance of the work by the Owner, whichever is later.
- b. The audits may include, without limitation, all cost reports, payment application documentation, check registers, any or all payments made to subcontractors, companies or individuals, for all work, supplies, equipment, and other items and activities associated with this Project.
- c. One of the purposes of the audit is for the Owner to have a complete accounting of all costs.
- d. The accounting method must clearly show the breakdown of the following as a minimum: Unit and material cost, Invoices, Specific wage rates for all trades, Contractor's fee, Insurance and bond costs, Equipment and tool rental costs.
- e. Any other documentation required or requested Audits may occur at regular or irregular intervals. The Construction Manager must be able to provide documentation required upon request within 24 hours during the duration of the Project and for the time frames thereafter as required under the Texas Record Retention laws.

13. JOB SAFETY OBJECTIVES:

- a. Conduct weekly safety meeting: - Implement Project safety requirements.
- b. Review subcontractor safety programs.
- c. Subcontractor conformance, initiate knowledge of OSHA requirements: Subcontractor responsible for costs and damages.
- d. Submission of accident and injury reports.
- e. Maintain safety meeting minutes.
- f. Inform subcontractors of procedures.
- g. Enforce alcohol and drug programs by subcontractors. - Implement and maintain clean-up.
- h. Fully administer the CMAR's Safety Program, COVID-19 Protocol plan and perform all obligations in accordance with applicable laws, rules, regulations, including Federal Occupational, Safety and Health Act, Clean Air Act, Federal Water Pollution Control Act and the American with Disabilities Act, CDC, State and local AHJ Covid-19 requirements and guidelines.

14. JOBSITE SECURITY FUNCTIONS:

- a. Monitor and control employee, vendor and public access to the jobsite.
- b. Monitor and control material and equipment deliveries to the jobsite.
- c. Monitor and control material and equipment being removed from jobsite through a material release form.

- d. Monitor and control site traffic.
- e. Monitor and perform periodic checks for alcohol and drugs.
- f. Monitor and control tools.
- g. Monitor material storage.
- h. Monitor trailers and all equipment within.
- i. Monitor and control employee, vendor theft. •

POST CONSTRUCTION PHASE SERVICES:

1. Final acceptance by the Owner is conditioned on completion and submission of all items:
 - a. Provide operating and maintenance manuals.
 - b. Secure and assemble warranties or guarantees.
 - c. Provide check-out of equipment.
 - d. Instruct operating personnel in equipment operating and maintenance procedures.
 - e. Assist in actual start-up of equipment.
2. Implement close-out procedures and ensure requirements are met:
 - a. Subcontractors' and vendors' final payment.
 - b. Resolution of claims
 - c. Final change orders
 - d. Assist Owner in enforcement of warranties or guaranties.
 - e. Conduct walk-through with Owner and Contractor.

PART V. BEST VALUE EVALUATION, QUALIFICATIONS AND CRITERIA & SELECTION

Proposal Evaluations will be made in Compliance with section 2269.254 of the Government Code. All proposals received will be evaluated based on the Best Value for Owner. In determining Best Value, Owner will consider the following,

1. **Purchase and Price Terms:** The Respondent will complete the Proposal Sheet with accurate pricing for the services requested;
2. **Financial Capacity:** The Respondents must demonstrate its ability to financially undertake the project. The successful Respondent must demonstrate that it has a stable history in the commercial building industry and the resources to carry out the Project, satisfy bonding requirements, cash flow requirements, etc.
3. **Experience with Similar Projects:** The Respondents must demonstrate experience with the construction of parking garages, commercial type offices, government buildings and public buildings of a similar nature and with similar construction requirements, etc. The Respondent must demonstrate its understanding of the key components and factors, which are necessary for expeditious and cost effective garage and office building construction. Inclusion of completion date, location, budget, scope, and Architect and Owner contact references of completed, similar projects will be required to support technical merit of this factor.

4. **Experience of Respondents Personnel:** The Respondent must demonstrate that personnel to be assigned to the project have adequate experience on similar projects performing the task assigned to them. Additionally, Respondents need to clearly illustrate their project management techniques and approaches, including scheduling, funds/budget management, change order controls, safety plans, communication and documentation, jobsite management, etc.
5. **Project Schedule:** The estimated timeframe for completion of the Gregg County Parking Garage and Office is 400 calendar days. The Respondent must outline its proposed project schedule and provide its proposed calendar days for project completion, from Notice to Proceed until Substantial Completion. A demonstration of the Respondent's ability to meet or exceed the estimated time requirement and an illustration of the Respondent's familiarity with the project through a graphic schedule and other information will enhance the Respondent's response to the Technical Merit of this factor.
6. **Interviews/Presentations:** Respondents may be required to make an oral presentation to the evaluation committee to further present their qualifications. These presentations shall provide the Respondent the opportunity to clarify their response and ensure a mutual understanding of the Service to be provided and the approach to be used. In addition, the evaluation committee may visit the Respondent's facility. Owner reserves to right to make a selection without an interview/oral presentation. All costs incurred by Respondent for the interview/presentations will be the sole responsibility of the Respondent. After any such presentation, submittals may be evaluated and scored again. Owner reserves the right at its sole discretion to determine if interview/presentations are in the best interest of the Owner and is under no obligation to request interviews/presentations from all Respondents.
7. **Acceptance:** Submission of a proposal implies the Respondent's acceptance of the evaluation criteria and Respondent's recognition that subjective judgments must be made by the evaluating committee.
8. **Proposal Validity:** All proposals submitted are to be valid for a period of thirty (30) days.
9. **Evaluation Criteria:** The award of the contract shall be made to the responsible Respondent whose proposal is determined to be the best evaluated offer taking into consideration the following, including the criteria set forth in Section 2269.055 of the Government Code.

| Evaluation Criteria | Percentage |
|---|-------------------|
| Qualifications/Business Capabilities (financials/litigation/safety record/references/forms completion etc.) | 10 % |
| Cost proposal price | 50 % |

| | |
|---|-------------|
| Experience with Similar Projects & Personnel | 30 % |
| Ability of Respondent to Perform within the Desired Timeframe/Proposed Schedule | 10 % |
| | |
| TOTAL | 100% |

10. CONTRACT NEGOTIATIONS In establishing a Contract as a result of the solicitation process, Owner may:

- a. Review all proposals and determine which Respondents are reasonably qualified for award
- b. Determine the Respondent whose response is most advantageous to Owner considering the best value and evaluation criteria
- c. Attempt to negotiate with the most qualified Respondent
- d. Contract at fair and reasonable terms, conditions and cost
- e. If negotiations are successful, enter into a Contract
- f. If negotiations are not successful, formally end negotiations with that Respondent
- g. Owner may then select the next most highly qualified Respondent and attempt to negotiate a Contract at fair and reasonable terms, conditions and cost with that Respondent
- h. Owner shall continue this process until a Contract is entered into or all negotiations are terminated
- i. Owner also reserves the right to reject any or all submittals, or to accept any submittal deemed most advantageous, or to waive any irregularities or informalities in the submittal received

11. CONTRACT AWARD: The successful Respondent will be required to execute a Contract with Owner, which finalizes the terms and conditions set forth in the requirements of this RFP and the successful Respondent’s proposal. No award can be made until Owner considers and approves execution of the Contract. Split or multiple awards may be made at the sole discretion of Owner.

12. PROPOSAL REQUIREMENTS: Respondents shall send (7) seven sets of SEALED proposals: one with original signatures and six (6) copies. Respondent shall also submit one flash drive (jump, thumb) with a copy of their proposal packet downloaded. All shall be sealed, labeled and mailed/hand delivered to the address below by the closing date specified. A facsimile transmission is not an acceptable response to this RFP Process and will not be considered.

13. Electronic Proposals will not be accepted.
14. **The proposal is to be sent to the RFP Coordinator at the address noted in Part III of this packet. The PACKAGE MUST SHOW THE PROJECT TITLE AND BE MARKED "SEALED PROPOSAL". Gregg County will not accept any proposals that have proposal pricing changes, notes, or any information on the outside of the envelope. Contractors shall not make any last minutes changes by noting them on the outside of the envelope. In the event this happens, Gregg County will not consider and will reject the Contractors entire proposal.**
15. Proposals that do not conform to the instructions given or which do not address all the services, as specified, may be eliminated from consideration. Owner, however, reserves the right to accept such proposals if it is determined to be in Owner's best interest. The proposal shall include: Title Page, Show the RFP title, name of Respondent, address, telephone number(s), email, name of contact person and date and time due.

PART VI. PROPOSAL SUBMISSION REQUIREMENTS:

Submittal Format: All submittals must follow the same format. No exceptions to this format will be accepted. To be accepted for evaluation, the submittal format must address all the required components in order.

The aim of the required format is to simplify the submittal preparation and evaluation process and to ensure that all submittals receive the same orderly review.

Table of Contents (Tab 1): Clearly identify the materials by Tab and Page Number.

Section I: Letter of Transmittal (Tab 2): Respondents should submit a letter expressing their interest in the project. The letter must contain, at a minimum, the following information:

- A. Briefly state the Respondent's understanding of the Service to be performed and make a positive commitment to provide the services as specified.
- B. Provide the name(s) of the person(s) authorized to make representations for your firm, their titles, address, telephone number, fax number, and e-mail address.
- C. The letter shall be signed in permanent ink by a corporate officer or other individual who has the authority to bind the Respondent. The name and title of the individual(s) signing the proposal shall be clearly shown immediately below the signature.

D. Acknowledge receipt of all addenda by completing **EXHIBIT H**, Acknowledgement of Addenda.

Section II: Qualifications and Experience of Respondents (Tab 3): Complete and sign the Respondent Qualification Form (**EXHIBIT G**) to include the required information for the Construction specified herein. As part of this document, Respondents shall identify the key individuals to be assigned to this project, including resumes and an organizational chart. Additionally, Respondents need to clearly illustrate their project management techniques and approaches, including scheduling, funds/budget management, change order controls, safety plans, communication and documentation, jobsite management, etc. The Respondent must demonstrate its understanding of the key components and factors, which are necessary for expeditious and cost effective garage and office building construction.

Section III: Cost Proposal Form (Tab 4): Complete and sign the Proposal Form (**EXHIBIT F**) to include the unit cost and extended cost for the Construction specified herein.

Section IV: References (Tab 5): The Respondents must demonstrate experience with the construction of parking garages, commercial type offices, government buildings and public buildings of a similar nature and with similar construction requirements, etc. Respondents shall provide at least three (3) references for which the same or similar Construction projects have been provided. Include a point of contact, address, e-mail, phone number and a brief description of the Service provided. Owner will conduct reference checks to verify and validate Respondent's performance. Reference checks indicating poor or failed performance may be cause for rejection of the proposal submitted. Inclusion of completion date, location, budget, scope, and Architect and Owner contact references of completed, similar projects will be required to support technical merit of this factor.

Section V: Required Financial Statements/Past or Pending Litigation (Tab 6): Respondent must provide information on the firm's financial resources and stability to include at least three (3) years of audited financial statements to include income/expense sheets and balance sheets.

Section VI: Required Certifications and Forms (Tab 7): Respondent shall provide fully executed certifications and forms (**EXHIBIT E**), identified. Failing to provide the following certifications and forms may result in the Respondent being removed from consideration for Contract award.

EXHIBIT B - Form 1295 - Certificate of Interested Parties

EXHIBIT C - Form CIQ - Conflict of Interest Questionnaire

EXHIBIT D - Non-Collusion Affidavit

Proposals should be prepared simply and economically, providing a straightforward, concise description of Respondent's ability to meet the requirements and specifications of this RFP. Emphasis should be on completeness, clarity of content, and responsiveness to the requirements and specifications of this RFP. Any proposal that fails to comply with the requirements contained in this RFP may be rejected by Owner, at its discretion.

00 40 00

PROCUREMENT FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exhibit A - Minimum Insurance and Bonding Requirements.
- B. Exhibit B - Form 1295 Certificate of Interested Parties
- C. Exhibit C - Form CIQ Conflict of Interest Questionnaire
- D. Exhibit D - Non-Collusion Affidavit
- E. Exhibit E - Respondent Contractor Pre-Award Certification
- F. Exhibit G - Respondent Qualification Statement
- G. Exhibit H - Acknowledgement of Addenda
- H. Exhibit I - Change Form

END OF SECTION

EXHIBIT A

MINIMUM INSURANCE AND BONDING REQUIREMENTS

Successful Respondent(s) agrees to maintain certain types of insurance and bond protection through the duration of the Project. All insurance policies and bonds are to be issued by an insurance company authorized to do business in the State of Texas, using an insurance company with an A.M. Best Rating of A5 or better. All subcontractors utilized must also comply with these specifications as if they were the successful Respondent. Specific details of coverage limits and conditions are to be followed as listed below. Any variance from these requirements must be denoted in writing and included as an exception on the Substitutions and Exceptions Form (**EXHIBIT I**).

REQUIRED INSURANCE

1. Worker's compensation and employer's liability coverage complying with the applicable laws of the State of Texas, covering all employees of Contractor and Subcontractors engaged in the work to be performed under this Contract. Employer's liability coverage shall have a minimum limit of \$100,000 for liability arising out of accident.

2. Comprehensive general liability insurance, including Contractor's protective liability, in Contractor's name, with bodily injury limits of not less than \$500,000 per person and \$1,000,000 per accident for bodily injury, and property damage limits of not less than \$1,000,000. The policy shall specifically include:
 - 2.1. XCU Coverage (property and casual insurance).

 - 2.2. Completed Operations Coverage for a period of 1 year from the date of final completion of the Work.

 - 2.3. Contractual Liability Coverage.

3. Automobile liability insurance, including coverage for owned, non-owned and hired vehicles, with minimum limits of not less than \$500,000 per person and \$1,000,000 per accident for property damage.

All policies of insurance shall contain a waiver of subrogation in favor of Gregg County, coverage in Paragraphs 2. and 3. shall name Gregg County as an additional insured. All policies shall be with companies acceptable to Gregg County, and shall provide thirty (30) days prior written notice to Gregg County prior to cancellation, termination, or amendment.

Contractor shall furnish Gregg County with a Certificate of Insurance or copies of policies evidencing all such insurance prior to commencement of the Work.

DEFINITIONS: WORKERS COMPENSATION INSURANCE COVERAGE

1. Certificate of Coverage – A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-1, TWCC-82, or TWCC-84.) showing statutory Workers’ Compensation Insurance Coverage for the person’s or entity’s employees providing services on a project, for the duration of the Project.

2. Duration of the Project – Includes the time from the beginning of the work on the Project until the Contractor’s work on the Project has been completed and accepted by Gregg County.

3. Persons or sub-contractors providing services on the Project (Subcontractor in Article 406.096) includes all persons or entities performing all or part of the services the contractor has undertaken to perform on the Project, regardless of whether that person contracted directly with the Contractor and regardless of whether that person has employees. This includes, with limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity or employees of any such entity, which furnishes persons to provide services on the Project. “Services” include, without limitation, providing hauling or delivering equipment or materials or providing labor, transit or other service related to a Project. “Services” do not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

The Contractor shall provide coverage based on proper reporting of classification code and payroll amounts and fill in of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the Contractor providing services on the Project, for the duration of the Project.

The Contractor must provide a Certificate of Coverage to Gregg County prior to being awarded the Contract.

If the coverage period shown on the Contractor’s current Certificate of Coverage ends during the duration of the Project, the Contractor must, prior to the need of coverage period, file a new Certificate of Coverage with Gregg County, showing that coverage has been extended.

The Contractor shall obtain from each person providing services on a Project, and provide to Gregg County.

1. A Certificate of Coverage, prior to that person beginning work on the Project, so the governmental entity will have on file Certificates of Coverage showing coverage for all persons providing services on this Project; and
2. No later than seven (7) days after receipt by the Contractor, a new Certificate of Coverage showing extension of coverage, if the coverage period shown on the current Certificate ends during the duration of the Project.

The Contractor shall retain all required Certificates of Coverage for the duration of the Project and for one (1) year thereafter.

The Contractor shall notify the governmental entity in writing by certified mail or personal delivery within ten (10) days after the Contractor knew or should have known of any change that materially affects the provision of coverage of any person providing services on the Project.

The Contractor shall post on each Project site a notice in the text form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the Project that they are required to be covered and stating how a person may verify coverage and report lack of coverage.

The Contractor shall contractually require each with whom it contracts to provide services on a Project to:

1. Provide coverage based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements which meets the statutory requirements of Texas Labor Code Section 401.011(44) for all of its employees providing services on the Project, for the duration of the Project.
2. Provide to the Contractor prior to that person beginning work on the Project a certificate showing that coverage is being provided for all employees of the Person providing services on the Project for the duration of the Project.
3. Provide to the Contractor prior to the end of the coverage, a new Certificate of Coverage showing extension of coverage, if the coverage period shown on the current certificate ends during the duration of the Project.

4. Obtain from each person or sub-contractor with whom it contracts and to provide to the Contractor; and a Certificate of Coverage, prior to the other person beginning work on the Project and for three (3) years thereafter; and the Coverage Period.
5. Retain all required Certificates of Coverage on file for the duration of the Project and three (3) years thereafter.
6. Notify the governmental entity in writing by certified mail or personal delivery within (10) days after the person/sub-contractor knew or should have known of any change that materially affects the provision of coverage of any person providing services on the Project.
7. Contractually require each person with whom it contracts to perform as required by paragraphs 1.1 to 1.7 with the Certificates of Coverage to be provided to the person for whom they are providing services.

By signing this proposal or providing or causing to be provided a Certificate of Coverage, the Contractor is representing to the governmental entity that all employees of the Contractor who will provide services on the Project will be covered by Workers' Compensation Coverage for the duration of the Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or in the case of a self-insured with the Commissions Division of self insurance regulation providing false or misleading information may subject the Contractor Administrative Penalties, Criminal Penalties or Other Civil Actions.

The Contractor's failure to comply with any of these provisions is a breach of Contract by the Contractor which entitles Gregg County to declare the Contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the governmental entity.

BONDING REQUIREMENTS

1. A Proposal guarantee from each Respondent equivalent to five (5) percent of the Proposal price. The "Proposal guarantees" shall consist of a firm commitment such as a Proposal bond, certified check, or other negotiable instrument accompanying a Proposal as assurance that the Respondent will, upon acceptance of his Proposal, execute such contractual documents as may be required within the time specified.

2. Sec. 2269.258 Government Code. PERFORMANCE OR PAYMENT BOND. (a) If a fixed contract amount or guaranteed maximum price has not been determined at the time the contract is awarded, the penal sums of the performance and payment bonds delivered to the governmental entity must each be in an amount equal to the construction budget, as specified in the request for proposals or qualifications.
(b) The construction manager-at-risk shall deliver the bonds not later than the 10th day after the date the construction manager-at-risk executes the contract unless the construction manager-at-risk furnishes a bid bond or other financial security acceptable to the governmental entity to ensure that the construction manager will furnish the required performance and payment bonds when a guaranteed maximum price is established.

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

OFFICE USE ONLY

Complete Nos. 1 - 4 and 6 if there are interested parties.
 Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.

| 4 Name of Interested Party | City, State, Country (place of business) | Nature of Interest (check applicable) | |
|-------------------------------|---|---------------------------------------|--------------|
| | | Controlling | Intermediary |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

5 Check only if there is NO Interested Party.

6 UNSWORN DECLARATION

My name is _____, and my date of birth is _____.

My address is _____, _____, _____, _____, _____.
(street) (city) (state) (zip code) (country)

I declare under penalty of perjury that the foregoing is true and correct.

Executed in _____ County, State of _____, on the _____ day of _____, 20____.
(month) (year)

 Signature of authorized agent of contracting business entity
 (Declarant)

ADD ADDITIONAL PAGES AS NECESSARY

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

FORM CIQ

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 Name of vendor who has a business relationship with local governmental entity.

2 Check this box if you are filing an update to a previously filed questionnaire. (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 Name of local government officer about whom the information is being disclosed.

Name of Officer

4 Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

Yes No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

Yes No

5 Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.

6 Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

Signature of vendor doing business with the governmental entity

Date

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at <http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm>. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

- (A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;
- (B) a transaction conducted at a price and subject to terms available to the public; or
- (C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

(a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

(2) the vendor:

(A) has an employment or other business relationship with the local government officer or a family member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds \$2,500 during the 12-month period preceding the date that the officer becomes aware that

- (i) a contract between the local governmental entity and vendor has been executed;
- or
- (ii) the local governmental entity is considering entering into a contract with the vendor;

(B) has given to the local government officer or a family member of the officer one or more gifts that have an aggregate value of more than \$100 in the 12-month period preceding the date the officer becomes aware that:

- (i) a contract between the local governmental entity and vendor has been executed; or
- (ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

(a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

- (1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);
- (2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or
- (3) has a family relationship with a local government officer of that local governmental entity.

(a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(1) the date that the vendor:

- (A) begins discussions or negotiations to enter into a contract with the local governmental entity; or
- (B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(2) the date the vendor becomes aware:

- (A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);
- (B) that the vendor has given one or more gifts described by Subsection (a); or
- (C) of a family relationship with a local government officer.

**EXHIBIT E
RESPONDENT/CONTRACTOR PRE-AWARD CERTIFICATIONS**

This checklist will be used to ensure that all required procurement certifications listed within have been read, initialed, and signed by the Respondent/Contractor BEFORE the proposal is submitted. All certifications listed below follow this checklist.

Respondent/Contractor's Initials:

-
1. EXHIBIT B - Form 1295 - Certificate of Interested Parties _____
 2. EXHIBIT C - Form CIQ - Conflict of Interest Questionnaire _____
 3. EXHIBIT D - Non-Collusion Affidavit _____

I HEREBY ATTEST THAT THE FORMS LISTED ABOVE WERE READ AND MY INITIALS ABOVE INDICATE THAT EACH ITEM WAS PROPERLY PREPARED AND EXECUTED.

DATE: _____

SIGNATURE: _____

NAME / TITLE: _____
RESPONDENT/
CONTRACTOR: _____

EXHIBIT G
GREGG COUNTY
PARKING GARAGE AND OFFICE
Longview, Texas

RESPONDENT QUALIFICATIONS STATEMENT

This form is to be submitted with the Proposal documents for construction of this facility attached to the Best Value Procurement document and response. Additional pages may be added as needed.

CONTRACTOR NAME _____

CONTRACTOR ADDRESS _____

CITY STATE ZIP _____

AUTHORIZED REPRESENTATIVE _____

TELEPHONE _____

FAX _____

EMAIL ADDRESS _____

TYPE OF ORGANIZATION (corporation, etc.) _____

LENGTH OF TIME AS CONTRACTOR _____

LENGTH OF TIME UNDER CURRENT NAME _____

OTHER NAMES PREVIOUSLY USED _____

DATE OF INCORPORATION OR ORGANIZATION _____

NAME OF PRESIDENT, OWNER, MANAGING PARTNER _____

1. Provide a statement of interest for the Project including a narrative describing the Respondent's unique qualifications as they pertain to this particular Project. Provide a statement on the availability and commitment of the Respondent, its principal(s) and assigned professionals to undertake the Project.
2. Provide resumes of the Construction Manager at Risk team that will be directly involved in the Project, including their experience with similar projects, the number of years with the firm,
3. Describe your Construction Management and Execution plan for providing Preconstruction Phase Services required for this Project.
4. Are there any judgments, claims, arbitration proceedings, or lawsuits pending or outstanding against your organization or its officers? (if yes, attach details)
5. Has your organization filed any lawsuits or requested arbitration on a construction project within the last five years? (if yes, attach details.)
6. Identify and describe the proposed Team's past experience for providing Construction Manager at Risk Services that are MOST SIMILAR TO THIS PROJECT within the last five (5) years. List the projects in order of priority, with the most relevant project listed first. Provide the following information for each project listed:
 - a. Project name, location, contract delivery method, and description
 - b. Construction cost estimate determined by respondent during pre-construction phase services
 - c. Final construction cost
 - d. Final project size in gross square feet
 - e. Type of construction (new, renovation, or expansion)
 - f. The owner's name and representative who served as the day-to-day liaison during the design and construction phases of the project, including telephone number
 - g. Architect/Engineer's name and representative who served as the day-to-day liaison during the construction phase of the project, including telephone numberReferences shall be considered relevant based on specific project participation and experience with the Respondent. The Owner may contact references during any part of this process. The Owner reserves the right to contact any other references at any time during the RFP process. Please acknowledge your approval for Owner to contact your references
7. Provide a detailed list of all Pre-Construction Services you will provide to the Owner and the Architect/Engineer (A/E) on this Project.
8. Describe what you perceive are the critical Pre-Construction issues for this Project. Describe your procedures, objectives and personnel responsible for reviewing design and construction documents and for providing feedback regarding cost, schedule and constructability to the A/E and the Owner on this Project.
9. Describe your process for attracting qualified and experienced mechanical, electrical and plumbing subcontractors to submit proposals for this project.
10. List Jurisdictions and trade categories in which your organization is legally qualified to do business, including license numbers.
11. Describe your project estimating system for developing the GMP Proposal and how you will monitor and track these costs on the schedule.

12. Describe the contingencies you will propose in the GMP, and how these contingencies will be managed through the completion of Construction Phase Services.
13. Briefly describe the firm’s approach for anticipating, recognizing and controlling safety risks and note the safety resources that the firm provides for each project’s Safety program.
14. Describe the methodology, including any technology or other assets, that the firm intends to use for prevention and/or control of incidents and insurance claims on this Project.
15. Describe what you believe are your unique operational skills and experiences, which differentiate your company from your competitors.
16. Describe your implementation of a quality control process for this Project during the Design Development stage through completion of Construction Documents stage.
17. Describe how your quality control team will measure the quality of construction performed by trade contractors on this Project, and how will you address non-conforming work.
18. Describe your methods for advertising, receiving proposals, awarding contracts and paying trade contractors on this Project, including review by the Owner.
19. Describe your warranty service support and warranty service implementation plan for this Project.
20. List categories of work that your organization normally performs with its own forces.
21. Has your organization ever failed to complete any work awarded to it? (if yes, attach details)
22. Attach a separate page listing major construction projects your organization currently has in progress. Provide name of project, owner, contract amount, percent complete, scheduled completion date.

TOTAL VALUE OF WORK CURRENTLY UNDER CONTRACT \$ _____

23. Provide at least two references in each of the following categories: Provide company name, representative name, telephone number, email address.

TRADE REFERENCES

BANK REFERENCES

SURETY

NAME OF BONDING COMPANY _____

NAME AND ADDRESS OF AGENT _____

SIGNATURE

NAME OF ORGANIZATION _____

AUTHORIZED REPRESENTATIVE _____

SIGNATURE _____

TITLE _____

DATE _____

EXHIBIT H – ACKNOWLEDGEMENT OF ADDENDA RECEIVED

GREGG COUNTY

CONSTRUCTION OF A PARKING GARAGE AND OFFICE

The undersigned acknowledges receipt of the following addenda to Gregg County Request for Proposal documents (give number and date of each)

ADDENDUM NUMBER _____ DATED: _____

ADDENDUM NUMBER _____ DATED: _____

ADDENDUM NUMBER _____ DATED: _____

ADDENDUM NUMBER _____ DATED: _____

ADDENDUM NUMBER _____ DATED: _____

ADDENDUM NUMBER _____ DATED: _____

Failure to acknowledge receipt of all addenda may cause the proposal to be considered non-responsive to the request which would require rejection of the proposal.

The undersigned understands that any condition stated above, clarification of the above, or information submitted on or with this form other than requested will render the quotation non-responsive.

DATE: _____

RESPONDENT/ CONTRACTOR: _____

ADDRESS: _____

CITY, STATE, ZIP: _____

AUTHORIZING OFFICIAL
SIGNATURE: _____

PRINT NAME: _____

TITLE: _____

**EXHIBIT I
CHANGE FORM / REQUEST FOR APPROVED EQUALS**

| | | | |
|---|--|--------------------|-------------------|
| PREPARED BY: | | DATE: | |
| ADDRESS: | | TELEPHONE: | |
| SPEC. #: | | SPEC. DATE: | |
| LOCATION OF REQUEST FOR CHANGE (PAGE, PARAGRAPH #): | | | |
| | | | |
| CHANGES REQUESTED: | | | |
| (All requested changes shall comply with all specified parameters and illustrate compliance. Incomplete requests will not be considered. Requested changes need to be submitted before the proposal phase written questions deadline) | | | |
| | | | |
| COMMENTS / REASON FOR CHANGE: | | | |
| | | | |
| AGENCY USE ONLY | | | |
| REVIEWED BY: | | DATE: | CONTROL #: |
| | | | |
| ACTION TAKEN: | | | |
| | | | |
| COMMENT: | | | |
| | | | |

00 42 00

PROPOSAL FORM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Advertisement For Proposal
- B. Exhibit F – Proposal Form

END OF SECTION

LEGAL NOTICE

GREGG COUNTY

Proposals for the Construction of a Parking Garage and Office
at 100 E. Methvin St. Longview, TX 75601

Gregg County is soliciting sealed competitive proposals for the construction of a parking garage and office at 100 E. Methvin St. Longview, TX 75601. The scope of the work involves the development and construction of a new 4-story parking garage with 13,701 sq. ft. office.

A complete digital set of proposal documents, plans and specifications can be requested by contacting: Josh Cristy at the email address: josh@schwarz-hanson.com (817)-377-3600. When requesting by email please provide: Company Name, GC/Trade, Representative Name, Position/Title, Email, Phone, Address.

Complete sets only are available. Those who request at least one set of Proposal Documents will be on the Respondent list to receive subsequent correspondence and addenda.

Sealed proposals will be accepted at the Gregg County Courthouse located at 101 E Methvin St, 3rd Floor County Courtroom, Longview, TX 75601 per proposal schedule, at which time they will be publicly opened. Late proposals will not be opened or accepted.

Gregg County reserves the right to accept or reject any or all proposals and to waive any informalities or irregularities in the proposal procedure or proposals when such actions are deemed in the best interest of the County.

PROPOSAL SCHEDULE:

| | |
|--|----------------------------------|
| Documents Available to Proposers: | February 21, 2022 |
| Pre-proposal Conference: | March 01, 2022 at 10:00 A.M. CST |
| Deadline for Written Questions: | March 03, 2022 at 5:00 P.M. CST |
| Issue Responses to Questions/Final Addendum: | March 08, 2022 |
| Proposals Due/Open Proposals: | March 15, 2022 at 2:00 P.M. CST |
| Proposed Board Award Approval Date: | April 11, 2022 |

**EXHIBIT F
PROPOSAL FORM**

TO: Gregg County
(hereinafter called the "Owner")

FOR THE CONSTRUCTION OF:

A NEW PARKING GARAGE AND OFFICE FOR GREGG COUNTY
100 E. METHVIN ST. LONGVIEW, TX 75601
(hereinafter called the "Project")

PROPOSAL BY:

(hereinafter called the "Respondent"), organized and existing under the laws of the State of Texas, doing business as [] a Corporation, [] a Partnership, or [] an Individual.

The Respondent, having examined the Instructions to Respondents and Contract Documents, including the Project Manual bound with the General Solicitation Packet, and the Drawings as enumerated on "Index of Drawings" (in the Project Manual), the Specifications as indicated in the "Table of Contents" (in the Project Manual), and the following Addenda. Addenda have been received and the provisions there for been included in the Proposal.

Addendum No. _____, _____, _____, _____, _____.

Dated _____, _____, _____, _____, _____.

And having visited the site and having familiarized himself with all conditions affecting the Work, hereby declares that it will furnish all necessary tools and equipment and furnish all materials and labor required to perform the Work described as the Project in accordance with provisions of the Contract Documents as prepared by Schwarz Hanson Architects, for the sum of:

BASE PROPOSAL:

_____ (\$ _____)

Total calendar days proposed for all work related to the Base Proposal _____

The Respondent, in submitting this Proposal, agrees:

1. That the Owner has the right to reject this Proposal or any or all Proposals and to waive any or all formalities or technicalities.
2. To hold this Proposal open for a period of sixty (60) calendar days after date of receipt.
3. To accept the provisions of Instruction to Respondents regarding disposition of Proposal security.
4. To enter into and execute the Agreement, if awarded, on the basis of this Proposal.

The Respondent further agrees to execute and deliver the Agreement and Performance and Payment Bonds in the form set forth in these Proposal Documents within seven (7) days after date of notification of acceptance of the Proposal; and in the event that the undersigned fails, refuses or neglects to execute and deliver the Agreement within the time specified, the Respondent will be considered as having abandoned said Proposal and as having defaulted in the offer to do the work on which his Proposal was based.

The Respondent certifies that this Proposal is made in strict conformity with all of the conditions, contingencies and requirements set forth in the Proposal Documents, stated in every part of the Drawings, Specifications, and all other parts of the Contract Documents setting forth the requirements for the performance of the Project Work and without collusion or connection with any person, partnership, company, firm, association or corporation offering sub-proposals on this Work.

PROPOSAL BREAKDOWN

The Respondent agrees to provide a detailed Proposal breakdown with the categories set out on the attached Price Schedule. The Respondent acknowledges that this information will be used by the Owner to evaluate the Proposals, however the Base Proposal amount given on page one of this Proposal form will govern in case of a discrepancy.

ALTERNATES

At this time, no Alternate have been identified in the contract documents.

If, prior to Proposal Date, any Alternates are identified through Addenda, additional information and amended proposal forms and submittal requirements will be provided.

TIME OF COMPLETION

The Respondent, if awarded Contract, will agree mutually with PCHD to complete the project within a determined maximum calendar day time-frame and will be required to meet that schedule as a condition of the contract, as outlined in the Proposal Documents. Liquidated Damages for not adhering to the contracted time schedule are defined in the Agreement and will be in effect.

However, the Respondent will have the option of proposing a shorter time for completion to be evaluated as part of the technical merit criteria outlined in the “Best Value Procurement” document in the Project Manual. If a shorter time frame is proposed the Respondent is bound to enter into a contract based upon that schedule. The Liquidated Damage clauses will be in affect based upon the contracted schedule.

NUMBER OF SIGNED SETS OF DOCUMENTS

The Proposal Form and all required documents (see list below), including all bonds, will be prepared in not less than five (5) original signed sets.

CERTIFICATION

The Information above is true, correct and complete to the best of my knowledge, information and belief.

Respectfully submitted,

Date: _____

Signed: _____

By (Printed): _____

Title: _____

Legal Address: _____

Telephone No.: _____

(Seal if Respondent is a corporation)

ATTACHMENTS REQUIRED:

1. Proposal Security Bond (5% of the Total Proposal Price) (as formatted by Bonding Company) (**EXHIBIT A**).
2. Proposal Breakdown using attached Price Schedule (**EXHIBIT F**).
3. Contractor Qualification Statement (**EXHIBIT G**) and any other required documentation required in Part III of the Project Manual.
4. Construction Schedule formatted by Respondent to conform to Time of Completion requirements stated above (**EXHIBIT F**).
5. Acknowledgement of Addenda (**EXHIBIT H**).
6. Required Form (**EXHIBIT E**), including:
 - a. Form 1295 - Certificate of Interested Parties
 - b. Form CIQ - Conflict of Interest Questionnaire
 - c. Non-Collusion Affidavit

**PRICE SCHEDULE
GREGG COUNTY PARKING GARAGE AND OFFICE**

| DIVISION | DESCRIPTION <i>Listed categories of work are general groups. Respondent shall include all portions of the work in one of the listed categories and the sum of prices shall match the proposal price on the listed in the official blank above.</i> | |
|----------------------------------|--|------------------------|
| | BASE BID PRICE | ALTERNATE PRICE |
| 1- GENERAL REQUIREMENTS | | |
| 2- EXISTING CONDITIONS | | |
| 3- CONCRETE | | |
| 4- MASONRY | | |
| 5- METALS | | |
| 6- WOOD, PLASTICS, & COMPOSITES | | |
| 7- THERMAL & MOISTURE PROTECTION | | |
| 8- DOORS & WINDOWS | | |
| 9- FINISHES | | |
| 10- SPECIALTIES | | |
| 11- EQUIPMENT | | |
| 12- FURNISHINGS | | |
| 21- FIRE SUPPRESSION | | |
| 22- PLUMBING | | |

| | | |
|--|--|--|
| 23- HEATING VENT. & AIR CONDITIONING | | |
| 26- ELECTRICAL | | |
| 27- COMMUNICATIONS | | |
| 28- ELECTRONIC SAFETY & SECURITY | | |
| 31- EARTHWORK | | |
| 32- EXTERIOR IMPROVEMENTS | | |
| 33- UTILITIES | | |
| TOTAL PROPOSAL PRICE | | |

**SECTION 00 52 00
AGREEMENT FORM**

PART 1 GENERAL

1.01 FORM OF AGREEMENT

1.02 DOCUMENT A101 - 2017), AS MODIFIED BY OWNER HEREAFTER REFERRED TO AS THE "AGREEMENT" ARE HEREBY MADE PART OF THESE CONTRACT DOCUMENTS TO THE SAME EXTENT AS IF CONTAINED HEREIN IN FULL, EXCEPT AS MODIFIED, AMENDED, REVISED, RESCINDED OR SUPPLEMENTED BY THE REMAINING CONTRACT DOCUMENTS.

1.03 RELATED REQUIREMENTS

A. Section 00 72 00 - General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION



AIA[®] Document A101[™] – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the _____ day of _____ in the year _____
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

The Architect:
(Name, legal status, address and other information)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101[™]-2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement.

AIA Document A201[™]-2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

The Owner and Contractor agree as follows.

Init.

TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
- 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- 4 CONTRACT SUM
- 5 PAYMENTS
- 6 DISPUTE RESOLUTION
- 7 TERMINATION OR SUSPENSION
- 8 MISCELLANEOUS PROVISIONS
- 9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

(Check one of the following boxes.)

- The date of this Agreement.
- A date set forth in a notice to proceed issued by the Owner.
- Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

(Check one of the following boxes and complete the necessary information.)

- Not later than () calendar days from the date of commencement of the Work.

By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

| Portion of Work | Substantial Completion Date |
|-----------------|-----------------------------|
|-----------------|-----------------------------|

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be (\$), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

| Item | Price |
|------|-------|
|------|-------|

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement. (Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

| Item | Price | Conditions for Acceptance |
|------|-------|---------------------------|
|------|-------|---------------------------|

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

| Item | Price |
|------|-------|
|------|-------|

§ 4.4 Unit prices, if any:

(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

| Item | Units and Limitations | Price per Unit (\$0.00) |
|------|-----------------------|-------------------------|
|------|-----------------------|-------------------------|

§ 4.5 Liquidated damages, if any:

(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:

(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than () days after the Architect receives the Application for Payment.

(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner’s prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor’s responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner’s final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect’s final Certificate for Payment, or as follows:

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

_____ % _____

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

- Arbitration pursuant to Section 15.4 of AIA Document A201–2017
- Litigation in a court of competent jurisdiction
- Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner’s convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner’s convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner’s representative:

(Name, address, email address, and other information)

§ 8.3 The Contractor’s representative:

(Name, address, email address, and other information)

§ 8.4 Neither the Owner’s nor the Contractor’s representative shall be changed without ten days’ prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

| | | |
|--------|-------|------|
| Number | Title | Date |
|--------|-------|------|

.6 Specifications

| | | | |
|---------|-------|------|-------|
| Section | Title | Date | Pages |
|---------|-------|------|-------|

.7 Addenda, if any:

| | | |
|--------|------|-------|
| Number | Date | Pages |
|--------|------|-------|

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

- AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

The Sustainability Plan:

| Title | Date | Pages |
|-------|------|-------|
|-------|------|-------|

Supplementary and other Conditions of the Contract:

| Document | Title | Date | Pages |
|----------|-------|------|-------|
|----------|-------|------|-------|

.9 Other documents, if any, listed below:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor’s bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER (Signature)

CONTRACTOR (Signature)

(Printed name and title)

(Printed name and title)

**SECTION 00 72 00
GENERAL CONDITIONS**

FORM OF GENERAL CONDITIONS

1.01 THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION (AIA DOCUMENT A201 - 2017), AS MODIFIED BY OWNER HEREAFTER REFERRED TO AS THE "GENERAL CONDITIONS" ARE HEREBY MADE PART OF THESE CONTRACT DOCUMENTS TO THE SAME EXTENT AS IF CONTAINED HEREIN IN FULL, EXCEPT AS MODIFIED, AMENDED, REVISED, RESCINDED OR SUPPLEMENTED BY THE REMAINING CONTRACT DOCUMENTS.

END OF SECTION



AIA[®] Document A201[™] – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503[™], Guide for Supplementary Conditions.

TABLE OF ARTICLES

- 1 GENERAL PROVISIONS
- 2 OWNER
- 3 CONTRACTOR
- 4 ARCHITECT
- 5 SUBCONTRACTORS
- 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
- 7 CHANGES IN THE WORK
- 8 TIME
- 9 PAYMENTS AND COMPLETION
- 10 PROTECTION OF PERSONS AND PROPERTY
- 11 INSURANCE AND BONDS
- 12 UNCOVERING AND CORRECTION OF WORK
- 13 MISCELLANEOUS PROVISIONS
- 14 TERMINATION OR SUSPENSION OF THE CONTRACT
- 15 CLAIMS AND DISPUTES

Init.

INDEX

(Topics and numbers in bold are Section headings.)

Acceptance of Nonconforming Work

9.6.6, 9.9.3, **12.3**

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3

Access to Work

3.16, 6.2.1, 12.1

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.3.2, 14.1, 15.1.2, 15.2

Addenda

1.1.1

Additional Costs, Claims for

3.7.4, 3.7.5, 10.3.2, 15.1.5

Additional Inspections and Testing

9.4.2, 9.8.3, 12.2.1, **13.4**

Additional Time, Claims for

3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**

Administration of the Contract

3.1.3, **4.2**, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

Allowances

3.8

Applications for Payment

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10

Approvals

2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10.1, 4.2.7, 9.3.2, 13.4.1

Arbitration

8.3.1, 15.3.2, **15.4**

ARCHITECT

4

Architect, Definition of

4.1.1

Architect, Extent of Authority

2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1

Architect, Limitations of Authority and Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2

Architect's Additional Services and Expenses

2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.5, 3.1.3, 3.5, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.4.2, 15.2

Architect's Inspections

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2

Architect's Relationship with Subcontractors

1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.6.8, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

Award of Subcontracts and Other Contracts for Portions of the Work

5.2

Basic Definitions

1.1

Bidding Requirements

1.1.1

Binding Dispute Resolution

8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1

Bonds, Lien

7.3.4.4, 9.6.8, 9.10.2, 9.10.3

Bonds, Performance, and Payment

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**

Building Information Models Use and Reliance

1.8

Building Permit

3.7.1

Capitalization

1.3

Certificate of Substantial Completion

9.8.3, 9.8.4, 9.8.5

Certificates for Payment

4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4

Certificates of Inspection, Testing or Approval

13.4.4

Certificates of Insurance
9.10.2
Change Orders
1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3,
7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1,
9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1,
11.5
Claims, Definition of
15.1.1
Claims, Notice of
1.6.2, 15.1.3
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**
Claims for Additional Time
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3,
11.3.2, 14.2.4, 15.1.7
Claims Subject to Arbitration
15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3,
6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**
Commencement of the Work, Definition of
8.1.2
Communications
3.9.1, **4.2.4**
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1,
9.10, 12.2, 14.1.2, 15.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1,
9.10.3, 12.2, 15.1.2
Compliance with Laws
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1,
13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8,
15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2,
15.4.4.2

Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY
SEPARATE CONTRACTORS
1.1.4, **6**
Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**,
9.3.1.1
Construction Schedules, Contractor's
3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.4
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR SUSPENSION
OF THE
5.4.1.1, 5.4.2, 11.5, **14**
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to
3.7.1, 3.10, 5.2, 6.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.3.6, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**,
9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3,
14.2.4, 14.3.2, 15.1.4.2, **15.1.5**, **15.2.5**
Contract Sum, Definition of
9.1
Contract Time
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5,
7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1,
8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2,
15.1.4.2, 15.1.6.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, **6.1.2**
Contractor's Construction and Submittal Schedules
3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2
Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2,
10.3, 11.3, 14.1, 14.2.1.1
Contractor's Liability Insurance
11.1
Contractor's Relationship with Separate Contractors
and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4

Contractor's Relationship with Subcontractors
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4

Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1

Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2

Contractor's Responsibility for Those Performing the Work
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8

Contractor's Review of Contract Documents
3.2

Contractor's Right to Stop the Work
2.2.2, 9.7

Contractor's Right to Terminate the Contract
14.1

Contractor's Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3

Contractor's Superintendent
3.9, 10.2.6

Contractor's Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4

Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1

Copies Furnished of Drawings and Specifications
1.5, 2.3.6, 3.11

Copyrights
1.5, **3.17**

Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1

Correlation and Intent of the Contract Documents
1.2

Cost, Definition of
7.3.4

Costs
2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14

Cutting and Patching
3.14, 6.2.5

Damage to Construction of Owner or Separate Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4

Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4

Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2, 11.3, 14.2.4, 15.1.7

Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2

Date of Commencement of the Work, Definition of
8.1.2

Date of Substantial Completion, Definition of
8.1.3

Day, Definition of
8.1.4

Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 14.2.2, 14.2.4, 15.1, 15.2

Decisions to Withhold Certification
9.4.1, **9.5**, 9.7, 14.1.1.3

Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1

Definitions
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1

Delays and Extensions of Time
3.2, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**, 10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5

Digital Data Use and Transmission
1.7

Disputes
6.3, 7.3.9, 15.1, 15.2

Documents and Samples at the Site
3.11

Drawings, Definition of
1.1.5

Drawings and Specifications, Use and Ownership of
3.11

Effective Date of Insurance
8.2.2

Emergencies
10.4, 14.1.1.2, **15.1.5**

Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.3, 14.1, 14.2.1.1

Equipment, Labor, or Materials
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2

Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4

Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.6, **15.2.5**

Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2

Faulty Work
(See Defective or Nonconforming Work)

Final Completion and Final Payment
4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3

Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4

GENERAL PROVISIONS
1

Governing Law

13.1

Guarantees (See Warranty)

Hazardous Materials and Substances

10.2.4, 10.3

Identification of Subcontractors and Suppliers

5.2.1

Indemnification

3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3

Information and Services Required of the Owner

2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5,

9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2,

14.1.1.4, 14.1.4, 15.1.4

Initial Decision

15.2

Initial Decision Maker, Definition of

1.1.8

Initial Decision Maker, Decisions

14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5

Initial Decision Maker, Extent of Authority

14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5

Injury or Damage to Person or Property

10.2.8, 10.4

Inspections

3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2,

9.10.1, 12.2.1, 13.4

Instructions to Bidders

1.1.1

Instructions to the Contractor

3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2

Instruments of Service, Definition of

1.1.7

Insurance

6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5, **11**

Insurance, Notice of Cancellation or Expiration

11.1.4, 11.2.3

Insurance, Contractor's Liability

11.1

Insurance, Effective Date of

8.2.2, 14.4.2

Insurance, Owner's Liability

11.2

Insurance, Property

10.2.5, 11.2, 11.4, 11.5

Insurance, Stored Materials

9.3.2

INSURANCE AND BONDS

11

Insurance Companies, Consent to Partial Occupancy

9.9.1

Insured loss, Adjustment and Settlement of

11.5

Intent of the Contract Documents

1.2.1, 4.2.7, 4.2.12, 4.2.13

Interest

13.5

Interpretation

1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1

Interpretations, Written

4.2.11, 4.2.12

Judgment on Final Award

15.4.2

Labor and Materials, Equipment

1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,

5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1,

10.2.4, 14.2.1.1, 14.2.1.2

Labor Disputes

8.3.1

Laws and Regulations

1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4,

9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8, 15.4

Liens

2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8

Limitations, Statutes of

12.2.5, 15.1.2, 15.4.1.1

Limitations of Liability

3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6, 4.2.7,

6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3, 11.3,

12.2.5, 13.3.1

Limitations of Time

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7,

5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,

9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15,

15.1.2, 15.1.3, 15.1.5

Materials, Hazardous

10.2.4, 10.3

Materials, Labor, Equipment and

1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,

5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2,

10.2.4, 14.2.1.1, 14.2.1.2

Means, Methods, Techniques, Sequences and

Procedures of Construction

3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2

Mechanic's Lien

2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8

Mediation

8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1,

15.4.1.1

Minor Changes in the Work

1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, **7.4**

MISCELLANEOUS PROVISIONS

13

Modifications, Definition of

1.1.1

Modifications to the Contract

1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7,

10.3.2

Mutual Responsibility

6.2

Nonconforming Work, Acceptance of

9.6.6, 9.9.3, **12.3**

Nonconforming Work, Rejection and Correction of

2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4,

12.2

Notice

1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4, 3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4, 8.2.2, 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1, 13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5, 15.1.6, 15.4.1

Notice of Cancellation or Expiration of Insurance
11.1.4, 11.2.3

Notice of Claims

1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5, 15.1.6, 15.2.8, 15.3.2, 15.4.1

Notice of Testing and Inspections
13.4.1, 13.4.2

Observations, Contractor's
3.2, 3.7.4

Occupancy

2.3.1, 9.6.6, 9.8

Orders, Written

1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2, 14.3.1

OWNER

2

Owner, Definition of

2.1.1

Owner, Evidence of Financial Arrangements

2.2, 13.2.2, 14.1.1.4

Owner, Information and Services Required of the

2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4

Owner's Authority

1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7

Owner's Insurance

11.2

Owner's Relationship with Subcontractors

1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2

Owner's Right to Carry Out the Work

2.5, 14.2.2

Owner's Right to Clean Up

6.3

Owner's Right to Perform Construction and to Award Separate Contracts

6.1

Owner's Right to Stop the Work

2.4

Owner's Right to Suspend the Work

14.3

Owner's Right to Terminate the Contract

14.2, 14.4

Ownership and Use of Drawings, Specifications and Other Instruments of Service

1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12, 5.3

Partial Occupancy or Use

9.6.6, **9.9**

Patching, Cutting and

3.14, 6.2.5

Patents

3.17

Payment, Applications for

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3

Payment, Certificates for

4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4

Payment, Failure of

9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Payment, Final

4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3

Payment Bond, Performance Bond and

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

Payments, Progress

9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

PAYMENTS AND COMPLETION

9

Payments to Subcontractors

5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2

PCB

10.3.1

Performance Bond and Payment Bond

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

Permits, Fees, Notices and Compliance with Laws

2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2

PERSONS AND PROPERTY, PROTECTION OF

10

Polychlorinated Biphenyl

10.3.1

Product Data, Definition of

3.12.2

Product Data and Samples, Shop Drawings

3.11, **3.12**, 4.2.7

Progress and Completion

4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4

Progress Payments

9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

Project, Definition of

1.1.4

Project Representatives

4.2.10

Property Insurance

10.2.5, **11.2**

Proposal Requirements

1.1.1

PROTECTION OF PERSONS AND PROPERTY

10

Regulations and Laws

1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4

Rejection of Work

4.2.6, 12.2.1

Releases and Waivers of Liens
9.3.1, 9.10.2
Representations
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
Review of Contract Documents and Field Conditions by Contractor
3.2, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and Samples by Contractor
3.12
Rights and Remedies
1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2, 12.2.4, **13.3**, 14, 15.4
Royalties, Patents and Copyrights
3.17
Rules and Notices for Arbitration
15.4.1
Safety of Persons and Property
10.2, 10.4
Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4
Samples, Definition of
3.12.3
Samples, Shop Drawings, Product Data and Samples at the Site, Documents and
3.11, **3.12**, 4.2.7
3.11
Schedule of Values
9.2, 9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
Separate Contractors, Definition of
6.1.1
Shop Drawings, Definition of
3.12.1
Shop Drawings, Product Data and Samples
3.11, **3.12**, 4.2.7
Site, Use of
3.13, 6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4
Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Special Inspections and Testing
4.2.6, 12.2.1, 13.4

Specifications, Definition of
1.1.6
Specifications
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
Statute of Limitations
15.1.2, 15.4.1.1
Stopping the Work
2.2.2, 2.4, 9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4
Subcontractor, Definition of
5.1.1
SUBCONTRACTORS
5
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7
Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, **11.3**
Substances, Hazardous
10.3
Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 15.1.2
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
2.3.3
Substitutions of Materials
3.4.2, 3.5, 7.3.8
Sub-subcontractor, Definition of
5.1.2
Subsurface Conditions
3.7.4
Successors and Assigns
13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4
Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6, 9.10.5, 14.2.1
Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2, 15.2.7
Surety, Consent of
9.8.5, 9.10.2, 9.10.3

Surveys
1.1.7, 2.3.4

Suspension by the Owner for Convenience
14.3

Suspension of the Work
3.7.5, 5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14

Taxes
3.6, 3.8.2.1, 7.3.4.4

Termination by the Contractor
14.1, 15.1.7

Termination by the Owner for Cause
5.4.1.1, **14.2**, 15.1.7

Termination by the Owner for Convenience
14.4

Termination of the Architect
2.3.3
Termination of the Contractor Employment
14.2.2

TERMINATION OR SUSPENSION OF THE CONTRACT

14

Tests and Inspections

3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 12.2.1, **13.4**

TIME

8

Time, Delays and Extensions of

3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5

Time Limits

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15.1.2, 15.1.3, 15.4

Time Limits on Claims

3.7.4, 10.2.8, 15.1.2, 15.1.3

Title to Work

9.3.2, 9.3.3

UNCOVERING AND CORRECTION OF WORK
12

Uncovering of Work
12.1

Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3

Unit Prices
7.3.3.2, 9.1.2

Use of Documents
1.1.1, 1.5, 2.3.6, 3.12.6, 5.3

Use of Site
3.13, 6.1.1, 6.2.1

Values, Schedule of
9.2, 9.3.1

Waiver of Claims by the Architect
13.3.2

Waiver of Claims by the Contractor
9.10.5, 13.3.2, **15.1.7**

Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**

Waiver of Consequential Damages
14.2.4, 15.1.7

Waiver of Liens
9.3, 9.10.2, 9.10.4

Waivers of Subrogation
6.1.1, **11.3**

Warranty

3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2, 15.1.2

Weather Delays
8.3, 15.1.6.2

Work, Definition of
1.1.3

Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3, 13.2, 13.3.2, 15.4.4.2

Written Interpretations
4.2.11, 4.2.12

Written Orders

1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining

provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building

information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the

site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's

capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes

remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

- 3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the

time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under

Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the

Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate

Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The

Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable

by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The

foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers

to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not

constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the

endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The

Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the

Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or Suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section

15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly

consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

Sample

DC 99 7

GEOTECHNICAL TESTING REPORT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Geotechnical report follows in this section.

END OF SECTION



ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

April 8, 2021

Brad Naeher
Schwarz-Hanson Architects
2570 River Park Drive, Suite 100
Fort Worth, Texas 76116

SUBJECT: Gregg County Parking Garage
Longview, Texas
Geotechnical Investigation
ETTL Job No. G 5470-205, Rev.01

Dear Mr. Naeher:

Submitted herein is the report summarizing the results of a geotechnical investigation conducted at the site of the above-referenced project.

If you have any questions concerning this report, or if we can be of further assistance during construction, please contact us. We are available to perform any construction materials testing and inspection services that you may require. Thank you for the opportunity to be of service.

Sincerely,
ETTL Engineers & Consultants Inc.
Texas Registered Engineering Firm #F3208

Owen B. Sanderson, P.E.
Project Manager

Stephen R. Richards, P.E.
Principal Consultant



04/08/2021



04/08/2021

Distribution: (PDF) Gregg County Court
(PDF) Walker Parking Consultants

Main Office 1717 East Erwin Street Tyler, Texas 75702

Phone: 903-595-4421

Fax: 903-595-6613

Longview, TX * Arlington, TX * Austin, TX * Texarkana, AR

WWW.ETTLINC.COM

Geotechnical Investigation
Gregg County Parking Garage
Longview, Texas

Submitted to

Brad Naehrer
Schwarz-Hanson Architects
Fort Worth, Texas

Prepared by

ETTL Engineers & Consultants Inc.
Tyler, Texas

| Rev. | Date | Reason for Revision | By | Check | P.E. |
|------|----------|------------------------------|----|-------|------|
| .01 | 4/8/2021 | amending to risk category II | OS | SR | OS |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

April 2020

TABLE OF CONTENTS

| | |
|---|----|
| 1.0 INTRODUCTION | 1 |
| 2.0 PROJECT DESCRIPTION | 1 |
| 3.0 SITE DESCRIPTION | 2 |
| 4.0 FIELD OPERATIONS | 2 |
| 5.0 LABORATORY TESTING | 3 |
| 5.1 One Dimensional Pressure Swell..... | 3 |
| 5.2 Unconsolidated/Undrained Triaxial Compression..... | 3 |
| 5.3 One-Dimensional Consolidation Test..... | 4 |
| 5.4 Consolidated/Undrained Triaxial Compression..... | 4 |
| 6.0 FOUNDATION SOIL STRATIGRAPHY AND PROPERTIES..... | 5 |
| 6.1 Site Geology | 5 |
| 6.2 Site Stratigraphy | 6 |
| 6.3 The Behavior of Expansive Soils..... | 8 |
| 6.3.1 Vertical Heave Predictions | 9 |
| 6.4 Seismic Site Classification..... | 11 |
| 7.0 GROUNDWATER OBSERVATIONS | 12 |
| 8.0 FOUNDATION DESIGN RECOMMENDATIONS | 12 |
| 8.2.1 Bearing Capacity of Shallow Footings | 14 |
| 8.2.2 Ground Improvements | 14 |
| 8.2.3 Construction Considerations | 15 |
| 8.3 Drilled Piers..... | 15 |
| 8.3.1 Shaft Embedment Considerations | 16 |
| 8.3.2 Vertical Capacity | 16 |
| 8.3.3 Soil Induced Uplift Loads..... | 17 |
| 8.3.4 Group Effects..... | 18 |
| 8.3.5 Uplift..... | 18 |
| 8.3.6 Lateral Load Analysis | 19 |
| 8.3.7 Lateral Load Resistance of Pier Caps..... | 20 |
| 8.3.8 Load Testing Program | 22 |
| 8.3.9 Construction Issues | 22 |
| 8.4 Grade Beams and Load-Bearing Elements Above Untreated Subgrade..... | 22 |
| 8.4.1 Void Boxes..... | 23 |
| 8.4.2 Drainage of Void Space..... | 23 |
| 9.0 FLOOR SYSTEMS and FLATWORK..... | 23 |
| 9.1 Structurally Suspended Slab | 24 |
| 9.1.1 Void Boxes..... | 24 |
| 9.1.2 Crawl Space..... | 24 |
| 9.1.3 Drainage of Void Space..... | 25 |
| 9.2 Slab on Grade..... | 25 |
| 9.2.1 Modulus of Subgrade Reaction | 25 |
| 10.0 BUILDING PERIMETER AND FLAT WORK | 25 |



| | |
|---|----|
| 10.1 Perimeter Moisture Barrier | 26 |
| 10.2 Exterior Flat Work (Sidewalks, Patios, Etc.) | 26 |
| 11.0 EXCAVATION AND SITEWORK | 27 |
| 11.1 Building Subgrade Preparation | 27 |
| 11.1.1 Overexcavate and Replace | 28 |
| 11.1.2 Native Subgrade Treatment by Pressure Injection | 28 |
| 11.2 Select Fill Beneath Structures | 29 |
| 11.3 Mechanical Moisture Conditioning of the Native Soils for Use as Fill | 30 |
| 11.3.1 Moisture Conditioned Expansive Soils | 31 |
| 12.0 SITE DESIGN | 31 |
| 12.1 Excavation Safety | 33 |
| 13.0 RETAINING WALLS | 33 |
| 13.1 Design of Retaining or Below Grade Walls | 34 |
| 13.2 Backfill | 35 |
| 13.3 Drainage | 35 |
| 14.0 LIMITATIONS | 35 |

Appendix A

Plate I: Plan of Borings
Log of Borings with Laboratory Test Data
Key to Soil Classification & Symbols

Appendix B

Laboratory Test Reports

Appendix C

Drilled Shaft Capacity Curves

Appendix D

Seismic Design Parameters

Appendix E

L-Pile Shear, Moment and Deflection Diagrams



1.0 INTRODUCTION

This study was performed at the request and authorization to proceed granted by Brad Naeher with Schwarz-Hanson Architects located in Fort Worth, Texas in accordance with our proposal dated March 3, 2020. Field operations were conducted on August 28th through the 31st, 2020.

The purpose of this investigation was to define and evaluate the general subsurface conditions of the existing parking lots located south of E. Methvin St. Rd. south of the Gregg County courthouse in Longview, Texas. A site map depicting the location is included in **Appendix A**.

Specifically, the study was planned to determine the following:

- Subsurface stratigraphy within the limits of exploratory borings;
- Classification, strength, expansive properties, and compressibility characteristics of the foundation soils;
- Suitable foundation types and allowable loading;
- Construction-related problems that may be anticipated by the investigation; and
- General Pavement Recommendations.

This investigation was carried out in three phases: 1) field exploration, sampling, and testing; 2) laboratory testing; and 3) engineering evaluation of data and reporting. The details of which are outlined in the following sections.

A variety of tests were performed on selected soil samples to provide the data used to form the basis for the conclusions and recommendations of this study. The conclusions and recommendations that follow are based on limited information regarding site grading. Using a handheld GPS unit, E TTL located the borings on the ground based on a conceptual layout provided by the client. E TTL did not confirm by a survey that the locations indicated on the Plan of Borings. The elevations stated herein were provided by representatives of the client. This information should be verified prior to design. Should any portion of it prove incorrect, this firm should be notified in order to assess the need for revisions to this report.

2.0 PROJECT DESCRIPTION

The proposed project will consist of a 4 or 5 level cast-in-place or pre-cast parking garage with a footprint of approximately 126 feet by 205 feet. Office space may be located along a 22 feet wide strip adjacent to Methvin St. on the north side of the proposed parking structure.



The following are the anticipated service column loads:

- Typical Corner Column 650 kips
- Typical Exterior Column 530 kips
- Typical Interior Column 1,450 kips

We anticipate that the lowest level will be set at existing grade except for the elevator service pits which will extend below this level. The east building line of the new structure will be located approximately 12 feet from an existing multi-level structure to the east. Foundation details and subgrade preparation of the existing structure are unknown at this time.

3.0 SITE DESCRIPTION

The project site consists of two separate existing parking lots separated by a grass median. The east lot is open with asphalt surfacing and the west area contains a drive-thru bank teller building and concrete pavement. Several trees are scattered around the perimeter of the bank teller building. The topography of the site is relatively flat.

4.0 FIELD OPERATIONS

Subsurface conditions were defined by four (4) sample core borings drilled to a depth of 60 feet and one sample core boring drilled to a depth of 87 feet. E TTL personnel staked the boring locations based on a site plan provided by the client's representative. The field boring logs were prepared as drilling and sampling progressed. The final boring logs are also included in **Appendix A**. Descriptive terms and symbols used on the logs are in accordance with the Unified Soil Classification System (ASTM D 2487). A reference key is provided on the final page of this report.

A truck-mounted drill rig utilized a combination of hollow stem auger and mud rotary drilling procedures to advance the borings. Soils were sampled utilizing a 1 3/8-inch I.D. by 24-inch long split-spoon sampler driven into the bottom of the borehole per ASTM D 1586 procedures. In conjunction with this sampling technique, the Standard Penetration Test was conducted by recording the N-value, which is the number of blows required by a 140-pound weight falling 30 inches to drive a split-spoon sampler 1 foot into the ground. For very dense strata, the number of blows is limited to a maximum of 50 blows within a 6-inch increment. Where possible, the sampler is "seated" six inches before the N-value is determined. The N-value obtained from the Standard Penetration Test provides an approximate measure of the relative density that correlates with the shear strength of the soil. The blow count obtained was multiplied by 1.25 to conservatively convert the N values from the automatic hammer to the standard N_{60} value for use in correlations to predict engineering properties ($N_{60} \leq 100$). The disturbed samples were removed from the sampler, logged, packaged, and transported to the laboratory for further identification and classification.

Soils were also sampled utilizing a 3-inch O.D. by 24-inch long thick-walled Shelby Tube sampler. Using the drilling rig's hydraulic pressure, the sampler was pushed smoothly into the bottom of the borehole. The consistency of these samples was measured in the field by a calibrated pocket



penetrometer. These values, recorded in tons per square foot, are shown on the boring logs. Such samples were extruded in the field, logged, sealed to maintain *in situ* conditions, and packaged for transport to the laboratory.

All boreholes were backfilled with cuttings after collecting final groundwater readings. Samples obtained during our field studies and not consumed by laboratory testing procedures will be retained in our Tyler office free of charge for 60 days. To arrange storage beyond this point in time, please contact the Tyler office.

| Table 4.0 – Boring Identification | | | | |
|-----------------------------------|-----------------------|--------------------|------------------------|--|
| Boring | Structure | Boring Depth (ft.) | Boring Elevation (ft.) | ¹ Estimated Groundwater Depth (ft.) |
| B-1 | NW Corner of Garage | 100 | NG | 18.0 |
| B-2 | SW Corner of Garage | 60 | NG | 18.0 |
| B-3 | NE Corner of Garage | 60 | NG | 18.0 |
| B-4 | SE - Corner of Garage | 100 | NG | 23.0 |
| B-5 | Center of Garage | 60 | NG | 18.0 |

Notes:

- 1) See Section 7.0

5.0 LABORATORY TESTING

Upon return to the laboratory, a geotechnical engineer visually examined all samples and multiple specimens were selected for representative identification of the substrata. By determining the Atterberg liquid and plastic limits (ASTM D 4318) and percentage of fines passing the No. 200 sieve (ASTM D 1140), field classification of the various strata was verified. Also conducted were natural moisture content tests (ASTM D 2216). These results are presented on the individual log of boring provided in **Appendix A**.

5.1 One Dimensional Pressure Swell

Pressure-swell testing (ASTM D 4546 Method C) was performed on intact, relatively undisturbed specimens. In some cases, the moisture content of a specimen is initially dried to assess the swell potential of soils that may be drier than the sample obtained. The test is conducted by initially loading the specimen within situ overburden pressure, allowing it to reconsolidate under in situ pressure. Next, the specimen is inundated and the amount of pressure necessary to restrain swelling is added. Finally, the restraining pressure is removed and the specimen is allowed to swell for a period of up to 96 hours. This data is used to compute the swelling index, the percentage of swell, and the restraining pressure.

5.2 Unconsolidated/Undrained Triaxial Compression

The strength and deformation characteristics of the cohesive strata were evaluated by conducting



unconsolidated, undrained triaxial compression tests (ASTM D 2850) on selected field samples obtained with the Shelby tube sampler. In this type of compression test, confining pressures were chosen that approximate in situ effective pressures at the sample depth below existing ground, and specimens were tested at in-situ moisture content. The specimens were axially loaded until failure occurred. The undrained shear strength (or cohesion) is equal to one-half of the peak compressive stress. In hard clays, it is very difficult to obtain specimens while maintaining the in-situ condition representative of the clay mass. This phenomenon is taken into account when evaluating test data from such specimens. Moisture content (ASTM D 2216) and dry density (ASTM D 2437) are determined as part of this test.

5.3 One-Dimensional Consolidation Test

Successive load increments are added to a saturated, 0.78-inch thick specimen trimmed from a Shelby tube sample to determine properties of consolidation due to load over time. Parameters derived from this test are used to predict the settlement of foundations including how much settlement will occur in a given period. We also develop constrained, drained moduli as they vary with confining pressure for use in predicting settlement.

5.4 Consolidated/Undrained Triaxial Compression

This type of test is used on soils that do not drain rapidly when loaded (e.g. clayey soils). Consolidated/undrained (CU) and consolidated/drained (CD) strength characteristics of the cohesive strata were evaluated by conducting triaxial compression tests (ASTM D 4764) on selected field samples obtained with the Shelby tube sampler, or remolded, as applicable. Trimming of the specimens was conducted where possible and when considered necessary to provide a relatively undisturbed specimen. In some cases, samples for testing are produced by remolding to an appropriate density. Excess pore pressures developed during compression were measured and were used to determine effective stress parameters (CD). A group of 3 or 4 specimens is chosen for testing at various confining pressures such that strength parameters derived from the test will cover the range of anticipated in situ stresses along potential failure surfaces. Specimens are saturated before testing and were axially loaded to failure (or 15% deformation, whichever occurred first) without allowing drainage from the specimen. The results are displayed on Mohr-Circle plots in **Appendix B**. Such plots are used to predict the failure envelope (defined by ϕ and c parameters) for both drained (effective stress) loading and undrained (total stress) loading.

| Table 5.0 – Soil Laboratory Testing Procedures | | |
|---|--------------------|------------------------|
| Laboratory Test | Test Method | Number of Tests |
| Dry Sieve Analysis (% Passing No. 4) | ASTM D 6913 | 29 |
| Dry Sieve Analysis (% Passing No. 40) | ASTM D 6913 | 29 |
| Washed Sieve Analysis (% Passing No. 200) | ASTM D 1140 | 29 |
| Atterberg Limits (Liquid & Plastic Limits) | ASTM D 4318 | 27 |
| Moisture Content by Dry Weight | ASTM D 2216 | 29 |



| Table 5.0 – Soil Laboratory Testing Procedures | | |
|---|--------------------|------------------------|
| Laboratory Test | Test Method | Number of Tests |
| U.U. Triaxial Compression Test | ASTM D 2850 | 11 |
| One Dimensional Pressure Swell | ASTM D 4546 | 4 |
| 1-D Consolidation | ASTM D 2435 | 3 |
| C.U. Triaxial Compression Test | ASTM D 4764 | 2 |

The above laboratory tests were performed in general accordance with applicable ASTM, U.S. Army Corps of Engineers procedures, and/or generally accepted practice. It should be noted that reference to ASTM or other standard procedures does not imply that all cross-referenced procedures in ASTM or other standards have been used, or that all ASTM or other procedures used have been followed exactly. Only those ASTM or other standard procedures and/or portions of procedures, which, in the professional judgment of the geotechnical engineer of record for this report, are applicable, appropriate, and necessary for this particular project, have been used or followed. Details regarding these tests are included on the logs (**APPENDIX A**) and in the Laboratory Test Reports in **APPENDIX B**.

6.0 FOUNDATION SOIL STRATIGRAPHY AND PROPERTIES

6.1 Site Geology

According to the Bureau of Economic Geology at the University of Texas at Austin, Geologic Atlas of Texas, Tyler Sheet, the proposed site is located in Queen City Sand Formation (Eqc).

The Queen City Sand formation is described as fine-grained to locally medium-grained quartz sand found in a series of laminated or thinly stratified white and red sands and sandy clays, frequently merging into one another and forming a mottled sandy clay or clayey sand. Ironstone concretions, sometimes occurring as ledges, are common within the formation. Upper sands rest on a series of black, blue, and gray micaceous sands, blue, brown, and gray clays with thin strata of sandstone and limestone. The thickness of the formation ranges from 100 to 400 feet and is generally thinning southeastward. The age is Eocene and can be found mapped throughout the Tyler Sheet.



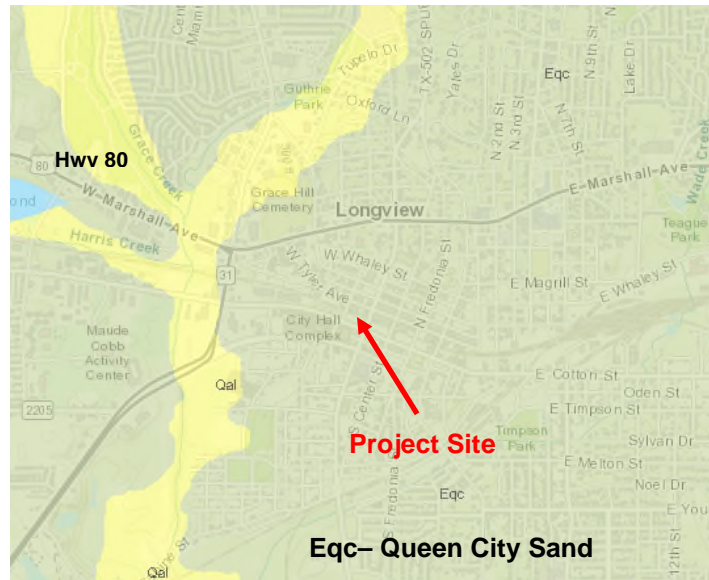


Figure 1: Geology Map

For more information please refer to the National Geologic Map Database and the Geologic Atlas of Texas:

<http://ngmdb.usgs.gov/Geolex>

<https://www.twdb.texas.gov/groundwater/aquifer/GAT/>

6.2 Site Stratigraphy

The soils at the site generally consist of five strata as described below. The classifications are based on weathering, depositional environment, mineralogy, color change, lithology, and structure. Detailed on the boring logs in **Appendix A** are the specific types and depths of the various soil strata encountered. The logs show defined boundaries between various soil types but in reality, the transition between types is generally gradual. Atterberg Plasticity Indices of the tested soils range from non-plastic to 91.

- Stratum 1 (Existing Ground Elevation to 18')
 - Redd. Brown, Lt Gray, with grayish Brown stiff to very stiff fat clay, (CH)
- Stratum 2 (18' Below existing grade to 28')
 - Brown with dark brown very dense clayey sand (SC) with some minor fat clay (CH) partings and seams. Absent in boring B-2, encountered at 28'-30' in boring B-5
- Stratum 3 (28' Below existing grade to 43')
 - Dark brown with dark gray, hard to very hard fat clay (CH) with minor silty sand (SM) seams and thin cemented glauconitic and sandstone seams (30')
- Stratum 4 (43' Below existing grade to 73')
 - Gray to dark gray very dense silty sand (SM) with minor fat clay (CH) seams



- Stratum 5 (73' Below existing grade to 87')
 - Dark brown very hard fat clay (CH) with minor silty sand seams (SM).
 - Auger Refusal at 87', drilled 6 inches into cemented sandstone.

The layering and depths described above should be considered general based on soil profiles within the structure footprint and could vary within the footprint in some areas. The reader should refer to the closest adjacent boring (log located in **Appendix A**) when determining soil properties.

6.2.1 Predicted Soil Properties

Listed in the table below are the predicted properties for each layer of soil encountered for borings where deep foundations may be utilized. These properties are derived from our testing of the soils, published correlations, as well as our experience with the soils in question. Test data from which these properties are derived are included on the logs and attached test reports.

6.2.1.1 Determining Representative Properties

Due to the non-homogeneous nature of the soil and the necessarily limited data, the issue of assigning quantitative design parameters for the various characteristics of a soil mass is open to interpretation. In assessing shear strength along a failure surface that passes through a large mass, it is reasonable to expect that strength variations will be encountered along any potential surface. Where data is sufficient, we believe that it is overly conservative to take the lowest test data values as representative of the characteristics of a soil mass. On the other hand, using average values could be unconservative. How we select the appropriate values to use is explained below.

The following philosophy has been adopted in developing the parameters recommended herein: The average of all applicable test results averaged with the lowest value is termed the "P25" value. The average of all applicable test results with the highest applicable value is termed the "P75" value. Rather than use the worst-case situation when sufficient data are available, we have used either the P25 value (when a low result would be conservative) or the P75 value (when a high result would be conservative) to predict parameters that are used to quantify the behavior of the soil mass. This procedure is only used when the variation in the data is spatially random. If there is a discernible pattern to the variation of the data (e.g. shear strength tends to be softer in low areas) then the data are grouped in accordance with the pattern prior to applying the method stated above (i.e. data are only averaged within groups).

In deriving unit weights and strength parameters, we took into account test data from previous studies (occasionally reinterpreted when appropriate) together with data from current tests.

Listed in **Table 6.2.1** below are the geologic strata with the P25 and the P75 (as appropriate) for various engineering properties. These properties are derived from our testing of the soils as well as our experience with the soils in question.



Table 6.2.1 - Predicted Soil Engineering Properties

| Stratum No. | 1 | 2 | 3 | 4 | 5 | Compacted TxDOT Base | Select Fill Compacted 100% D698 | Moisture Conditioned Clay |
|--|---------------------------|--------------|---------------------------|--------------|---------------------------|----------------------------|---------------------------------------|---------------------------------|
| ¹ Moist Unit Weight (pcf) | 120 | 125 | 125 | 120 | 125 | 135 | 125 | 115 |
| Soil Classification - USDS | CH | SC | CH | SM | CH | GP | SC/SandyCL | CH |
| Peak Strength Parameters | | | | | | | | |
| Drained Cohesion (psf) | 275 | - | 250 | - | 250 | | | 100 |
| ² Drained Friction Angle (Deg.) | 24 | 30 | 25 | 34 | 30 | 40 | 32 | 20 |
| ³ Undrained Cohesion (psf) | 1200 | - | 4000 | - | >5000 | | 1000 | 800 |
| Lateral Earth Pressures | | | | | | | | |
| Rankine – Kp (passive) | 2.37 | 3.00 | 2.46 | 3.54 | 3.00 | 4.60 | 3.26 | 2.04 |
| Rankine – Ka (active) | 0.422 | 0.333 | 0.406 | 0.283 | 0.333 | 0.217 | 0.307 | 0.490 |
| Rankine – Ko (at rest) | 0.593 | 0.500 | 0.577 | 0.441 | 0.500 | 0.357 | 0.470 | 0.658 |
| Settlement Parameters | | | | | | | | |
| Modulus of Subgrade Reaction (pci) | 50 | - | - | - | - | - | 100 | 30 |
| Initial Void Ratio – Eo | 0.95-1.05 | 0.725 | 0.7-0.9 | 0.5-0.6 | 0.6-0.8 | | | |
| ⁴ Preconsolidation Pressure- Pc (tsf) | 3.25 | 3.16 | | | | | | |
| Compression Index – Cc | 0.280 | 0.095 | | | | | | |
| Recompression Index – Cr | 0.03 | 0.01 | | | | | | |
| ⁵ Drained Tangent Modulus – Mt (ksi) | 200 | 375 | 350 | 400 | 450 | 8000 | | |
| ⁶ Soil Type (For L-Pile Analysis) | Stiff Clay w/o Free Water | Sand (Reese) | Stiff Clay w/o Free Water | Sand (Reese) | Stiff Clay w/o Free Water | - | Sand (Reese) | Stiff Clay w/o Free Water |

Notes:

- 1) Use buoyant unit weight where applicable
- 2) Estimated drained friction angle (Phi = degrees), estimated from correlated test data
- 3) Peak Unconsolidated/Undrained shear strength (psf) at in-situ moisture content, measured by U.U. triaxial test or estimated from SPT field data.
- 4) Pre-consolidation pressure (tsf) was measured at the sample depth. Value varies with overburden.
- 5) Mt = Confined (1D) Tangent Modulus (ksf) estimated from consolidation testing
- 6) Use default L-Pile values for K and e50, as applicable

6.3 The Behavior of Expansive Soils

Expansive soils can be any of the following soil types: Lean Clay (CL) or Fat Clay (CH), which exhibit the ability to change volume (shrink or swell) with the addition or subtraction of moisture.



Expansive soils such as are found at various depths throughout the soil profile swell when they absorb moisture and shrink as they dry. Structures placed on these soils move up and down with such volume changes of the soil. When expansive soils are covered by an impermeable surface such as a structure or pavement, seasonal moisture fluctuation at the interior of the covered area tends to be reduced or eliminated due to the lack of exposure to natural wetting and drying conditions (i.e., wind, rain, sun, vegetative, etc.). At the perimeter of the structure, however, infiltration into the foundation soils from surface drainage could lead to local swelling of the clays (if they were dry at the start of construction) resulting in tilt or distortion of the foundation. Where areas immediately adjacent to the structure are paved both the risk of swelling due to excess moisture absorption and shrinkage due to moisture loss are reduced significantly.

At the time of exploration, the moisture content of the surficial 12' active zone of highly expansive clay soils encountered was moist to wet, based on a comparison with the plastic limit moisture. The potential for swelling based on conditions at the time of drilling is considered to be moderate to high. The potential for shrinkage is predicted to be high to very high. As the moisture content of the soil changes from what it was in our samples, the potential for swelling and shrinkage will change accordingly. For example, the expansive soils will exhibit a much higher swell potential if they were to dry prior to construction.

6.3.1 Vertical Heave Predictions

The assessment of the impact of expansive soils given below is predicated on soil moisture change that is a result of normal climatological fluctuation only. Factors such as poor drainage and consequent ponding water, plumbing leakage, excavation details (e.g. permeable backfill in trenches or beneath structures), and vegetation can result in moisture changes (and consequent swelling or shrinkage) outside the ranges predicted herein. The predicted heave is also the predicted differential movement that could be experienced by a slab and/or foundation placed on grade.

6.3.1.1 Potential Vertical Rise (PVR)

One method for quantifying the potential for subgrade movement at any given location is to calculate the Potential Vertical Rise (PVR) (Tex 124 E Modified). This calculation takes into account the inter-relationship between depth, Plasticity Index (PI), and fluctuations in soil moisture. The maximum potential shrink/swell of the existing, PVR, due to normal climatological fluctuations in soil moisture content is predicted to be 6.3 inches or less at existing grade. These calculations are based on assumed dry conditions and an estimated seasonal moisture fluctuation zone of approximately 12 feet.

6.3.1.2 USACE Potential Vertical Heave

Another method for predicting the potential of vertical heave (PVH) of the subgrade soils is the USACE Hand (manual) Method as described in FOUNDATIONS IN EXPANSIVE SOILS (TM 5-818-7, 1983) section 5-4 (See also, EVALUATION OF LEVEL OF RISK FOR STRUCTURAL MOVEMENT USING EXPANSION POTENTIAL, Nelson & Chao, Geo-Frontiers 2001 © ASCE 2011). This method is a prediction of vertical heave based on test results determined from an oedometer free swell test. These calculations are based on moisture conditions at the time of



sampling and an estimated moisture fluctuation zone of approximately 12 feet. Based on laboratory testing of specimens trimmed at in-situ moisture, the predicted PVH is on the order of 3.8 inches at the existing grade. Significant drying of stratum 1 prior to construction could lead to greater heaving than predicted herein.

6.3.2 Expansive Soils Risk Assessment

Risk and cost are inversely related and a decision must be made by the owner as to the best approach when weighing the risk of detrimental foundation soil movement against the cost of a foundation and floor system that either isolates the structure from such movements or reduces the effect of such movements to a tolerable level. When expansive soils are present at a given site, the risk of soil movements detrimental to the building structure and function needs to be mitigated. A system utilizing a structural slab suspended above a void space and supported on deep foundations can virtually eliminate the risk but is also relatively costly. Conversely, a floor slab placed on a prepared subgrade would likely be the least costly approach, but would also be more susceptible to damage from foundation soil movements. Since the optimum approach is rarely immediately apparent, we provide the following information as an aid in dealing with the risk aspect of various approaches.

Many factors must be considered in assessing the risk of shrink/swell behavior including:

1. Soil characteristics (Atterberg Limits, % fines - clay/silt)
2. The thickness of various soil layers and depth below the ground surface
3. Soil layer moisture content at the time of construction relative to moisture content at the time of testing and relative to the maximum attainable during swelling.
4. Restraint effect of overburden and/or foundation loads on heaving
5. Factors that contribute to change in soil moisture content including:
 - a. Rainfall
 - b. Drainage characteristics immediately adjacent to the structure
 - c. Desiccation effects of sun, wind, and vegetation (such as trees and shrubs)
 - d. The seasonal depth of moisture penetration and exfiltration
 - e. Exposure to, or isolation from, drying or wetting effects both during construction and after completion
 - f. Landscaping and irrigation
 - g. Utility trench construction
 - h. Plumbing leaks

The actual movement experienced by a given portion of the structure is dependent on a complex interaction of the various factors noted above. The accuracy of predicted movement is determined by how well the prediction accounts for these factors. The TxDOT PVR method is widely accepted for prediction of shrink/swell movement potential but is derived from empirical data and established correlations with Atterberg Limits. The USACE method, on the other hand, is based on the measured swell of actual specimens and is, thus, considered superior to the PVR method in accounting for the soil heaving characteristics at the moisture condition assumed.



When we speak of foundation movements, we consider them as “potential” movements that may, in fact, only partially, or even never occur. The measures recommended in this report are intended to reduce the risk of exceedance of the predicted potential movements. It is the usual case that if these measures are properly implemented, structure performance is satisfactory. However, sometimes conditions outside the scope of this study (some of which are noted elsewhere herein) can result in excessive movement and structure distress.

Actual vertical change in soil thickness (i.e. heave or shrinkage) is directly related to the change in soil moisture content, so that if the moisture content change can be limited, the heave potential is reduced proportionally. However, moisture change is the hardest variable to assess and control. The perimeter areas of structures are typically the most susceptible to moisture change factors related to natural climate variations as well as the other factors listed in Item 5, above. The main risk of moisture fluctuation for interior areas, however, is mainly related to Items 5e (during construction), 5g, and 5h.

The performance of floor slabs placed on the native ground or prepared subgrade (i.e. undercut and replacement with select fill, or moisture conditioned clay) is dependent on the accuracy of the shrink/swell predictions and our understanding of the finished grades. Because current prediction methods cannot precisely account for all the factors involved, as noted, the slab-on-grade option carries with it a greater degree of risk of distress than the structural floor option. The recommendations provided in this report will help to mitigate the risk, but not eliminate it.

6.4 Seismic Site Classification

IBC-2012 requires density/shear modulus information extending to a depth of 100 feet for seismic site classification. The current scope does not include the required 100-foot soil profile with borings that are drilled to a maximum of 87 feet below the existing grade. Consequently, we have assumed that the density (blow count) of the soil/rock encountered at the terminal depth is representative of the profile to a depth of 100 feet. If the seismic site class definition is critical to the design, this assumption should be confirmed by further testing. Based on the site class noted below we do not believe further testing would benefit in an improved site classification.

Based on the IBC-2012, the seismic site class definition is **Class C “Very Stiff Soil”**. We have assumed a **Risk Category of II**. California’s Office of Statewide Health Planning and Development (OSHPD) provides an online tool that calculates the seismic design values based on the overall project and site information listed above. A print out of this report is provided in **Appendix D**. E TTL does not warrant the accuracy of this report and it is presented to the client for information purposes only.

For more information regarding the information we have provided, please visit:

<https://www.usgs.gov/natural-hazards/earthquake-hazards/hazards>
<https://seismicmaps.org/>



7.0 GROUNDWATER OBSERVATIONS

Data regarding the groundwater level was obtained by observations in open boreholes. Due to the use of mud rotary drilling techniques, groundwater observations post drilling can be suspect as a result of introducing drilling fluid into the borehole. Reported groundwater levels are based on observed seepage during dry hollow stem auger drilling prior to switching to mud rotary. At best this provides only an approximation of the phreatic surface. Based on these observations and a review of the samples retrieved, we estimate the phreatic surface to be approximately 18 feet below the existing ground surface and about 23' deep at the southeast corner.

At the time of drilling *phreatic surface that should be considered for the design of this project may vary significantly from that which was observed in the borings due to the following factors:*

- The characteristics of the soil profile may have prevented the water level in the boring from rising to the phreatic level during the period of observation
- A given boring may not intercept groundwater bearing zones (i.e. the groundwater is perched or travels in seams or fissures that are not continuous over the entire site)
- Groundwater may only be perched in pockets above local aquacludes, but the distribution of borings is not generally adequate to confirm this with a high level of certainty
- Groundwater level varies seasonally and with rainfall
- Rotary wash drilling methods introduce fluid into the boring that often makes it impossible to distinguish between groundwater and drilling fluid

If the designer believes that the level of groundwater could significantly impact the project, then E TTL should be contacted to develop a plan for piezometer installation and monitoring to more accurately assess the groundwater levels at the site.

8.0 FOUNDATION DESIGN RECOMMENDATIONS

Two independent design criteria must be satisfied in the selection of the type of foundation to support the proposed structure. First, the ultimate bearing capacity, reduced by an appropriate factor of safety (usually taken as 3 for DL plus sustained LL and which varies depending on the loading case) (or resistance factor if LRFD analysis), should not be exceeded by the bearing pressure (factored for LRFD analysis) transferred to the foundation soils. Second, predicted total and differential vertical movements due to consolidation and/or expansion of the underlying soils during the operating life of the structure(s) should be within tolerable limits. Settlement limitations of isolated foundation elements, if any, were unknown at the time of report preparation. For most structures similar to that of the current project, 1 to 2 inches of predicted total settlement or heave is widely considered an acceptable target for design. *It should be noted, however, that if the differential settlement or heaving of this magnitude were actually to occur, distress including cracks in walls and floors and door frame distortion, etc. can be expected at least in some circumstances.* Where there are no walls supported on the floor (as may be the case for much of this structure),



then the higher potential could be considered as heaving of the floor may create some floor cracks, but there would be no partitions to be concerned about.

Some conditions that may affect foundation and slab performance (e.g. plumbing leaks, poor drainage conditions, deep-seated heave, etc.) are difficult to account for in standard slab and foundation design procedures and are not considered elsewhere in this report. Such sources of moisture change could cause significant shrink/swell movements of the expansive clay that will remain beneath the building and result in significant distress. If it is desired to virtually eliminate the risk of damage from vertical movement due to these conditions, an option incorporating deep foundations with a suspended slab is recommended for the proposed office space.

8.1 General Considerations

Due to the magnitude of anticipated column loads and in order to meet the above criteria, either deep foundations (drilled piers) or ground improvement for support of shallow foundations is recommended. There are numerous methods for improving the ground to provide adequate support of foundations, most of which are proprietary and provided on a design/build basis. Rammed aggregate and vibratory stone columns are examples of systems that are typically used locally for this type of ground improvement application. It should be noted that porous aggregate piers comprising such systems can provide a conduit for water to penetrate to, and accumulate in the deeper clays potentially resulting in deep-seated heave. This potential should be considered and sufficiently mitigated by the vendor in the design of any ground improvement system.

Due to the potential excessive settlement of spread footings and the potential risk involved with ground improvements, drilled piers (straight shaft) can also be considered for support of the superstructure. This type of foundation will utilize passive pressure, skin friction, and end bearing to resist lateral and vertical loads. Because drilled shafts will penetrate groundwater in zones subject to caving, temporary surface casing and/or slurry drilling techniques will likely be required to keep the hole from caving (details below).

Where expansive clays underlie structures, it is considered essential that measures be taken to help assure subgrade moisture stability (see **Section 11.0**) in order to enhance the chances of satisfactory structure performance. Provision should be made to account for the possibility of some differential movement (see movement prediction in **Section 6.3**) between the building and driveways, sidewalks, and other associated appurtenant structures. Proper site design that prevents water from soaking into the subgrade soils around the structures and appurtenances (i.e. provides for rapid runoff away from them) is critical to reduce the potential for excessive movement caused by saturation of foundation soils and should help limit differential movement between exterior soil-supported elements and the structures.

Footings, floor slabs, pavements or other appurtenances supported on grade will potentially be subject to vertical movements due to the expansive surficial clay soils (See **Section 6.3.1** above). Where such movement (estimated as +/- 3.8" at existing grade) cannot be tolerated, floor slabs, stairs, and other appurtenances should be supported on piers over 8-inch-thick void boxes, or on subgrade prepared to reduce the potential movements to a tolerable level (typically 1 to 2 inches or



less), see **Section 11.0**.

8.2 Shallow Spread Footings

Shallow Spread footings should only be utilized where the subgrade preparation option chosen in **Section 11.2.3** includes the removal of the expansive clays and replacing them with select fill (not moisture-conditioned fill). The minimum horizontal dimensions of the zone of removal beneath the loaded element should equal the footing width (or length) plus the thickness of the select fill below the footing. Shallow footings bearing in untreated native soils should only be considered where footings carry incidental loads such as small retaining wall footings, AC pads, signage, etc. and where predicted potential movements of the subgrade (heave and/or settlement) will not significantly affect the aesthetics or functionality of the foundation or items supported on it.

8.2.1 Bearing Capacity of Shallow Footings

Footings should be designed to bear in prepared subgrade or properly compacted select fill at a minimum depth of 2 feet below the finished subgrade or adjacent exterior grade (whichever is deeper). Isolated footings should have a minimum width of 2 feet and strip footings should be at least 12 inches wide. Listed in the table below are the recommended gross allowable bearing pressures for the various types of subgrade modifications. These allowable pressures incorporate a safety factor relative to shear failure of the soil of at least 3 and may be increased up to 33% for intermittent loads such as wind.

The predicted settlement due to the dead plus sustained live load pressure is noted in the table for the maximum allowable footing width. The settlement is predicted to occur immediately for footings bearing in the select fill. Footings bearing in clay will settle over time. The predicted consolidation settlement of an applied load on the moisture treated clay does not include the consolidation settlement of the recompacted fill under its own weight, see **Section 113.1.1**.

| Bearing Material or Stratum | Bearing Capacity of Isolated footings (psf) | Bearing Capacity of Strip footings (psf) | Predicted settlement for a maximum footing width (in/ft) |
|------------------------------------|--|---|---|
| Select Fill (soil) | 3,000 | 2,500 | 1" / 7' |
| Moisture Treated Clay | 2,000 | 1,500 | 1" / 4.5' |
| Stratum 1 | 2,500 | 2,000 | 1" / 5' |

8.2.2 Ground Improvements

Due to the magnitude of anticipated column loads and to meet the design criteria, shallow spread footings founded in the undisturbed native ground or prepared subgrade are not considered feasible for any of the main structure footings because of predicted excessive settlement under normal bearing pressure. However, the bearing capacity can be improved and the settlement potential reduced by some form of ground improvement.



8.2.2.1 Shallow Footings on Aggregate Piers/Stone Columns

The design of this type of ground improvement system is typically performance-based and proprietary to the specialty design-build contractors such as Geopier® or Hayward Baker. The systems can be a cost-effective foundation solution to support settlement sensitive structures while providing increased allowable bearing and reduced settlement. The process increases the lateral stress in surrounding soil; thereby further stiffening the stabilized composite soil mass. In similar soil profiles, the allowable bearing capacity has been increased to 5,000psf or greater and depends on several variables and design criteria determined by the specialty design-build contractor. One such variable is the method chosen to reduce the PVR/PVH. Aggregate piers placed through compacted select fill will require a different design than those placed through recompacted, moisture-conditioned clay, or chemically injected clay.

As previously noted, aggregate piers are typically comprised of a crushed stone similar to TxDOT flex base. When these piers are installed through an expansive clay, they can become conduits that could facilitate water, either flowing below the surface slab or through fissures in the clay mass, to accumulate in the crushed stone and eventually seep into the untreated clays potentially causing heaving beyond what is predicted in **Section 6.3.1**. Aggregate piers have been utilized in expansive soil profiles and each specialty design-build contractor has methods for reducing the risk deep-seated heave.

8.2.3 Construction Considerations

All shallow footing excavations should be inspected by qualified personnel to ensure that subgrade is composed of firm, undisturbed native soil or properly compacted select fill as recommended in this report. Water and/or loose material in footing excavations should be removed prior to final shaping of the footing excavation and placement of concrete

8.3 Drilled Piers

Drilled shafts have the advantage of being single elements that can provide both large vertical and large lateral capacity. Drilled shafts will consist of cylindrical excavations that are filled with high slump concrete that is reinforced with a steel cage. Steel should be adequate to resist drag loads (if any) as well as uplift loads and bending moments and shears from lateral loads. The reinforcing cage should be fitted with heavy-duty spacers (e.g. "ShaftSpacer" by Foundation Technologies - light plastic wheels are unacceptable) to maintain clearance between the steel cage and the side of the hole. Steel spacers are also unacceptable due to corrosion potential increase. Only straight shafts are considered since under-reaming may prove problematic.

Sizes for which static vertical load design information is provided herein include 18" to 72", which are believed sufficient to adequately cover the anticipated loading ranges (A 72" diameter design curve is included for group action calculations (See **Section 8.2.4**)). Contact E TTL for design curves for additional shaft sizes, if needed. In general, the loads suggested as "allowable" can be increased by 33% for transient loads such as wind and seismic (except for cases where these loadings result in a net uplift on a given shaft). The information provided in this report is based on that found in *Drilled Shafts: Construction Procedures and LRFD Design Methods – FHWA GEC 010* - Federal Highway Administration, 2010.



8.3.1 Shaft Embedment Considerations

In general, shafts that are smaller in diameter and deeper are more economical than those which are larger in diameter and shallower since the volume of concrete is less for the former and capacity in the deeper soils is generally greater than in the shallower soils. *The minimum recommended embedment is determined not only by load capacity but by the depth necessary to resist heave as discussed below and must be deeper than the active zone which is predicted to be about 12' deep.*

8.3.2 Vertical Capacity

Drilled piers mobilize both skin friction and end bearing to distribute the loads from the proposed structures to the subsoil. The amount of movement it takes to develop full ultimate skin friction is generally less than 0.5 inch, whereas the amount of movement necessary to develop ultimate end bearing is on the order of 3% to 5% of the tip diameter (in sands capacity is even available at tip movements in excess of 5%). To limit the settlement of the shaft to a generally accepted magnitude, the amount of end bearing that can be mobilized is limited (more so for larger shafts than for smaller ones). That is, a calculation of the “effective” ultimate capacity or the mobilized ultimate capacity at a limited settlement, involves adding the full ultimate skin friction capacity to a reduced (in some circumstance) ultimate end bearing.

Because of the myriad possible combinations of sizes and loading conditions and the unknown constrictions at any given location, capacity curves are provided which can be used to select size and embedment for individual, isolated shafts in select fill/native soil.

Capacity curves titled “**DRILLED SHAFT CAPACITIES**” are included in **Appendix D**. There is an individual plot for each of the shaft sizes selected showing recommended allowable (FS noted on the curve) skin friction (so indicated in the legend of the plot by a dashed line) and total load (indicated by the solid line curve labeled in the legend with the shaft diameter).

The vertical capacity read from the applicable curve represents the “effective ultimate” (i.e. total ultimate reduced to limit predicted tip settlement at ultimate load to 1” or less) divided by a safety factor (as noted). For drilled shafts, the safety factor of 3 is recommended because load testing is not routinely conducted to confirm design assumptions. *It should be noted that this capacity only represents the geotechnical capacity of the shaft. The designer needs to check whether other issues such as concrete strength may limit the capacity to something less than the geotechnical capacity.* If design tip elevations are significantly greater than the limit of exploration, additional exploration should be conducted to confirm the capacities assumed on the curves (where provided curves have been extended by others beyond the depth of exploration).

Note that the embedment from the curve represents depth below the existing ground elevation. Where fill will be placed above the existing grade at a given shaft location, add the thickness of the fill to the embedment depth determined from the procedure set forth herein to determine the preliminary required embedment depth below-finished grade (This is a conservative approach, especially where the fill thickness is not significant and it is often the case that the embedment from the curve can be used as the depth below finished grade). The elevation below the finished ground



surface read from the appropriate design curve can be conservatively used as the required embedment length below the base of any pier cap. Alternatively, the capacity of a given pier can be determined by subtracting from the capacity of the shaft as determined by the procedure set out in this section (below), the capacity from the skin friction curve at the depth of the pier cap.

Where a shaft is subject to significant lateral load, the skin friction capacity of that portion of the top of the shaft that deflects laterally more than 1% of shaft diameter should be neglected (this may be the case especially for smaller diameter shafts with significant lateral load). Information regarding the depth to be ignored can be readily obtained from the lateral analysis curves derived from an L-Pile analysis (not a part of this study). The appropriate **DRILLED SHAFT CAPACITIES** curve should be examined to determine the skin friction capacity at the depth where deflection determined in the L-Pile analysis is equal to 1% of shaft diameter and this value should be subtracted from the capacity at the embedment depth to determine the design capacity for the shaft.

*These results are for individual piers and will need to be modified for group action of shafts as indicated in **Section 8.3.4**, below.*

Limiting working loads to the level indicated by the curves should limit the settlement of isolated piers at working load (not the settlement at ultimate load) to something in the neighborhood of 0.5" or less. However, the settlement considered by the design curves is the tip settlement of the isolated pier, not the head. You will need to check the elastic compression on the pier (use say 67% of its actual length for "L" in the $(P \cdot L)/(A \cdot E)$ formula for the approximate computation of elastic compression to see if it is a significant amount). As a rule of thumb, it should only be significant for very slender piers. The settlement of pier groups can be significantly greater than the settlement predicted for an isolated pier and, thus, requires a separate evaluation.

8.3.3 Soil Induced Uplift Loads

Drilled shafts could experience tensile loads as a result of post-construction heave in the surficial clay soils in which the shaft is embedded. The magnitude of these loads varies with the shaft diameter, soil parameters, and particularly the in-situ moisture levels at the time of construction. The active zone is predicted to be about 13' deep and all shafts must be anchored below that depth as they may experience uplift from the native clay soils throughout the active zone. The reinforcement quantity should be adequate to resist tensile (uplift) forces resulting from soil adhesion equal to 1,200 psf (ultimate value) acting over the upper 12 feet of the pier shaft perimeter that is in contact with native expansive soils (i.e. adhesion in zones where select fill or moisture treated clay replaces native clay or where embedment is in native soils other than fat clay or lean clay may be assumed equal to 0 for the purpose of heave evaluation).

Uplift due to swelling of the soil should be analyzed separately from (i.e. not in addition to) uplift resulting from other loads (e.g. wind or seismic). A check should be made to verify that the *ultimate* side resistance of the portion of the shaft embedded below 12' is at least equal to the induced heave above that level (i.e. Safety Factor of 1 in this instance) and that the shaft reinforcement is adequate to prevent tensile failure at the active zone depth. Ultimate side resistance of the portion of the shaft embedded below the active zone may be predicted by reference to the appropriate



Drilled Shaft design curve in **APPENDIX D**. Subtract the side resistance indicated by the curve at depth of the bottom of the active zone from the side resistance indicated at embedment depth and multiply the result by the indicated factor of safety for side resistance. This is the predicted *ultimate* side resistance of the portion of the shaft embedded below the active zone and the sum of it plus sustained dead load (including shaft weight) should at least be equal to the ultimate heave computed above. Also, if the uplift due to swelling soils is greater than the net uplift resulting from other applied loads, it should be used to check the structural adequacy of the shaft and soil resistance.

8.3.4 Group Effects

8.3.4.1 Cohesive Profiles (SC, CL, CH, MH)

Pier groups in purely cohesive soil profiles should be checked as follows (USACE EI 02C097 Chapter 5 Section 3a (2)): The group of piers is assumed to act as an equivalent shaft with a perimeter equal to the outside perimeter of the group and an end area equal to the area encompassed by the perimeter of the group. To compute the average allowable unit skin friction resistance on the peripheral surface of the group, read the values from the skin friction curve at the embedment depth selected (which is a factored ultimate skin friction for the individual pier) and divide it by the surface area of the pier (perimeter of the pier times the embedment depth). Multiply this value times a factor of 1.8 to convert pier skin friction to group skin friction (The factor of 1.8 is a conservative value to convert adhesion of cohesive soil to piers to the average cohesion of the soil over the embedment depth, which is what controls in the analysis of skin friction of the equivalent pier (or soil block)). Multiply this value times the perimeter of the group times the embedment depth of the piers to predict the allowable side shear for the group.

To compute unit end bearing for the group, subtract the total capacity read from the design curve labeled as [72"] (i.e. the shaft diameter in inches as indicated in the legend) at the embedment depth from the skin friction capacity at the same depth and divide the result by the end area of the 72" pier (28.3 sq ft). This value is the ultimate end-bearing unit pressure modified by the safety factor noted on the curve. Multiply this value times the plan area of the group to predict the total allowable end bearing for the group. Add the total group end bearing to the total group side shear to arrive at the predicted total group capacity. The capacity (tension or compression) of the group (equivalent shaft) may not exceed the sum of the individual capacities of the shafts comprising the group. A pier cap (encompassing the entire group) in contact with the ground is recommended provided the design takes into account uplift forces from swelling soils, where applicable (contact this office for further information, if desired).

8.3.4.2 Group Settlement

The settlement of a group can be significantly more than what would be anticipated for an isolated shaft. E TTL can assist in this evaluation if provided with specifics regarding configurations and loads.

8.3.5 Uplift

In this instance, a value of 70% is recommended to calculate the capacity of an individual shaft in uplift as a percentage of downward skin friction capacity. Read the skin friction curve from the chart



at the embedment depth (which is allowable skin friction (Ultimate/(SF noted))). Multiply this value by 0.7. The resistance value calculated using this skin friction value is compared to the uplift load applied to the top of the shaft minus the shaft weight and, as long as the resistance is greater, the predicted factor of safety against uplift failure is equal to the safety factor noted on the curve combined with any factors by which the load has been modified.

The allowable uplift resistance of a pier group should be determined in accordance with AASHTO (1996) Section 4.13.3.3.6b which states that the group uplift capacity should be determined as the lesser of:

1. The design allowable uplift capacity of a single pier (as specified above) times the modification factor for pile spacing (where applicable and as noted elsewhere herein) times the number of piers in the group. The modification for spacing applies only to cohesionless and mixed soil profiles.
2. Two-thirds of the effective (use buoyant weight for the portion below the groundwater level) weight of the group and soil contained within a block defined by the perimeter of the pier group and the embedded length of the piers.
3. One half of the effective (use buoyant weight as noted above) weight of the pier group and soil contained within a block defined by the perimeter of the pier group and the embedded pier length plus one half of the total soil shear resistance on the peripheral surface of the pier group. To compute the average shear resistance on the peripheral surface of the group, take the uplift value computed above for the individual pier (*not* modified for group effects) and divide it by the surface area of the pier (perimeter of the pier times the embedment depth). For purely cohesive soil profiles only, multiply this value times 1.8 to convert pier side-shear to group side-shear.

8.3.6 Lateral Load Analysis

A lateral load analysis depends on soil properties as well as the stiffness of the drilled shaft being analyzed and, so, entails a cooperative process involving both the structural engineer and the geotechnical engineer. Because of the myriad possible combinations of sizes, embedments, reinforcing, and loading conditions, as well as the unknown constrictions at any given location, it is not feasible at this time to predict conditions associated with the lateral loading of piers. However, E TTL was asked to provide shear and moment diagrams for laterally loaded piers with diameters of 36", 42" and 48" and at a maximum horizontal deflection of 1 inch. For this analysis, we used L-Pile software. Programs such as the LPile program by Ensoft calculate the stiffness of drilled shafts accounting for reinforcement as well as section cracking (i.e. stiffness reduction) for a given combination of vertical and horizontal loads. Soil parameter values that are recommended for use in a lateral load analysis are listed in **Table 6.2.1, Predicted Soil Engineering Properties**, above.

The following assumptions were made and serve as a basis of the L-Pile analysis:

1. Shafts are embedded 45' (or more)
2. Moisture treatment of the top 10' of native clay occurs prior to shaft construction
3. Concrete strength at 28 days: 4,000 psi



4. The top of the shaft is at current existing grade
5. Shafts are in the free head condition (i.e. moment developed at the top of the shaft during lateral deflection is 0)
6. Shafts deflect laterally 1" at the ground line.
7. Shafts are loaded with a concentric vertical load of 530 kips during lateral displacement. The critical combination of loads yielding the maximum horizontal deflection generally consists of the maximum horizontal load together with the minimum vertical load. This combination typically results in the severest moment and the least effective moment of inertia (due to cracking of the section).
8. The analyses are for isolated shafts and do not account for the effects of adjacent shafts or group action

Results of the analysis in the form of shear, moment, and deflection curves are provided in **Appendix E**. E TTL can assist with a more detailed lateral load analysis once information regarding shaft diameter, reinforcing, head fixity, and lateral loads have been preliminarily determined and if such conditions are deemed to warrant more detailed analysis.

8.3.6.1 Group Action of Laterally Loaded Piers

A group of piles or piers loaded laterally will generally have a total lateral capacity (for a given lateral deflection of the pile heads) less than the sum of the individual lateral capacities. This is true when the group consists of more than one row of piers/piles and/or the direction of the lateral load is not perpendicular to a line connecting the piles in the row.

We recommend that the analysis of pier/pile groups for lateral load be performed in accordance with the recommendations of *GEC No. 8 – DESIGN AND CONSTRUCTION OF CONTINUOUS FLIGHT AUGER PILES* – FHWA 2007, Section 5.6.3.

8.3.7 Lateral Load Resistance of Pier Caps

Resistance to lateral loads can be developed via a combination of passive earth pressure acting against the face of footings and pile/pier caps and lateral resistance developed by deep foundations. The resistance of piers to lateral loads is discussed elsewhere in this report. A portion of ultimate passive earth pressure can be applied to the face(s) of footings and pier caps to resist lateral loads. **Caution:** *Lateral resistance against the vertical face of pier caps or spread footings should only be assumed where construction can be controlled to assure that the footing is cast against undisturbed earth, or backfill between the excavation face (which needs to be nearly vertical and extended to the bottom of cap elevation) and the footing edge is placed under density-controlled conditions (backfill should be placed to 100% ASTM D698).*

In determining the total resistance to lateral loads, the degree of lateral movement that can be tolerated must be considered. This is related to the fact that there is a direct relationship between lateral load and horizontal deflection for piers and there is also a direct relationship between lateral movement and degree of passive resistance that can be mobilized. The magnitude of lateral movement needs to be consistent for each contributing element in computing total allowable resistance. (This relationship is rather complex and E TTL can provide further assistance when



provided with specifics of a given situation). To determine the total allowable lateral load for a given lateral deflection limitation, the mobilized passive pressure on a pile cap should be added to the resistance from the individual piles (modified for group effects as detailed elsewhere in the report) and the sum reduced by an appropriate safety factor. Lateral support to the cap afforded by a floor slab or other rigid element placed in contact with the cap should also be considered.

Ultimate passive resistance of the soil loaded by a block (in the form of a triangular distributed load) can be estimated by the following formula for both drained and undrained conditions and selecting the most critical condition:

$$P_p \text{ (drained)} = \gamma \cdot (K_p) \cdot z + 2 \cdot c' \cdot (K_p)^{0.5}$$

$$P_p \text{ (undrained)} = \gamma \cdot (K_p) \cdot z + 2 \cdot c \cdot (K_p)^{0.5} \text{ (usually reduces to: } \gamma \cdot z + 2 \cdot c)$$

Where:

γ = effective unit weight

K_p = Passive pressure coefficient = $(\tan(45 + \phi'/2))^2$ (generally equals 1 for undrained $\phi=0$ condition)

ϕ' = Effective angle of internal friction.

ϕ = Undrained angle of internal friction, generally = 0

c' , c = drained/undrained cohesion

z = depth where pressure is determined

The appropriate parameters to be used in the above equation are to be selected from **Table 6.2.1** for the appropriate loading condition that controls (i.e. long-term(drained) or short term (undrained)) for the soil against the face of the footing. A significant amount of lateral movement is required to fully mobilize ultimate passive pressure (as much as 6% of the depth to the base of the loaded face). To limit the lateral movement to about 1% (of the depth to the base of the loaded face) a safety factor of about 2 to 2.5 is recommended for the reduction of the ultimate passive component of resistance.

Full passive resistance assumes that the footing excavation can be constructed in such a manner as to provide solid contact of the side of the concrete with the undisturbed sides of the excavation (which may be impractical in some situations). *Caution:* Lateral resistance against a vertical face should only be assumed where construction can be controlled to assure that the footing is cast against undisturbed earth, or backfill between the excavation face (which needs to be constructed as nearly vertical as possible and extended to the bottom of footing elevation) and the footing edge is placed under density-controlled conditions (backfill should be placed to 100% ASTM D698). It should be noted that such heavy compaction against a wall face will result in earth pressures against the wall exceeding the usually assumed active or at-rest pressures. *Also, the temporary excavation face needs to be nearly vertical and extended to the bottom of the footing elevation. The portion of the sides of the excavation for the footing that is comprised of fat clay exposed to wetting or drying action and that is within 5' of the finished ground surface should be neglected with respect to computing passive resistance to account for possible softening or shrinkage of the zone.*



Passive resistance should only be counted upon provided that there will be no excavation within a distance from the edge of the footing or pile cap equal to 1.6 times the depth of the base of the footing. Such excavation would disturb the strength of the resisting passive wedge. If the lateral loads are primarily due to intermittent loads such as wind or seismic, then excavation adjacent to the footing might be allowed (based on the ability of the piles to carry any lateral load at the time of the excavation) provided that any soil removed would be replaced at a minimum density of 100% of ASTM D698. *Also, the temporary excavation face needs to be as described above.*

8.3.8 Load Testing Program

We recommend that the information provided herein for the design of piers be based on a factor of safety of 3. If a design based on a lower factor of safety (e.g. 2) is to be considered, a load test program is recommended to more accurately assess capacity. Unless the project entails a very large number of piers, this approach would not generally be economical. E TTL can assist you in planning a test program should you desire to pursue this further.

8.3.9 Construction Issues

Construction of all drilled piers should be monitored by personnel familiar with their installation. As a minimum, it is recommended that a representative of this firm be present before and during drilled pier construction to monitor test piers and production pier installation procedures. Free water and/or loose material at the base of excavations should be removed, as appropriate, prior to placement of concrete.

Groundwater observations as well as geologic conditions indicate that slurry drilling methods will probably be required. Methods for dealing with this situation should be discussed with prospective contractors prior to bidding.

Concrete should be designed and placed with a relatively high slump (7 to 9 inches) to provide solid contact of the shaft with the side of the hole. Close engineering supervision is essential during the installation of the foundation units in order to assure that construction is performed in accordance with the plans and specifications. Also, to help ensure proper construction of the drilled piers, close coordination between the drilling and concreting operations is considered to be of primary importance. Concrete should be placed at each drilled pier location *immediately* after the completion of drilling. Concrete placement in the shaft should be at a rate of at least 40' of shaft per hour. *In no case should a shaft remain open overnight.*

Construction documents must specify that all foundation units should be constructed in accordance with ACI 336.1 "Standard Specification for the Construction of Drilled Piers," latest edition. Only contractors familiar with and competent in the employment of these methods should be considered for the work. The actual capacity of the completed foundation is directly related to the degree of conformance to correct construction procedures.

8.4 Grade Beams and Load-Bearing Elements Above Untreated Subgrade

All grade beams and load-bearing elements (columns and load-bearing walls) should be supported by the drilled shafts with a minimum **8-inch void space** provided beneath all grade beams and pile



caps to prevent contact with native (untreated) soils. This void will serve to reduce distress resulting from swell pressures that may be generated by the expansive clays. In addition, the members should be designed for uplift pressures equal to the crushing strength of the void boxes in the event that the boxes do not deteriorate before the soil begins to expand. Where the subgrade is prepared by moisture treatment or replaced with non-expansive select fill to reduce the potential for swell, the void space can be eliminated, provided the element in contact with grade can tolerate some uplift pressure generated by heaving soil.

Grade beams should be double formed. Earth forming of beams below ground is not recommended because of the inability to control beam excavation width. Grade beams may be cast on cardboard carton forms or formed above grade.

Backfill around the structure perimeter and against the exterior face of grade beams or panels (especially where there is not pavement abutting the building) should be properly compacted native clays wide enough to cover the area of over-excavation (minimum of 5') and 2' thick. Compaction should be to a minimum of 95 percent of ASTM D 698, at optimum moisture content or above as determined by that test. This clay fill is intended to reduce surface water infiltration beneath the structure.

8.4.1 Void Boxes

One method to create voids beneath grade beams is the use of 8-inch thick void (carton) forms (placed in accordance with the manufacturer's recommendations). Care should be taken to not crush the carton forms, or to allow the carton forms to become wet or otherwise degraded prior to or during concrete placement operations. A non-degradable soil retainer should be provided to help prevent in-filling of this void when the form decays. As a quality control measure during construction, "actual" concrete quantities placed should be checked against "anticipated" quantities. Significant concrete "overage" would be an early indication of a collapsed void, which should be remedied by replacing the collapsed form.

8.4.2 Drainage of Void Space

A drainage system should be provided to intercept and prevent the collection of surface drainage (as well as other potential sources of water) in the void spaces beneath the structure. Landscape irrigation water and/or rainfall running down the face of the building can infiltrate the ground surrounding the structure (where there is no abutting moisture barrier such as a pavement sealed to the edge of the structure), collecting in the void beneath the perimeter beam and floor slab, possibly leading to excessive heave or other moisture-related problems (e.g. rupture of plumbing connections). This drain system should be similar to that recommended in UFC 3-220-07 *FOUNDATIONS IN EXPANSIVE SOILS*, Section 7.2.b.

9.0 FLOOR SYSTEMS AND FLATWORK

Floor systems placed on native subgrade will potentially be subject to differential movements as noted in **Section 6.3.1** and which may result in unacceptable distress to the floor and elements



supported thereon. Managing and/or mitigating this risk can be addressed in a number of ways including (in order of decreasing risk and increasing cost):

1. Moisture treatment or removal and replacement of a portion of expansive clay beneath the floor to reduce the degree of potential movement, generally to within a predicted range of 1” (smaller residential and commercial buildings) to 2” (larger commercial and industrial buildings).
 - a. In order to reduce the predicted potential shrink/swell movements to about 1” to 2” we recommend that the building subgrade be prepared as set forth in **Section 11.1**. Even with replacement of the expansive subgrade with non-expansive fill the risk of heaving and shrinkage, though reduced, is not eliminated. Over excavation and replacement of a portion of the expansive clay with more permeable select fill to reduce the potential movement can, in some instances, create a “bathtub” (reservoir) beneath the structure that has the potential to collect surface drainage (or water from other sources such as plumbing leaks) at its base. Water that collects on the native clay at the base of the undercut will soak into the deeper, expansive clays over time thus increasing the risk of excessive deep-seated heave.
2. Isolation of the floor from subgrade movements by structurally suspending it on deep foundations above a void or crawl space.

Both options are discussed in more detail below. If the risk from predicted potential vertical differential movements as noted in **Section 6.3.1** and as modified per the provisions of **Section 11.1** of this report is not considered tolerable, a structurally suspended floor slab (option 2 above) can be used to significantly reduce the risk of distress. The choice of whether to go with a ground supported slab system essentially depends on the owner’s/client’s tolerance for risk and the comparison of the need for, and costs of repair should damage occur vs. the additional construction costs of a relatively low-risk system.

9.1 Structurally Suspended Slab

The most positive means of eliminating the effects of vertical subgrade movements on the structure is to structurally suspend the entire floor system (including grade beams) as well as all other non-load bearing elements by supporting them above the ground on deep foundations such as drilled piers. Based on the potential vertical heave calculated in **Section 6.3.1**, and other considerations where the subgrade is not treated or replaced, we recommend that this space be a **minimum of 8 inches**. Any appurtenances attached to the structure such as stairs or decks should also be suspended above an 8-inch thick void space and supported on deep foundations. Soil retainers at the edges of voids are recommended to prevent soil from migrating into the void space.

9.1.1 Void Boxes

See **Section 8.4.1**.

9.1.2 Crawl Space

If a crawl space is utilized, provision should be made to provide drainage of the crawl space below the slab, in the event water enters into this area. The minimum 24-inch void space created beneath



the floor system should be sealed so that it does not collect surface drainage but should be vented to help prevent the build-up of excess moisture. The base of the space should be higher than the surrounding ground to reduce the chances that water will collect in it. Where this is not possible, grading of the space to a drain(s) is recommended. In extremely expansive soils where potential movements can be detrimental to the plumbing connections, we recommend a crawl space to allow for the plumbing to be hung from the bottom of the slab or other measures to address the potential effects of soil movement on plumbing connections and function.

9.1.3 Drainage of Void Space

See **Section 8.4.2**.

9.2 Slab on Grade

Floor slabs (and exterior flatwork, if desired – See **Section 10.2**) can be placed on a subgrade prepared as described in **Section 11.1**. Slab-on-grade construction should only be considered if the risk of slab movement (and potential consequent damage) as noted throughout this report can be tolerated. The level of acceptable movement varies with the design and other requirements, but methods are normally selected with the goal of limiting predicted slab movements to about 1 to 2 inches or less. Reductions in anticipated movements can be achieved by using subgrade modification methods developed for that purpose as discussed below.

9.2.1 Modulus of Subgrade Reaction

Design of Slabs on Ground, ACI 360R provides a methodology for thickness design of floors subjected to concentrated wheel and post loads as well as area rack loads. That procedure requires a characterization of the subgrade support in the form of the modulus of subgrade reaction (MSR), k . This value represents the pressure applied to the subgrade surface on a 30" diameter plate that results in a deflection of 1" and is in units of psi/in (or PCI). Actual plate load testing of the finished subgrade to determine an appropriate value is not generally practical, so predictions are made based on published correlations of the modulus with soil properties (ACI 330R). Based on those correlations, the MSR is predicted to be 50 PCI at the top of the native fat clay subgrade and 100 PCI at the top of the properly compacted select fill below the concrete slab. This value assumes that the anticipated select fill is densified to a minimum of 100% of the standard proctor (ASTM D698) density. The use of a crushed stone base material can be used to increase the modulus. Eight to twelve inches of crushed stone can be considered to increase the modulus to 150 and 185 PCI respectively.

10.0 BUILDING PERIMETER AND FLATWORK

Planting beds adjacent to the structure should be contained in leak-proof boxes or a horizontal moisture barrier sealed to the grade beam should be used in conjunction with them in order to isolate the building subgrade from water infiltration sources such as sprinkler systems. Backfill adjacent to the structure should be as discussed in **Section 8.3** to help limit surface infiltration. If trees are desired near the perimeter of the building, we do not recommend the slab on grade options without some additional measures such as a root barrier because as trees mature, they



tend to send roots beneath the building, desiccating the soils and causing them to shrink and the floor to settle.

Vehicle or pedestrian ramps leading up to the building should be configured to avoid abrupt differential movement between the building slab and the ramps which could occur where such elements are supported on the untreated native subgrade while the building is supported on deep foundations and/or where a portion of the native soil beneath the building has been replaced with non-expansive fill. Transitioning details will be required at the points where ramps connect with paving and other slab-on-grade elements. In addition, ramp slabs should be constructed so that slopes sufficient for effective drainage of surface water are still provided should the potential differential movements discussed elsewhere herein occur.

Where the predicted potential differential heave (as discussed in **Section 6.3.1**) between elements supported on native subgrade and the structure which is supported on deep foundations is considered significant, and where the ground around such elements is exposed to moisture change (i.e. not covered by pavement), “hinge” slabs that are doveled in into the structure grade beam to allow for some rotation but not separation and designed to span over a void below to native grade at some distance from the building, allow the exterior slab to rotate about its joint with the grade beam without significant distress. Such hinge slabs also help to prevent moisture fluctuation in the perimeter zone of the structure where an effective seal is maintained at the joint of the exterior slab with the building foundation. Such slabs should be sloped sufficiently to prevent an eventual slope toward the building resulting from exterior subgrade heave. The void below these slabs should be drained to prevent the accumulation of surface drainage.

10.1 Perimeter Moisture Barrier

To reduce the risk that the native clay, which will remain beneath the building footprint, will experience significant fluctuation in moisture content, a moisture barrier that extends to a distance of at least 8 feet beyond the perimeter of the building can be placed. This barrier can be in the form of concrete (floor slab, sidewalk, or paving) abutting the building and with all joints sealed and maintained, or a synthetic sheet vapor barrier such as STEGO® WRAP VAPOR BARRIER (20-MIL), or equivalent that is sealed to the foundation edge and is buried sufficiently to prevent damage. Where 8 feet of extension beyond the building perimeter is not available, the vapor barrier can be turned into a trench the depth of which is equal to the remaining length of the barrier sheet and which is backfilled with flowable fill.

10.2 Exterior Flat Work (Sidewalks, Patios, Etc.)

Flatwork placed on grade will be subject to movement due to subgrade swelling or shrinkage, the amount of which depends on the preparation of the subgrade (see **Sections 6.3.1 and 11.1**). The movement is usually most pronounced in the immediate vicinity of exposed edges of the slabs and is generally much less in the interior areas, provided that the surface is well maintained with joints and cracks sealed. Conditions at the edges of slabs on grade should be sufficient to provide for rapid drainage of surface water away from the edge. Shrubs, trees, and planting beds in the vicinity of pavement edges are often causes of excessive fluctuation of soil moisture leading to the distress of adjacent flatwork.



Consideration can be given to extending the recommended building subgrade preparation to include entrances, sidewalks, porticos, flatwork or any other areas sensitive to movement and where the predicted potential movement is considered significant. Outside the zone treated for the building (i.e. outside an area including 5' outside of the building line), a minimum cover of 24 inches of select fill can be used to reduce the potential movement somewhat.

In order to reduce abrupt differential movements between exterior flatwork areas that are placed on the prepared subgrade and those that are not where predicted potential movements are significant, consideration should be given to a transition zone whereby the depth of treatment or over-excavation is tapered from the full depth zone up to the ground surface at a slope of 1:1 or flatter.

Although movement potential can be reduced by the removal or moisture treatment of problematic soils, it may be more economical to maintain and repair the flatwork rather than to extensively remove or treat potentially expansive soil. Determining the optimum approach was beyond the scope of this investigation.

Irrigated landscaped areas often surround exterior flatwork areas. Moisture fluctuations in the landscaped areas surrounding relatively narrow flatwork areas can subject the soils underlying the flatwork to expansion and contraction. In order to reduce the risk of moisture fluctuations in the upper portions of the soil profile beneath the slab, consideration can be given to a vertical moisture barrier along the perimeter of the flatwork.

Sidewalks should not be placed in a manner that could impound water adjacent to the structure should they be subject to heave (predictions of the degree of potential heave are discussed in **Section 6.3.1**) at some time in the future. Articulating joints in the flatwork can serve to lessen the extent of distress due to shrink/swell movements of the soil upon which they are placed. Such joints will require regular maintenance to maintain a sealed condition. The better the drainage and joint and crack maintenance, the lower the risk potential for distress.

11.0 EXCAVATION AND SITEWORK

11.1 Building Subgrade Preparation

In order to validate the design assumptions given above regarding allowable foundation loads, and, to provide a serviceable floor system (within the limitations stated above), the subgrade of the building must be properly prepared. The following procedures are recommended as a minimum:

- Strip to remove all topsoil, crushed gravel, and other deleterious materials from the subgrade and a minimum of 6" deep. Where trees are removed (or have been removed in the last year) from the structure footprint area, the entire root zone should be cut out and replaced with select fill. Root zones tend to be comprised of highly desiccated soil, which, if left in place, are prone to significant swelling, resulting in heaving of the slab. Verify that all stump holes are backfilled with properly compacted select fill.



- Remove existing utility lines and pervious backfill from beneath the structure footprint. If left in place, such lines can serve as conduits for the transport of moisture beneath the footprint. Backfill excavations with properly compacted select fill.

11.1.1 Overexcavate and Replace

- The following *minimum* over-excavation is recommended for each specific situation listed. Limits of the base of the over-excavation should extend beyond building and/or footing lines a distance of 5' and should taper up to finished grade at a 1:1 slope. See **Sections 11.2 and 11.3** for more details.
 - *Drilled piers with grade beams and unstiffened floor slab on prepared subgrade:* Overexcavate below existing *and* finished subgrade beneath the footprint to a minimum depth of 4' or 7', to reduce predicted PVR to 2" or 1", respectively, as desired. Where replace soil consists of moisture-conditioned native clay increase the overexcavation depths to 5' and 8', respectively, to reduce predicted PVR to 2" or 1", respectively, as desired. The exposed subgrade at the bottom of the excavation should be moisture conditioned and recompacted (see **Section 11.2.2 (4)**) to a depth of 12 inches and recompacted.
 - *Maintain specified moisture content until subgrade is covered with fill or slab.*
 - Place select fill or moisture-conditioned native soil (as applicable) to finished slab subgrade, or finished subgrade minus select fill cap and flex base (as applicable) for the case of moisture-conditioned native backfill. Maintain finished subgrade in a moist condition until covered with slab.

11.1.2 Native Subgrade Treatment by Pressure Injection

Some degree of pre-swelling/stabilization can be achieved by means of water pressure injection. Chemicals such as EarthLok™, Lime or Potassium should be added to the injection water to reduce the risk of detrimental heaving beneath adjacent structures. **NOTE:** The soil profile contains a high number of secondary features such as silty sand partings and joints formed in the blocky clay mass. These features have proven to cause some difficulties during the injection process because the water is forced through the secondary features and not readily absorbed into the clay portion of the profile. However, these secondary features also allow for better distribution of injection fluid throughout the profile. The net result may be that the site will need more than the typical number of passes and/or a longer wait period between each pass to allow the clay blocks to absorb the moisture.

Due to the proximity of the site to adjacent structures, we do not recommend injection with untreated water because it can cause the soil adjacent to the existing structure to heave. In this case a chemical such as potassium added to the injection fluid can help reduce the heaving effects of the clay. *The applicability and amount of chemical to be added to the injection water to sufficiently limit the risk of damage to adjacent structures is a decision to be made by the vendor.*



In general, the injection procedure is performed as follows:

1. Grade site as required to a maximum elevation of finished subgrade minus 12 inches (a lower elevation may be necessary to accommodate flexbase used to increase MSR (See Section 9.2.1). Fills (native or select) should only be placed as described in **Sections 12.3 and 12.4** below after the existing subgrade is injected.
2. Pressure-inject the exposed soils to a depth of 10 feet below existing grade using methods to achieve an average measured swell potential of 1% or less with no layer greater than 2%. Post injection testing is required to verify the swell potential of the injected clays.
3. Within 48 hours of completion of injection operations (and acceptance), rework subgrade to a depth of 12 inches and recompact at a minimum of 3 percentage points above optimum moisture to between 93 and 98 percent of Standard Proctor Density (ASTM D 698). Over-compaction should not be allowed. The subgrade should be maintained in a moist condition until the select fill cap is placed.
4. Complete pad fill using at least 12 inches of select fill as specified elsewhere herein plus flex base (as applicable). The initial lift of select fill should be placed within 48 hours after satisfactory completion of injection operations or approved testing. The moisture condition of the completed pad shall be maintained by sprinkling the finished pad periodically with water. If this is not practical, then a vapor barrier should be placed on the subgrade prior to placing the required thickness of select fill. If the treated subgrade is too wet or unstable to work on or compacted against, cut out and replace with compacted fill or 6% hydrated lime can be worked into the top 12 inches to provide a stable working platform. Details can be provided during construction.
5. Initial penetration with the injection rods may be difficult for soils that are hard in consistency. Some areas are already sufficiently wet to meet recommended swell potential and may only require a few passes, while others will require multiple injections passes to obtain the desired moisture levels. The time and cost associated with the anticipated multiple injections and the testing regime should be included in the project budget and schedule. Contact E TTL for additional information about post-injection testing.

11.2 Select Fill Beneath Structures

Select fill shall consist of homogeneous soils (i.e. not sand with clay lumps) free of organic matter and particles larger than 3 inches in diameter. Select fill should possess an Atterberg Plasticity Index (PI) less than 18, with a liquid limit of 40 or less and with a percentage passing the No. 200 sieve of 65% or less. If the material has a percentage passing the No. 200 sieve less than 40% or more than 40% is retained on the No. 40 sieve (excluding percent gravel retained on No.4 sieve), the upper limit of PI can be increased to 25.



Atterberg limits testing of the fill at a rate of 1 test per 500 cubic yards of fill placed (minimum 1 test per fill area per lift and as visual changes occur) is recommended to verify that fill specifications are met. The material should be placed in the following manner:

- Prepare the subgrade in accordance with the recommendations discussed elsewhere herein. Sites that slope more than about 15% should be benched with 8-foot wide benches prior to placing fill.
- Place subsequent lifts of select fill in thin, loose layers not exceeding 9 inches in thickness to the desired rough grade and compact to a minimum of 100% of the maximum density defined by ASTM D 698 (Standard Proctor). Maintain moisture within a range of -1% optimum to optimum +3%.
- Conduct in-place field density tests at a rate of one test per 3,000 square feet of lift area for every lift with a minimum of 2 tests per lift. *Density testing is essential to assure that the soil beneath the structure is properly placed.*
- Prevent excessive loss of moisture during construction (periodic sprinkling may be required).

11.3 Mechanical Moisture Conditioning of the Native Soils for Use as Fill

This process entails the removal of native clay, processing to effectively and uniformly adjust the moisture content and recompaction to within the desired density range. The following procedure for moisture conditioning must be strictly followed under the full-time, direct supervision of a representative of this firm.

- When final overexcavation depth is achieved, rework subgrade to a depth of 12 inches and recompact at a minimum of 3 percentage points above optimum moisture to between 93 and 98 percent of Standard Proctor Density (ASTM D 698) (or as directed by the engineer of record). Over-compaction should not be allowed. The subgrade should be maintained in a moist condition until the first lift is placed.
- The clay to be moisture conditioned should be wetted as necessary and reworked to a uniform condition prior to compaction. This should be done under the full-time, direct supervision of a representative of this firm. Upon completion of the building site work, periodic site inspections are recommended to verify that the site (especially the perimeter) is maintained in a continuously moist condition.
- Place the moisture-conditioned clay in 9-inch loose lifts and recompact as directed by the engineer (typically at a minimum of 3 percentage points above optimum moisture to between 93 and 98 percent of Standard Proctor Density (ASTM D 698)). Over-compaction should not be allowed. Each lift should be maintained in a moist condition until the next lift is placed.



- Complete pad fill using 12 inches of select fill as specified elsewhere herein and flex base (as applicable). The initial lift of select fill should be placed within 48 hours after satisfactory completion of moisture conditioning. The moisture condition of the completed pad shall be maintained by sprinkling the finished pad periodically with water. If this is not practical, then a vapor barrier should be placed on the subgrade prior to placing the required thickness of select fill.

11.3.1 Moisture Conditioned Expansive Soils

Moisture conditioning of native soils is a process whereby the moisture content of the native soils is raised and the density is adjusted to limit the potential for future absorption of moisture and consequent heave. Moisture can be increased either by injecting it via probes under pressure inserted into the native subgrade or by removing the native clays, processing them at a higher moisture content, and recompacting them in a controlled manner. Because the site is within proximity to existing buildings, we do not recommend simple water injection due to the risk of heaving distress within the existing building's foundation. Chemical treatment of the injected water can be considered as an alternative to water injection, to reduce the risk of heaving adjacent structures (see **Section 9.2.1**).

Moisture conditioning does not totally eliminate the potential for future heave, but rather is designed to reduce the predicted heave that might result from normal climatological moisture variation. Increasing the moisture content of the native clays also increases the potential for shrinkage and/or consolidation settlement. Typically, however, a slab on grade with a moisture barrier beneath the slab virtually eliminates the potential for shrinkage in the interior of the structure footprint. Where the building perimeter areas are susceptible to drying action of the climate conditions (i.e. where they are exposed and are not protected by some moisture barrier), the potential for shrinkage can be significant and needs to be considered in the design of the perimeter zone of the structure.

11.3.1.1 Consolidation Settlement of Recompacted Moisture Conditioned Clay

We predict that the total settlement potential of the moisture conditioned clay fill due to its own weight over time is approximately 1.1% of its total thickness with the maximum thickness being 9 feet and the maximum predicted settlement being 1.2 inches. A portion of this settlement will occur during placement which we estimate to be about 0.7 inch. This does not include the additional settlement due to significantly large loaded floor areas (e.g. storage racks, etc.) or any footing loads. Because the recompacted clay should have a total unit weight less than the current in-situ unit weight of the native soil that it will replace, the predicted additional settlement of the untreated clay to remain in place below the moisture treated zone is considered negligible.

12.0 SITE DESIGN

The following recommendations are derived from years of experience with structures founded on expansive soils and are considered essential to satisfactory structure performance, especially where the floor slab is to be placed on grade:



- Sidewalks should be sloped away from buildings and should not be tied to the structures (with the exception of entrance walkways). The joint between the sidewalk or pavement and the foundation should be sealed and maintained. Sidewalks should not impound water adjacent to the structure. Potential heave of native ground (see **Section 6.3**) adjacent to the structure needs to be taken into consideration when constructing the walk so as to avoid a sidewalk which impounds water adjacent to the structure.
- Any unpaved ground surface around the building as well as paved areas should be sloped away from the building on all sides so that water will rapidly drain away from the structure. A minimum slope of 5% is recommended for the unpaved areas 10 feet wide immediately adjacent to the structure. Drainage swales should have a minimum longitudinal slope of 2%. Roof drainage should be conveyed by an appropriate means for a distance of at least 15 feet from the building before it is allowed to drain into the subgrade. Water should not be allowed to pond near the building after the floor system has been placed.
- Trees should not be closer than their mature height to the structure and landscape beds should not be placed adjacent to the building unless they can be contained in watertight planter boxes and irrigation water can be prevented from seeping into the subgrade around the building. A horizontal moisture barrier (e.g. heavy gage polyethylene (e.g. StegoWrap 20 mil) permanently sealed to the foundation edge at the ground line and sloped away from the building) placed beneath planting beds and extending to a distance of at least 8' from the building perimeter (and as wide as necessary to cover the overexcavated area) is an alternative to planter boxes provided it is maintained in a watertight condition (i.e., joints sealed and punctures repaired). Planting bed edging should not impound water. A root barrier around the entire structure perimeter will provide some added assurance against desiccation of the soil due to roots growing beneath the structure. Periodic root pruning may be required to limit drying of soils beneath foundations due to vegetation. *Over irrigation adjacent to the structure can cause an increase in subsurface moisture contents that could lead to heaving.*
- To help limit surface water infiltration beneath the structure, backfill in the area above the overexcavated area (minimum 5 feet wide adjacent to the structure) should be native lean or fat clay soil compacted to a minimum density of 95% of ASTM D 698 (Standard Proctor) at a moisture content of optimum + 2% or greater. This zone should be at least 2 feet thick. This backfill is not necessary where pavement abuts the structure and the joint is sealed. A vertical moisture barrier sealed to the side of the foundation and extending to a depth of about 8' will provide added protection against moisture fluctuation beneath the building footprint.
- Backfill for utility line ditches should be carefully controlled and should consist of a relatively impermeable material (clayey sand or lean clay), especially in the area beneath and immediately outside of the structure. Old utility lines should be removed from beneath the structure. Fill in new or old utility trenches should be placed to the same specifications as

select fill. The top 6 inches under paving should be compacted to a density equal to that specified for the pavement subgrade.

- Utility connections to the building should be flexible to allow for anticipated soil movements (see predictions elsewhere in this report) that will be different than the anticipated movement of the structure to which they are connected (e.g. where attached to, or passing through a foundation element supported on piers). Drain lines should be placed so that potential movements beneath or adjacent to the building do not affect functionality of the line.
- Any significant differential movement potential between structures supported on deep foundations and the native subgrade needs to be addressed in the design of utilities (See **Sections 6.3 and 11** for predicted soil movements). Common approaches to this issue entail utility conduits supported on deep foundations and/or utility corridors placed on prepared subgrade. In either case there will need to be a transition zone where the depth of soil preparation tapers from full depth to none at a 1:1 slope or flatter (verify that the resultant slope of the utilities can tolerate this differential slope and still be functional). The prepared zones beneath utility corridors should be twice the width of the corridor at its base tapering up to the ground surface at a 1:1 slope in all directions (i.e. perpendicular to the longitudinal axis of the corridor).

12.1 Excavation Safety

The Federal Register, Volume 54, No. 209 (Latest Revision), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) contain the “Construction Standards for Excavations, 29 CFR, part 1926, Subpart P”. The contractor is solely responsible for designing and constructing stable, temporary excavations in accord with these standards and should shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom, considering the effects upon adjacent existing foundations. The contractor’s “responsible person”, as defined in CFR Part 1926, should evaluate the soil exposed in the excavation as part of the contractor’s safety procedure. In no case should the height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. Testing to evaluate the stability of slopes created during excavations at this site was beyond the scope of this study.

13.0 RETAINING WALLS

Cast in place concrete walls may be utilized to form the transition between levels or for below grade walls. Stem/retaining walls that will be an integral part of the superstructure should be designed for bearing and settlement as noted in **Section 8.2** above. All retaining walls should be checked against failure due to overturning, sliding, and global stability. Such an analysis was outside the scope of this investigation and can only be performed once the geometry of the wall, wall reinforcing, horizontal and vertical loads and cut/fill scenarios are known. Contact E TTL for further assistance, if required.



13.1 Design of Retaining or Below Grade Walls

Presented in **Table 6.2.1** are at-rest, active and passive earth pressure coefficients for use in calculation of appropriate earth pressures for the various soil strata and backfill material types assumed to be placed adjacent to below grade walls or retaining walls. At-rest earth pressures are recommended in cases where little wall yield is expected (such as structural below-grade and basement walls). Active earth pressures may be used in cases where the walls are designed to allow for a certain degree of outward horizontal movements (such as cantilevered retaining walls). Active and at-rest pressures represent actual working loads, while the passive earth pressure, which is utilized as a resisting force, is an ultimate value and should be modified by a safety factor (commonly 1.5) in calculating allowable passive resistance (The appropriate safety factor actually depends on the size and depth of the footing as well as the allowable horizontal movement. If this is critical further evaluation should be conducted). Allowable passive resistance also needs to be modified to account for conditions of the soil at the toe (e.g. soaking or drying shrinkage as well as construction methodology), which may alter the resistance available to be mobilized. The recommendations in this section apply to those walls which are installed in open cut or embankment fill areas such that the backfill extends out from the base of the wall at an angle of at least 45 degrees from the vertical for the entire height and length of the wall.

The values in **Table 6.2.1** do not account for the possible presence of ground-water in the retained soil. To prevent hydrostatic pressure build-up, retaining walls should incorporate a functional drainage system within the backfill zone. The effects of surcharge loads, where applicable, should be incorporated into wall pressure diagrams by adding a uniform horizontal pressure component equal to the lateral earth pressure coefficient times the surcharge load, applied to the full height of the wall. Free draining aggregate or manufactured drainage mats along with outlet piping are recommended for collection and removal of surface water that may percolate behind the wall. Proper control of surface water will help to prevent buildup of higher walls pressures. In areas where pavement does not abut the retaining wall, the final 12 inches of backfill should consist of a low permeability clayey soil compacted to at least 95% ASTM D698 to help reduce infiltration of surface water into the structural backfill.

The design parameters for walls below grade do not include an allowance for surcharge loads or sloped soil profiles behind the wall. Typically, surcharge loads should not be placed within a horizontal distance from the top of the wall equal to the height of the wall, unless allowances are made in the design by increasing the equivalent hydrostatic pressure.

For retaining walls bearing on on-site soils, we recommend a coefficient of sliding resistance of 0.4 (or a maximum allowable sliding resistance of 500 psf) and a maximum footing bearing capacity as noted in **Table 8.2** (depending on the subgrade material). Retaining walls bearing in expansive soils, such that are found on this site, will be subject to the predictive movements predicted in **Section 6.3.1**. If wall(s) cannot tolerate such movements consideration should be given to preparation of the subgrade to reduce the movements to 1 or 2 inches (as applicable), see **Section 11.0** below



13.2 Backfill

The compactive effort should be controlled during backfill operations adjacent to walls. Over-compaction can produce lateral earth pressures in excess of at-rest magnitudes. Compaction levels adjacent to walls should be maintained between 95 and 100% Standard Proctor (ASTM D 698) achieved with relatively light hand compaction equipment in thin lifts (about 6" loose or as required to achieve compaction). If backfill is compacted to a higher density immediately behind walls using heavy equipment, the lateral pressures given above may need to be increased significantly. Heavy equipment should not operate closer to the wall than a distance equal to 60% of the height of the lift being compacted above the base of the wall. Clayey soils with a PI above 25 are not normally recommended for backfill and under some circumstances could cause extremely high lateral pressures due to swelling. Also, soils that are not free draining should be considered as undrained unless appropriate measures are taken to ensure that they do not become saturated either by surface drainage or groundwater.

13.3 Drainage

The readings for the static water level taken during drilling operations indicated that the static water level should typically be below the anticipated wall construction levels. Variations may be experienced throughout the year as groundwater data usually reflect a seasonal condition. However, the precise nature of the seasonal fluctuation of groundwater levels can only be determined via an installation of piezometers and a long-term monitoring program, which was outside the scope of this investigation. Dewatering (except, perhaps for dealing with relatively minor seepage during wet periods of the year) is typically not anticipated to be necessary for the construction of the below-grade structures proposed for the project.

14.0 LIMITATIONS

Geotechnical design work is characterized by the presence of a calculated risk that soil and groundwater conditions may not have been fully revealed by the exploratory borings. This risk derives from the practical necessity of basing interpretations and design conclusions on a limited sampling of the subsoil stratigraphy at the project site. The number of borings and spacing is chosen in such a manner as to decrease the possibility of undiscovered anomalies, while considering the nature of loading, size and cost of the project. The recommendations given in this report are based upon the conditions that existed at the boring locations at the time they were drilled. The term "existing groundline" or "existing subgrade" refers to the ground elevations and soil conditions at the time of our field operations.

It is conceivable that soil conditions throughout the site may vary from those observed in the exploratory borings. If such discontinuities do exist, they may not become evident until construction begins or possibly much later. Consequently, careful observations by the geotechnical engineer must be made of the construction as it progresses to help detect significant and obvious deviations of actual conditions throughout the project area from those inferred from the exploratory borings. Should any conditions at variance with those noted in this report be encountered during construction, this office should be notified immediately so that further investigations and supplemental recommendations can be made.

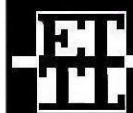
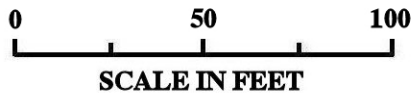
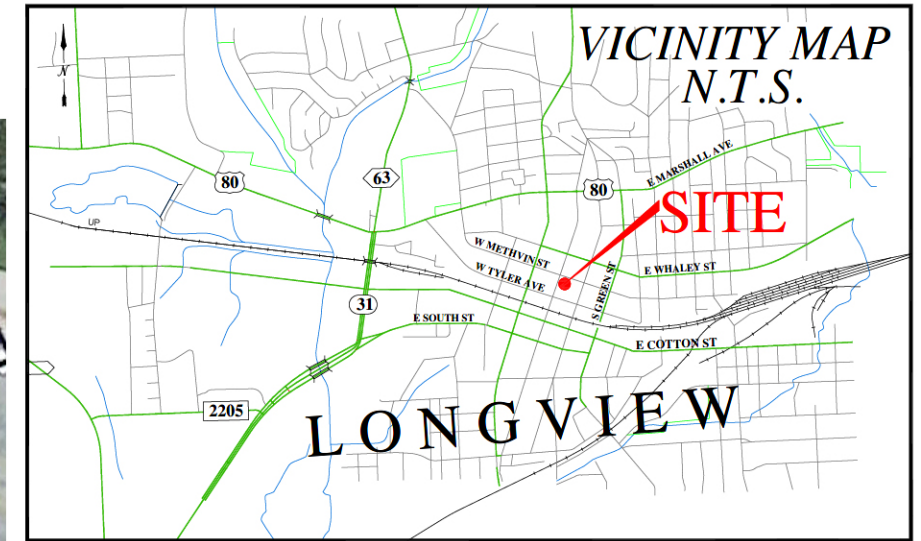


Construction plans and specifications should be submitted to E TTL for review prior to issuance for construction to help verify that the recommendations of this report have been correctly understood and implemented.

This company is not responsible for the conclusions, opinions, or recommendations made by others based on the contents of this report. The recommendations made in this report are applicable only to the proposed scope of work as defined in **SECTION 2.0 PROJECT DESCRIPTION** and may not be used for any other work without the express written consent of E TTL Engineers. The purpose of this study is only as stated elsewhere herein and is not intended to comply with the requirements of 30 TAC 330 Subchapter T regarding testing to determine the presence of a landfill. Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. No warranties are either expressed or implied.



Appendix A
Plan of Borings
Borings Logs



E TTL
ENGINEERS & CONSULTANTS
MAIN OFFICE
1717 EAST ERWIN
TYLER, TEXAS 75702
903-595-4421

**GREGG COUNTY
PARKING GARAGE
LONGVIEW, TEXAS**

PLATE I - PLAN OF BORINGS
JOB NO.: G5470-205
SCALE: AS SHOWN
DATE: SEPTEMBER 2020

APPROVED BY

DRAWN BY
A.K.B.



ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

LOG OF BORING B-3

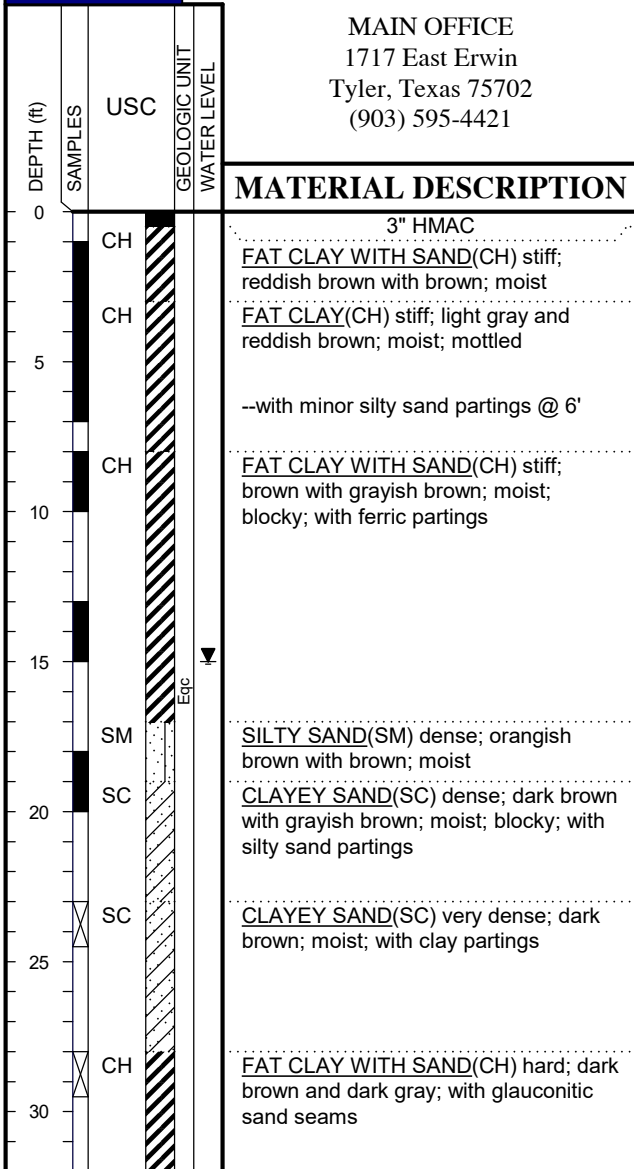
PROJECT: Gregg County Parking Garage
Longview, Texas

DRILL RIG: D-50 Track Rig

PROJECT NO.: G5470-205

BORING TYPE: Flight Auger

DATE: 8/26/20
SURFACE ELEVATION: Not Measured



| FIELD STRENGTH DATA | BLOW COUNT | | | | COMPRESSIVE STRENGTH | | | Natural Moisture Content and Atterberg Limits | | | MOISTURE CONTENT (%) | ATTERBERG LIMITS (%) | | | SIEVE ANALYSIS | | | SWELL TEST | | | |
|---------------------|-------------|---|---|---|----------------------|----------------------------|----------------------|---|------------------|--------------|----------------------|----------------------|----|----|----------------------|--------------------|-------------------|-------------------|----------------|---------------------------|----------------------|
| | 20 40 60 80 | | | | DRY DENSITY (pcf) | COMPRESSIVE STRENGTH (tsf) | MOISTURE CONTENT (%) | Plastic Limit | Moisture Content | Liquid Limit | | LL | PL | PI | MINUS #200 SIEVE (%) | PLUS #40 SIEVE (%) | PLUS #4 SIEVE (%) | DRY DENSITY (pcf) | FREE SWELL (%) | ZERO SWELL PRESSURE (ksf) | MOISTURE CONTENT (%) |
| | ▲ | ▲ | ▲ | ▲ | | | | | | | | | | | | | | | | | |
| P=2.75 | | | | ■ | | | | | | | | | | | | | | | | | |
| P=3.0 | | | | ■ | | | | | | | | | | | | | | | | | |
| P=2.25 | | | ■ | | | | | | | 35 | 87 | 24 | 63 | 86 | 3 | | | | | | |
| P=3.25 | | | | ■ | | | | | | | | | | | | | | | | | |
| P=4.0 | | | | ■ | | | | | | 35 | 91 | 22 | 69 | 80 | 7 | | | | | | |
| P=3.75 | | | | ■ | | | | | | | | | | | | | | | | | |
| N=85 | | | | ● | | | | | | 34 | 48 | 26 | 22 | 43 | 4 | | | | | | |
| N=43 | | | | ● | | | | | | | | | | | | | | | | | |

Water Level: Est. ▼ Measured: ▼ Perched: ▼
Water Observations: Water level @ 15' and caved to 17' after 48 hours.

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (tsf)
L - Lab Vane Shear (tsf)

Notes:
GPS Coordinates: N32.495978°, W94.739080°
Driller: Alex Ballesteros
Logger: Evan Felker

Appendix B

Laboratory Test Results



ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

LABORATORY TEST DATA SUMMARY SHEET

PROJECT: **Gregg County Parking Garage**
 ETTL JOB NUMBER: **G 5470-205**
 PROJECT LOCATION: **Longview, Texas**
 CLIENT: **Gregg County, Texas**
 PROJECT MANAGER.: **Owen Sanderson**

START DATE: **9/2/2020**
 FINISH DATE: **9/11/2020**
 TECHNICIAN(S): **Micah**
 DATE SAMPLED: **8/26-31/2020**

| Boring No. | Depth (ft.) | | Sample No. | Description of Sample | USCS Classification | Atterberg Limits | | | Moisture Content (%) | (% Passing No. 200 Sieve) | (% Retained No. 40 Sieve) | (% Retained No. 4 Sieve) | Unit Weight / Compression Tests | | | | | Consol. / Swell Tests Results | | | | | |
|------------|-------------|------|------------|-----------------------------|-----------------------|------------------|----|----|----------------------|---------------------------|---------------------------|--------------------------|---------------------------------|----------------------|----------------------------|--------------------|--------------------------|-------------------------------|----------------------|----------------|----------------------------|-------------|--|
| | Top | Bott | | | | LL | PL | PI | | | | | Dry Unit Weight (pcf) | Moisture Content (%) | Compressive Strength (tsf) | Failure Strain (%) | Confining Pressure (psi) | Dry Unit Weight (pcf) | Moisture Content (%) | Free Swell (%) | Restraining Pressure (ksf) | | |
| | | | | | | | | | | | | | | | | | | | | | | CU Triaxial | |
| B-1 | 1 | 3 | | Brown, Lt. Br. w/ Redd. Br. | CL Sandy Lean Clay | 39 | 13 | 26 | 15 | 64 | 1 | 0 | | | | | | 114.6 | 13.9 | 0.4 | 0.88 | | |
| B-1 | 3 | 5 | | Redd. Br. w/ Lt. Brown | Visual Fat Clay | NT | NT | NT | NT | NT | NT | NT | 100.3 | 21.9 | 2.83 | 2.23 | 2.94 | | | | | | |
| B-1 | 5 | 7 | | Brown w/ Lt. Gray & Red | CH Fat Clay | 100 | 31 | 69 | 34 | 90 | 3 | 0 | 86.4 | 33.8 | CU Triaxial | | | | | | | | |
| B-1 | 8 | 10 | | Brown w/ Lt. Gray & Red | CH Fat Clay | 86 | 25 | 61 | 35 | 88 | 3 | 0 | 91.2 | 30.8 | | | | | | | | | |
| B-1 | 13 | 15 | | Brown w/ Grayish Brown | CH Fat Clay | 68 | 20 | 48 | 29 | 93 | 0 | 0 | 88.1 | 30.6 | 0.973 | 4.48 | 9.14 | | | | | | |
| B-1 | 18 | 20 | | Brown w/ Org. Brown | SM Silty sand | 37 | 25 | 12 | 29 | 39 | 2 | 1 | | | | | | | | | | | |
| B-1 | 28 | 30 | | Dk. Brown w/ Dk. Gray | CH Fat Clay | 63 | 18 | 45 | 26 | 94 | 2 | 0 | | | | | | | | | | | |
| B-1 | 33 | 35 | | Dk. Brown | CH Fat Clay | 87 | 25 | 62 | 30 | 93 | 1 | 0 | | | | | | | | | | | |
| B-1 | 58 | 60 | | Dk. Brown & Gray | SM Silty Sand | NT | NT | NT | 28 | 25 | 1 | 0 | | | | | | | | | | | |
| B-2 | 3 | 5 | | Lt. Gray w/ Red | CH Fat Clay | 90 | 25 | 65 | 34 | 92 | 2 | 0 | 86.3 | 33.7 | 0.841 | 2.54 | 3.00 | | | | | | |
| B-2 | 5 | 7 | | Brown w/ Lt. Gray & Red | CH Fat Clay | 97 | 30 | 67 | 37 | 86 | 1 | 0 | | | | | | 85.2 | 33.4 | 6.7 | 6.41 | | |
| B-2 | 8 | 10 | | Brown w/ Lt. Gray & Red | CH Fat Clay | 70 | 23 | 47 | 24 | 85 | 5 | 0 | 92.4 | 30.0 | 1.05 | 1.21 | 6.1 | 95.5 | 26.4 | 3.6 | 5.19 | | |
| B-2 | 23 | 25 | | Dk. Brown | CH Sandy Fat Clay | 50 | 17 | 33 | 23 | 68 | 0 | 0 | 99.4 | 23.8 | 1.67 | 8.08 | 15.2 | | | | | | |
| B-2 | 33 | 35 | | Dk. Brown | CH Fat Clay | 101 | 29 | 72 | 33 | 94 | 0 | 0 | 89.5 | 32.9 | 4400 | 3.96 | 21.3 | Trimmed SPT Sample | | | | | |
| B-2 | 50 | 60 | Combo-200 | Gray | SM Silty Sand | NT | NT | NT | 25 | 24 | 1 | 0 | | | | | | | | | | | |
| B-3 | 5 | 7 | | Lt. Gray w/ Redd. Br. | CH Fat Clay | 87 | 24 | 63 | 35 | 86 | 3 | 0 | | | | | | | | | | | |
| B-3 | 13 | 15 | | Brown w/ Grayish Brown | CH Fat Clay with Sand | 91 | 22 | 69 | 35 | 80 | 7 | 0 | | | | | | | | | | | |
| B-3 | 23 | 25 | | Dk. Brown | SC Clayey sand | 48 | 26 | 22 | 34 | 43 | 4 | 0 | | | | | | | | | | | |
| B-3 | 33 | 35 | | Dk. Bronn | CH Fat Clay | 65 | 18 | 47 | 25 | 92 | 0 | 0 | 96.9 | 26.0 | 0.903 | 5.84 | 21.3 | Trimmed SPT Sample | | | | | |

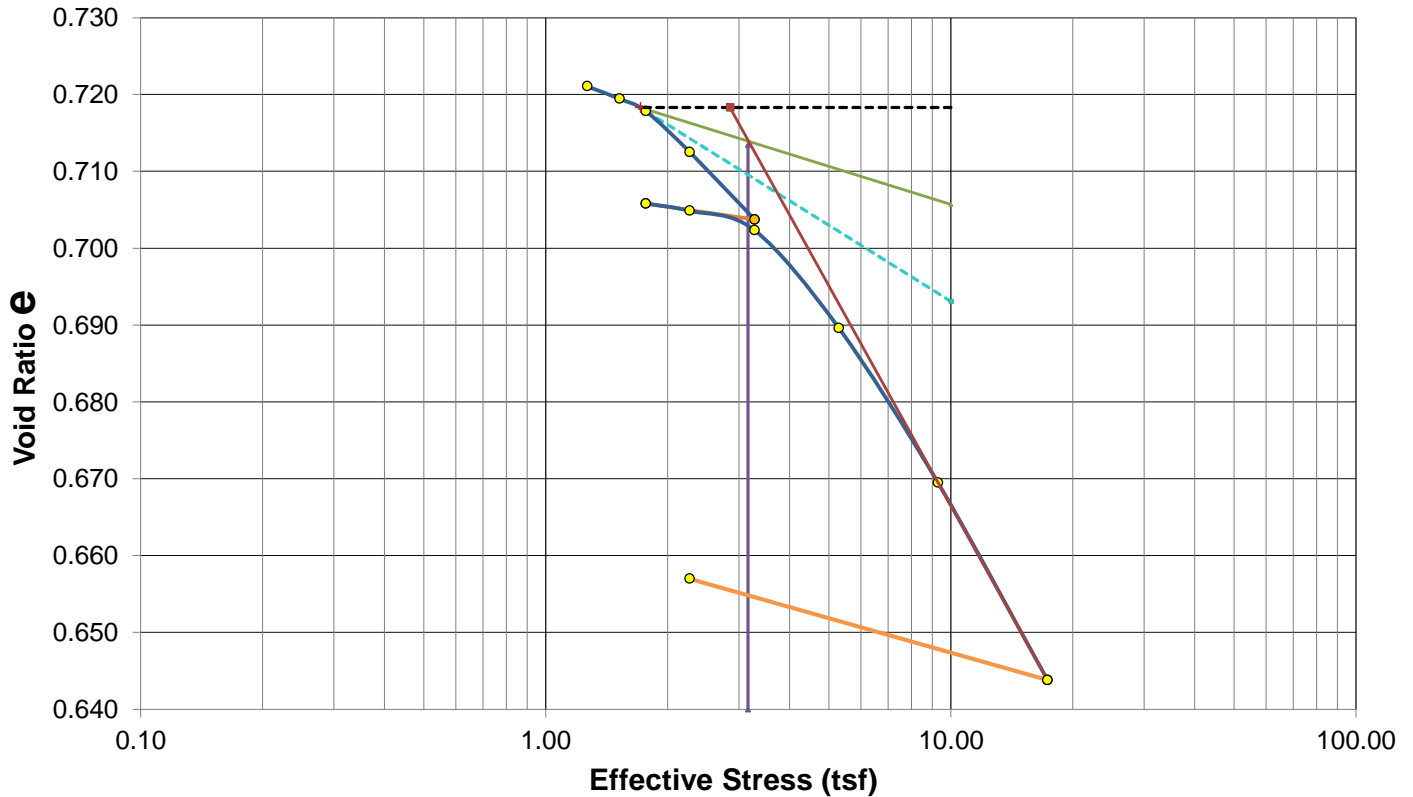
NT = Not Tested, Visual Classification
 NP = Non Plastic, LL Attempted



ETTL Engineers & Consultants Inc.

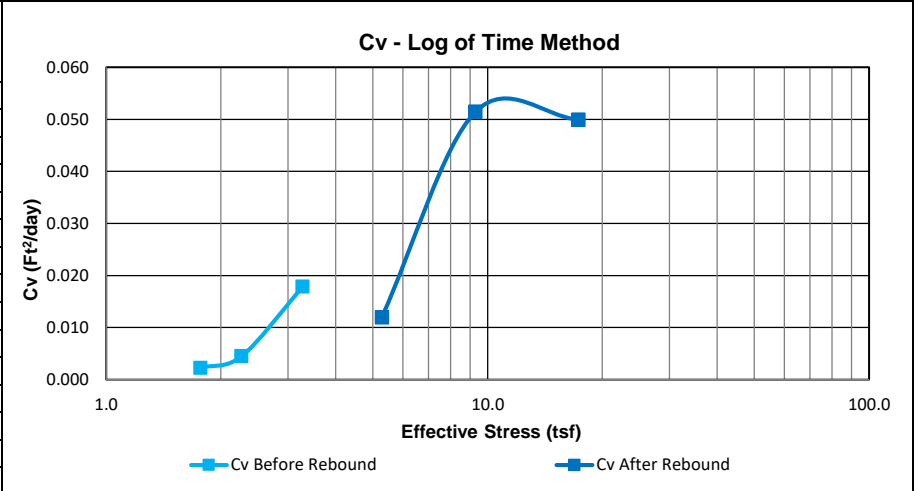
GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2435 - One-Dimensional Consolidation



| Initial Setup e_i | Overburden e_o | Restrain Swell (tsf) | Restrain Swell e_{RS} | Overburden Swell e_s | C_r (initial loading) | C_r (@ 2 tsf) | C_r (@ 16 tsf) | C_c | P_c (tsf) | Estimated OCR |
|---------------------|------------------|----------------------|-------------------------|------------------------|-------------------------|-----------------|------------------|-------|-------------|---------------|
| 0.754 | 0.725 | 1.39 | 0.721 | 0.721 | 0.020 | 0.008 | 0.015 | 0.095 | 3.16 | 2.7 |

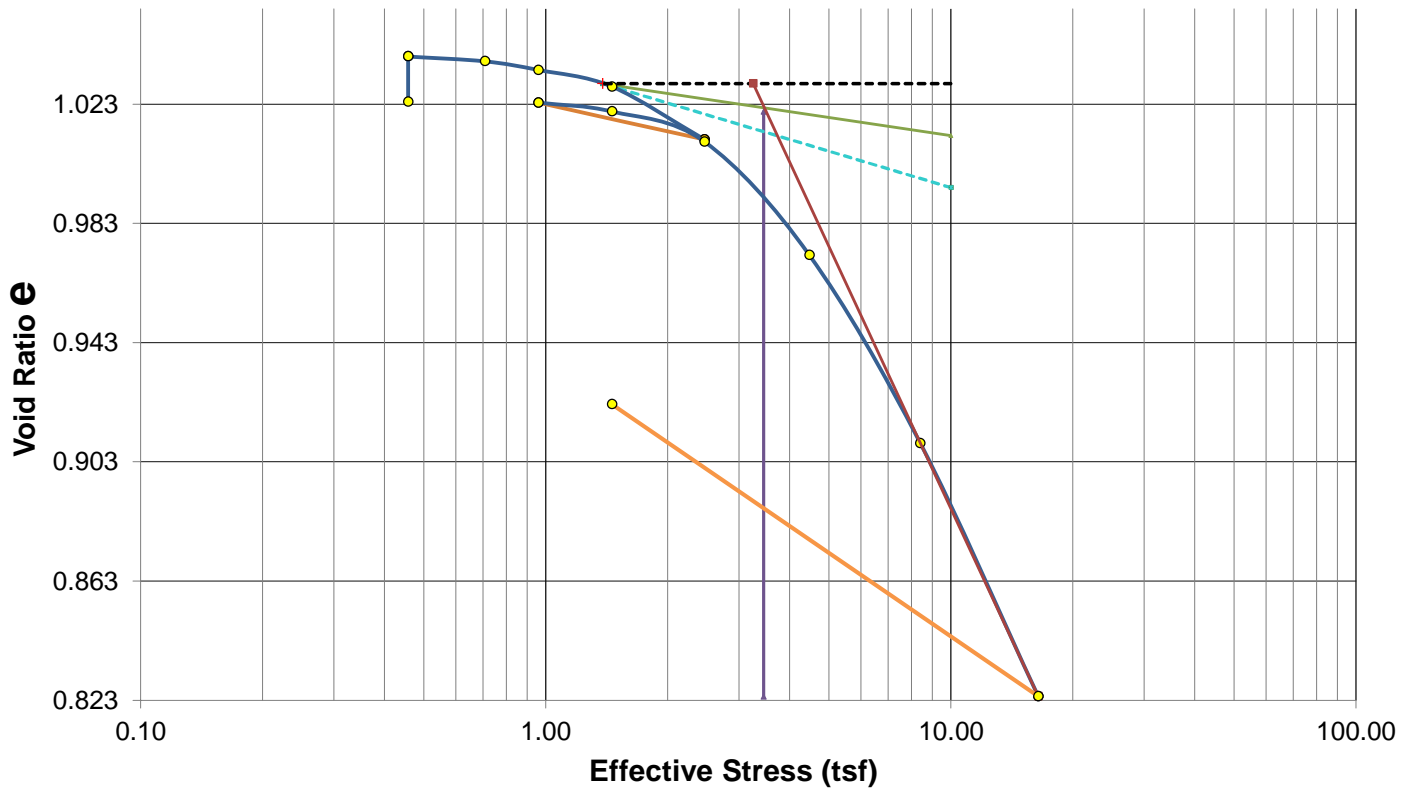
| Effective Stress (tsf) | (%) Strain @ 24 Hrs. | Void Ratio e @ 24 Hrs. | C_v (ft ² /day) Log of Time @ EOP |
|------------------------------------|------------------------------------|--------------------------|--|
| 1.26 | 0.019 | 0.721 | - |
| 1.52 | 0.094 | 0.719 | 0.003 |
| 1.77 | 0.188 | 0.718 | 0.002 |
| 2.26 | 0.497 | 0.713 | 0.005 |
| 3.27 | 1.008 | 0.704 | 0.018 |
| 1.77 | 0.887 | 0.706 | Not Cal. |
| 2.26 | 0.941 | 0.705 | Not Cal. |
| 3.27 | 1.089 | 0.702 | 0.007 |
| 5.28 | 1.828 | 0.690 | 0.012 |
| 9.29 | 2.998 | 0.669 | 0.052 |
| 17.30 | 4.490 | 0.644 | 0.050 |
| 2.26 | 3.724 | 0.657 | Not Cal. |
| Est. Insitu Effective Stress (psf) | Estimated Ground Water Depth (ft.) | | |
| 2341 | 20.0 | | |



| Sample and Test Data | | | | | Project Information | | | | |
|-----------------------|--------------|--------------------------------|---------------|--------------|---|--------------|-----------------------------|-----------|--|
| Boring: | B-1 | | Depth / Spl#: | 18.0'-20.0' | | Project: | Gregg County Parking Garage | | |
| Material Description: | | | | | Brown with Orangish Brown - Clayey Sand, (SC) | | | | |
| LL | PL | PI | -200% | Assumed S.G. | ETTL Job No.: | G 5470-205 | | | |
| 37 | 25 | 12 | 39 | 2.670 | Client: | Gregg County | | | |
| Initial MC | Final MC | Initial Dry Unit Weight (pcf): | | 96.4 | Technician: | TommyBurns | Report Date: | 9/23/2020 | |
| 27.7% | 24.1% | Final Dry Unit Weight (pcf): | | 101.2 | | | | | |
| Initial Sat. % | Final Sat. % | Test method: | | A | Trimmed Shleby Tube Sample | | | | |
| 98.2% | 100.0% | Test Condition: | | Inundated | | | | | |
| Initial e | Final e | Testing Consolidometer | | | | | | | |
| 0.000 | 0.644 | Soil Test | | G312 | | | | | |

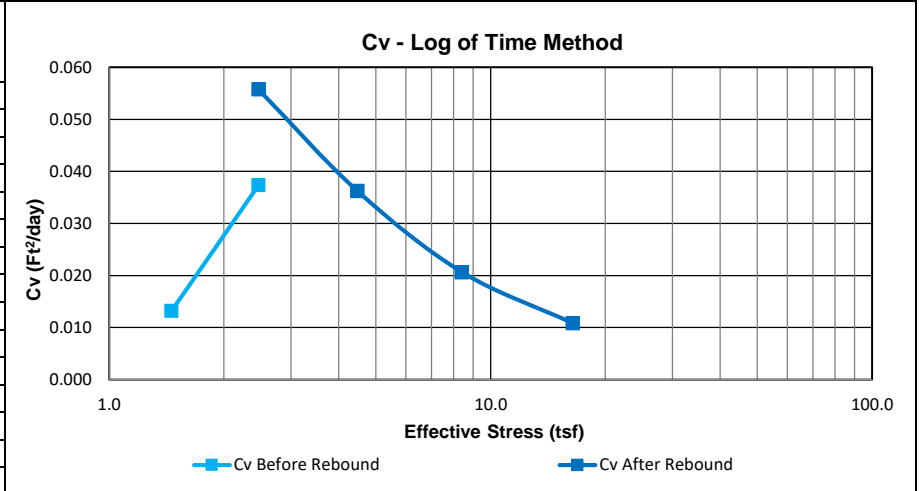


ASTM D 2435 - One-Dimensional Consolidation



| Initial Setup e_i | Overburden e_o | Restrain Swell (tsf) | Restrain Swell e_{RS} | Overburden Swell e_s | C_r (initial loading) | C_r (@ 2 tsf) | C_r (@ 16 tsf) | C_c | P_c (tsf) | Estimated OCR |
|---------------------|------------------|----------------------|-------------------------|------------------------|-------------------------|-----------------|------------------|-------|-------------|---------------|
| 1.050 | 1.024 | 1.09 | 1.022 | 1.039 | 0.008 | 0.030 | 0.093 | 0.292 | 3.45 | 10.2 |

| Effective Stress (tsf) | (%) Strain @ 24 Hrs. | Void Ratio e @ 24 Hrs. | C_v (ft ² /day) Log of Time @ EOP |
|------------------------|----------------------|--------------------------|--|
| 0.46 | 0.013 | 1.024 | - |
| 0.46 | 0.013 | 1.039 | - |
| 0.71 | 0.079 | 1.037 | Not Cal. |
| 0.96 | 0.223 | 1.034 | Not Cal. |
| 1.46 | 0.499 | 1.029 | 0.013 |
| 2.46 | 1.365 | 1.011 | 0.037 |
| 0.96 | 0.761 | 1.023 | 0.117 |
| 1.46 | 0.906 | 1.021 | Not Cal. |
| 2.46 | 1.405 | 1.010 | 0.056 |
| 4.47 | 3.269 | 0.972 | 0.036 |
| 8.41 | 6.367 | 0.909 | 0.021 |
| 16.42 | 10.528 | 0.824 | 0.011 |
| 1.46 | 5.724 | 0.922 | 0.010 |



| Sample and Test Data | | | | | Project Information | | | | | |
|-----------------------|--------------|--------------------------------|---------------|--------------|---|--------------|-----------------------------|-----------------|--|--|
| Boring: | B-2 | | Depth / Spl#: | 5.0'-7.0' | | Project: | Gregg County Parking Garage | | | |
| Material Description: | | | | | Brown with Lt Gray and Red - Fat Clay, (CH) | | Location: | Longview, Texas | | |
| LL | PL | PI | -200% | Assumed S.G. | ETTL Job No.: | G 5470-205 | | | | |
| 97 | 30 | 67 | 86 | 2.670 | Client: | Gregg County | | | | |
| Initial MC | Final MC | Initial Dry Unit Weight (pcf): | | 82.2 | Technician: | TommyBurns | Report Date: | 10/6/2020 | | |
| 37.7% | 53.2% | Final Dry Unit Weight (pcf): | | 91.2 | | | | | | |
| Initial Sat. % | Final Sat. % | Test method: | | A | | | | | | |
| 95.8% | 100.0% | Test Condition: | | Inundated | Trimmed Shelby tube sample | | | | | |
| Initial e | Final e | Testing Consolidometer | | | | | | | | |
| 1.024 | 0.824 | Soil Test | | G312 | | | | | | |



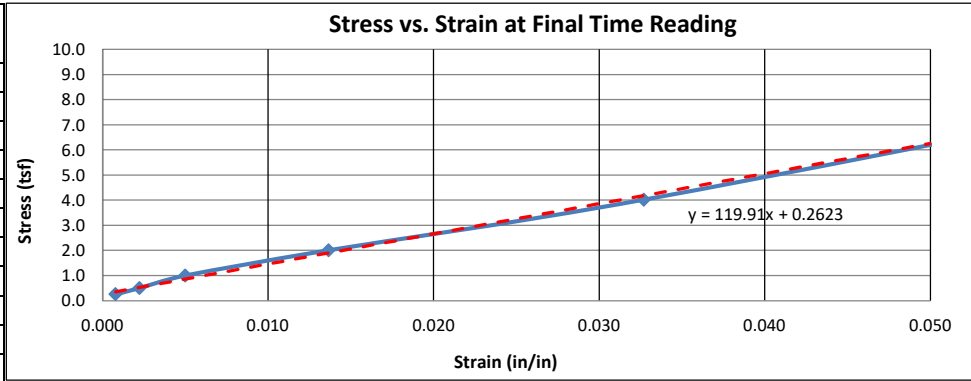
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

| | | | | | |
|------------------------------|---|---------------------|--------------|------------------------|------------|
| Project: | Gregg County Parking Garage | Boring: | B-2 | Depth: | 5.0'-7.0' |
| ETTL Job No.: | G 5470-205 | Client: | Gregg County | Technician (s): | TommyBurns |
| Location: | Longview, Texas | Report Date: | 10/6/2020 | | |
| Material description: | Brown with Lt Gray and Red - Fat Clay, (CH) | | | | |

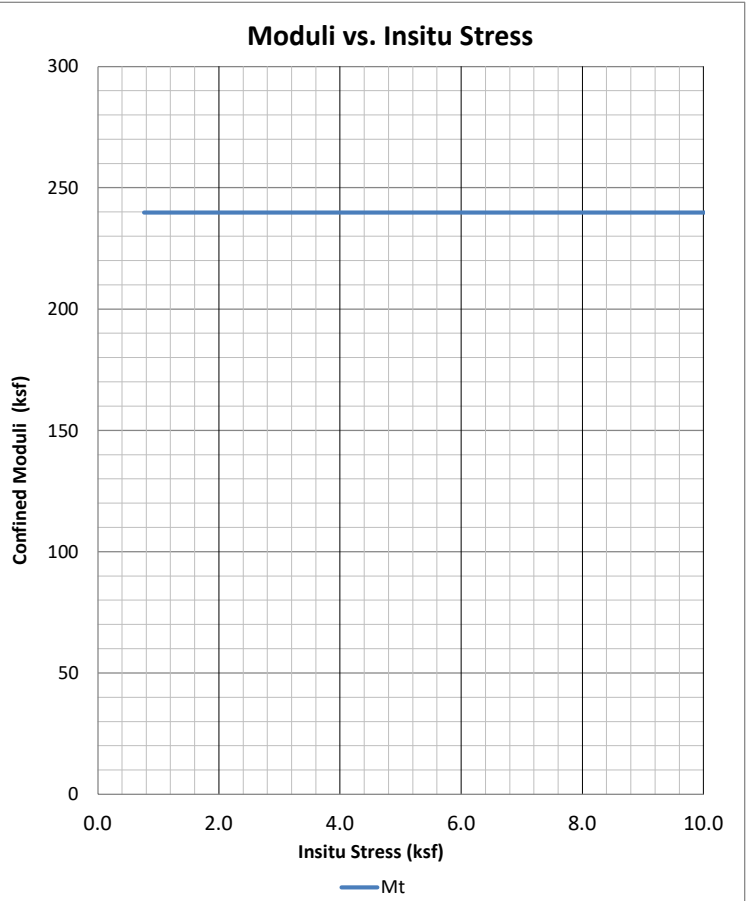
Calculation of the Confined Moduli at Final Strain due to Load Addition

| Load Cycle | Applied Load (tsf) | Strain (in/in) |
|------------|--------------------|----------------|
| 0.25 | 0.251 | 0.0008 |
| 0.5 | 0.502 | 0.0022 |
| 1 | 1.000 | 0.0050 |
| 2 | 2.007 | 0.0137 |
| 4 | 4.017 | 0.0327 |
| 8 | 7.950 | 0.0637 |
| 16 | 15.967 | 0.1053 |
| | | |
| | | |
| | | |
| | | |



* Input trendline equation in A30 and copy down

| Stress (ksf) | Strain (in/in) | Mt | Et | Es |
|-----------------------------|----------------|------|-----|-----|
| 0.525 | 0.000 | - | - | - |
| 0.764 | 0.001 | 240 | 112 | 357 |
| 1.004 | 0.002 | 240 | 112 | 234 |
| 1.484 | 0.004 | 240 | 112 | 173 |
| 1.964 | 0.006 | 240 | 112 | 153 |
| 2.443 | 0.008 | 240 | 112 | 143 |
| 2.923 | 0.010 | 240 | 112 | 136 |
| 3.402 | 0.012 | 240 | 112 | 132 |
| 3.882 | 0.014 | 240 | 112 | 129 |
| 4.362 | 0.016 | 240 | 112 | 127 |
| 4.841 | 0.018 | 240 | 112 | 126 |
| 5.321 | 0.020 | 240 | 112 | 124 |
| 5.801 | 0.022 | 240 | 112 | 123 |
| 6.280 | 0.024 | 240 | 112 | 122 |
| 6.760 | 0.026 | 240 | 112 | 121 |
| 7.240 | 0.028 | 240 | 112 | 121 |
| 7.719 | 0.030 | 240 | 112 | 120 |
| 8.199 | 0.032 | 240 | 112 | 120 |
| 8.678 | 0.034 | 240 | 112 | 119 |
| 9.158 | 0.036 | 240 | 112 | 119 |
| 9.638 | 0.038 | 240 | 112 | 118 |
| 10.117 | 0.040 | 240 | 112 | 118 |
| 10.597 | 0.042 | 240 | 112 | 118 |
| 11.077 | 0.044 | 240 | 112 | 117 |
| 11.556 | 0.046 | 240 | 112 | 117 |
| 12.036 | 0.048 | 251 | 117 | 117 |
| | | | - | |
| | | | | |
| | | | | |
| | | | | |
| Estimated Poisson's Ratio = | | 0.40 | | |
| | Et / Mt | 0.47 | | |



Mt = Confined Tangent Modulus
 Et = Young's Tangent Modulus
 Es = Young's Secant Modulus
 All moduli are drained moduli

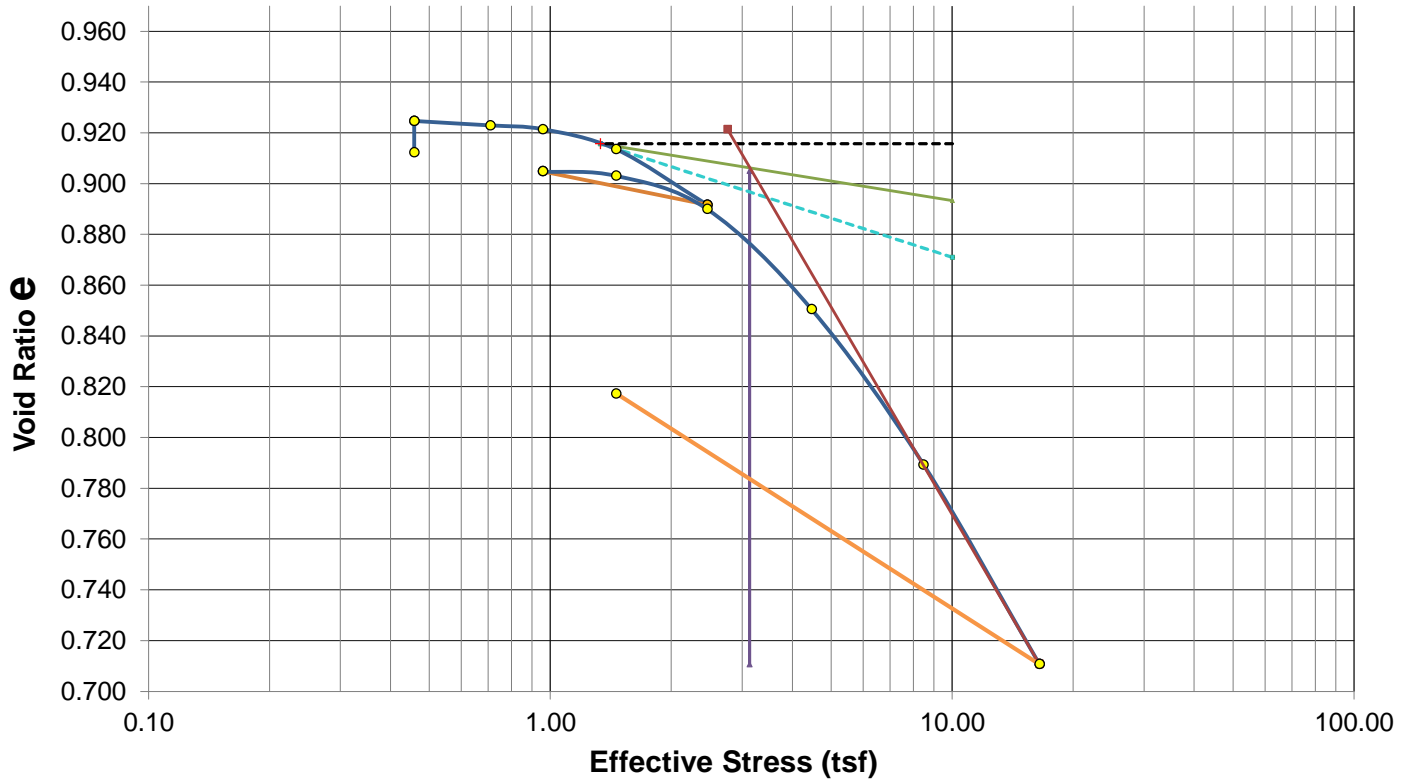
**Trendline equations are used for settlement Calculations



ETTL Engineers & Consultants Inc.

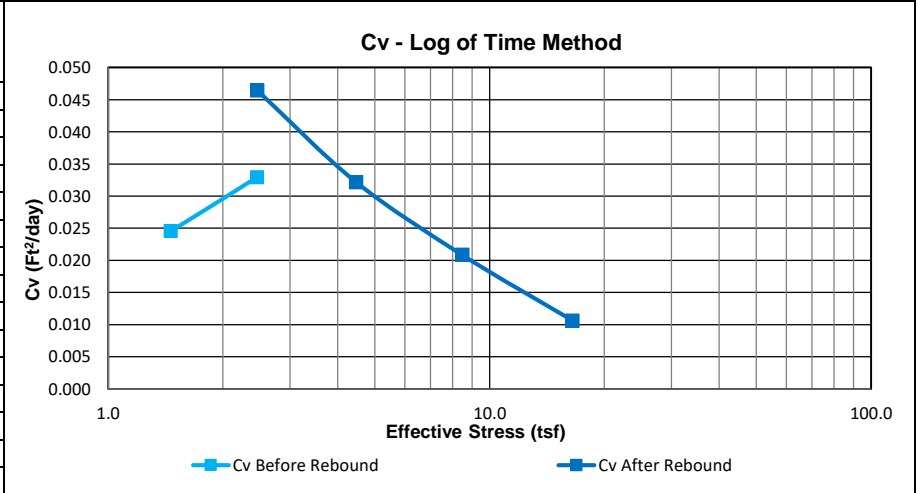
GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2435 - One-Dimensional Consolidation



| Initial Setup e_i | Overburden e_o | Restrain Swell (tsf) | Restrain Swell e_{rs} | Overburden Swell e_s | C_r (initial loading) | C_r (@ 2 tsf) | C_r (@ 16 tsf) | C_c | PC (tsf) | Estimated OCR |
|---------------------|------------------|----------------------|-------------------------|------------------------|-------------------------|-----------------|------------------|-------|----------|---------------|
| 1.050 | 0.912 | 1.09 | 1.022 | 0.925 | 0.009 | 0.032 | 0.101 | 0.272 | 3.13 | 9.3 |

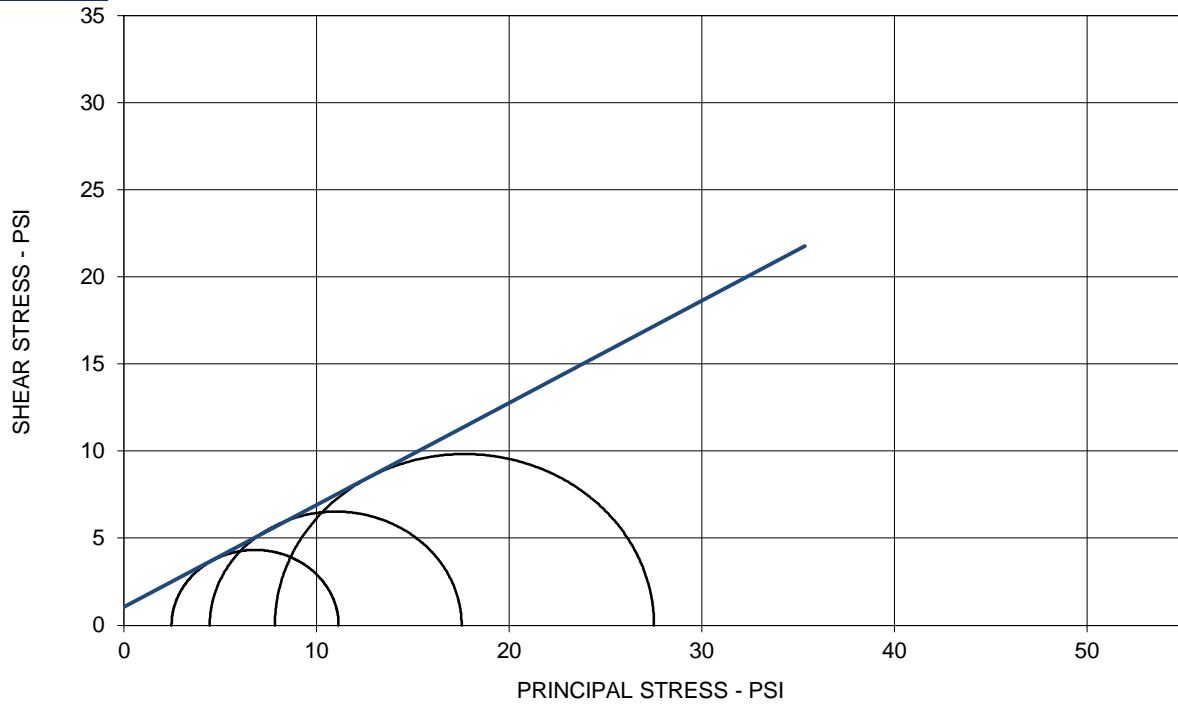
| Effective Stress (tsf) | (%) Strain @ 24 Hrs. | Void Ratio e @ 24 Hrs. | C_v (ft ² /day) Log of Time @ EOP |
|------------------------------------|------------------------------------|--------------------------|--|
| 0.46 | 0.006 | 0.912 | - |
| 0.46 | 0.007 | 0.925 | - |
| 0.71 | 0.090 | 0.923 | Not Cal. |
| 0.96 | 0.167 | 0.921 | Not Cal. |
| 1.46 | 0.580 | 0.913 | 0.025 |
| 2.46 | 1.713 | 0.892 | 0.033 |
| 0.96 | 1.030 | 0.905 | 0.042 |
| 1.46 | 1.121 | 0.903 | Not Cal. |
| 2.46 | 1.803 | 0.890 | 0.046 |
| 4.47 | 3.851 | 0.851 | 0.032 |
| 8.48 | 7.033 | 0.789 | 0.021 |
| 16.49 | 11.116 | 0.711 | 0.011 |
| 1.46 | 5.577 | 0.817 | 0.007 |
| Est. Insitu Effective Stress (psf) | Estimated Ground Water Depth (ft.) | | |
| 676 | 20.0 | | |



| Sample and Test Data | | | | | Project Information | | | | | |
|-----------------------|--------------|---|-------|--------------|----------------------------|-----------------------------|--------------|-----------|--|--|
| Boring: B-3 | | Depth / Spl#: 5.0'-7.0' | | | Project: | Gregg County Parking Garage | | | | |
| Material Description: | | Lt Gray with Reddish Brown - Fat Clay, (CH) | | | Location: | Longview, Texas | | | | |
| LL | PL | PI | -200% | Assumed S.G. | ETTL Job No.: | G 5470-205 | | | | |
| 87 | 24 | 63 | 86 | 2.670 | Client: | Gregg County | | | | |
| Initial MC | Final MC | Initial Dry Unit Weight (pcf): | | 87.0 | Technician: | TommyBurns | Report Date: | 10/6/2020 | | |
| 29.5% | 26.6% | Final Dry Unit Weight (pcf): | | 97.2 | | | | | | |
| Initial Sat. % | Final Sat. % | Test method: | | A | | | | | | |
| 85.2% | 100.0% | Test Condition: | | Inundated | Trimmed Shelby Tube Sample | | | | | |
| Initial e | Final e | Testing Consolidometer | | | | | | | | |
| 0.912 | 0.711 | Soil Test | | G312 | | | | | | |



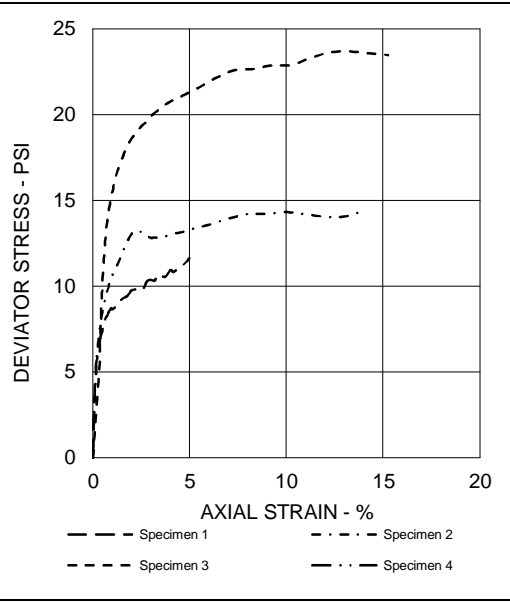
ETTL Engineers & Consultants, Inc
ASTM 4767, CU Triaxial Compression of Soil



Page 1

EFFECTIVE STRESS PARAMETERS

$\phi' = 30.4 \text{ deg}$ $c' = 1.1 \text{ psi}$

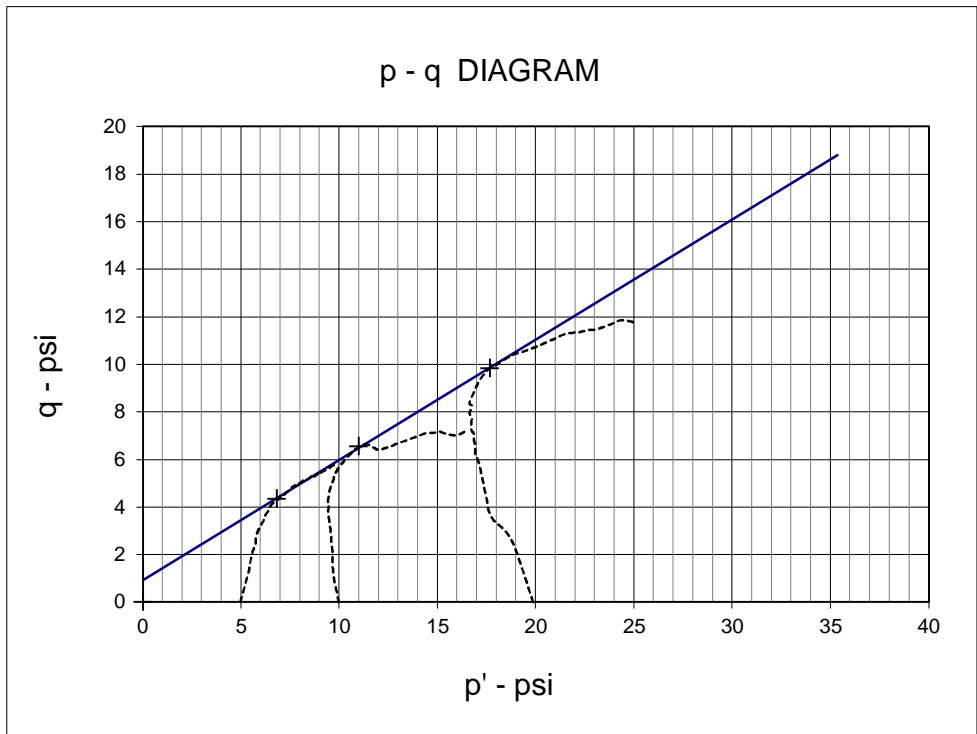
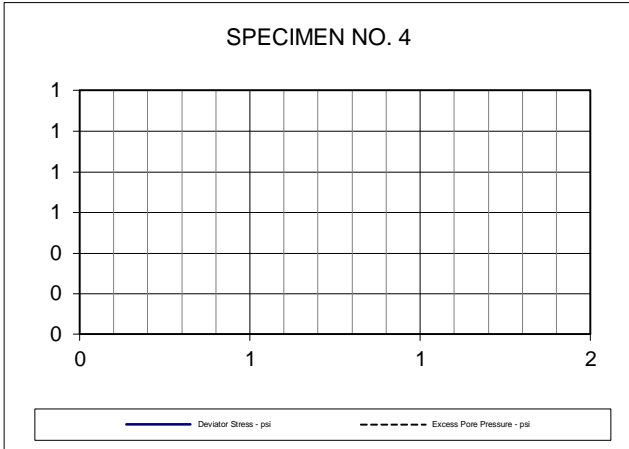
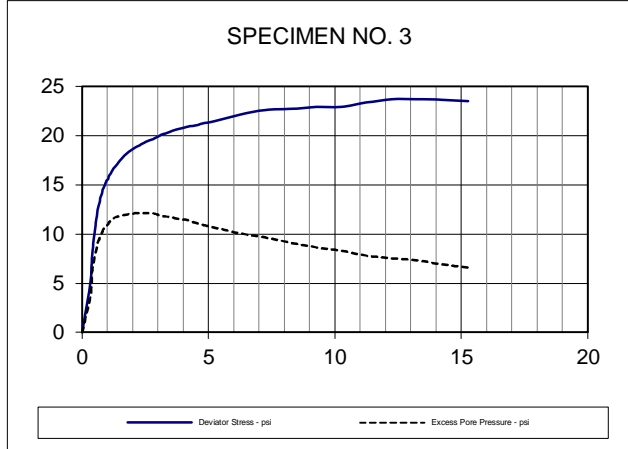
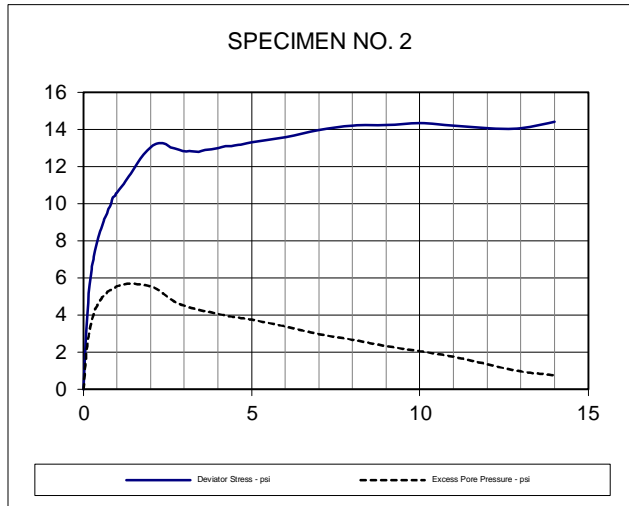
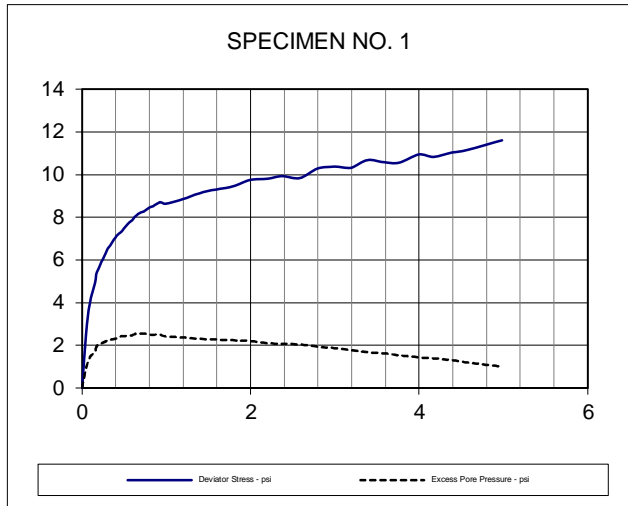


| SPECIMEN NO. | 1 | 2 | 3 | 4 |
|-----------------------------|--------|--------|--------|---|
| INITIAL | | | | |
| Moisture Content - % | 34.1 | 33.6 | 30.8 | |
| Dry Density - pcf | 86.6 | 86.3 | 91.2 | |
| Diameter - inches | 2.00 | 2.00 | 2.01 | |
| Height - inches | 4.47 | 4.49 | 4.48 | |
| AT TEST | | | | |
| Final Moisture - % | 38.2 | 37.7 | 33.8 | |
| Dry Density - pcf | 86.7 | 87.0 | 92.7 | |
| Calculated Diameter (in.) | 2.01 | 1.99 | 2.02 | |
| Height - inches | 4.50 | 4.46 | 4.51 | |
| Effect. Cell Pressure - psi | 5.0 | 10.0 | 19.9 | |
| Failure Stress - psi | 8.67 | 13.08 | 19.68 | |
| Total Pore Pressure - psi | 62.5 | 65.5 | 72.1 | |
| Strain Rate - inches/min. | 0.0005 | 0.0005 | 0.0005 | |
| Failure Strain - % | 0.9 | 2.0 | 2.9 | |
| σ_1' Failure - psi | 11.14 | 17.53 | 27.52 | |
| σ_3' Failure - psi | 2.47 | 4.45 | 7.84 | |

TEST / SAMPLE DESCRIPTION

PROJECT / SAMPLE INFORMATION

| | |
|---|--|
| TYPE OF SPECIMEN: Trimmed Shelby Tube Sample | PROJECT: Gregg County Parking Garage |
| DISCRIPTION: Brown with Lt. Gray & Red Fat Clay, (CH) | CLIENT: Gregg County, Texas |
| BORING: B-1 | LOCATION: Longview, Texas |
| DEPTH: 5'-7' (5 & 20 psi), 8'-10' (10 psi) | PROJECT NO: G 5470-205 |
| LL: 100 31 PI: 69 Percent -200: 90 | DATE SAMPLED: 8/31/2020 DATE TESTED: 9/2/2020 |
| REMARKS: Calculated at the maximum Obliquity | SAMPLED BY: ETTL Drilling |
| | TESTED BY: Hermann Walka, P.E. |
| | REPORTED BY: Owen Sanderson, P.E. |

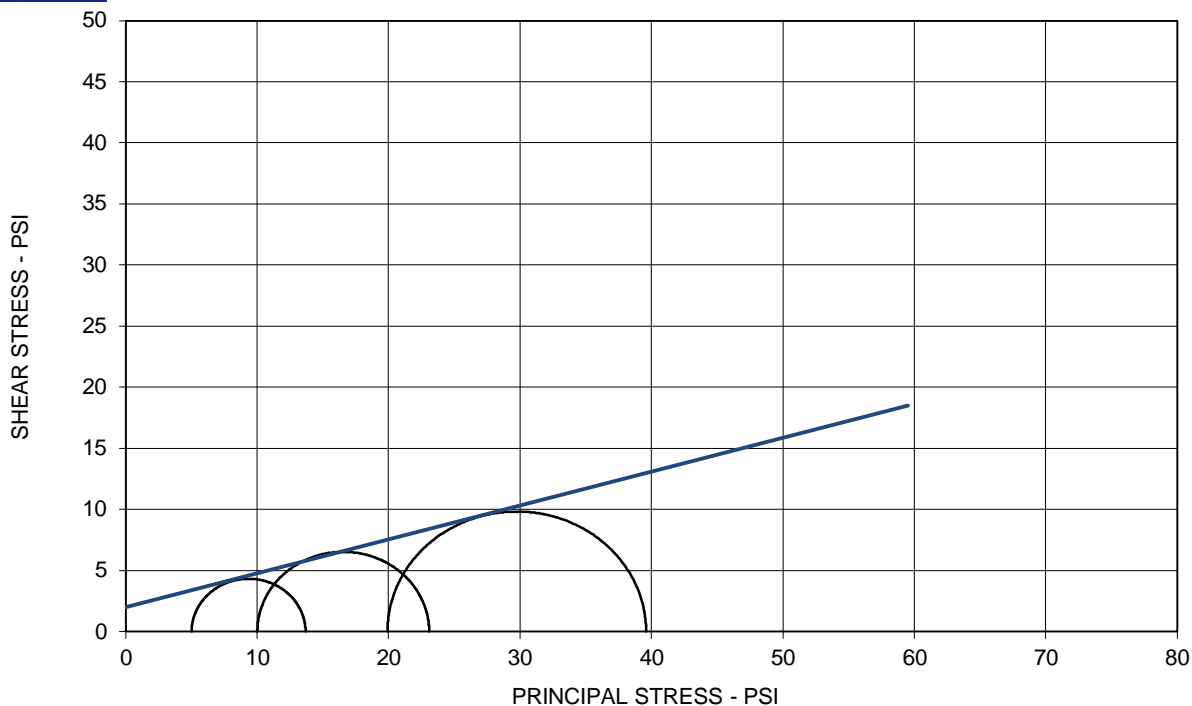


| | | | |
|--------------------------------------|--|-----------------------|---------------|
| EFFECTIVE STRESS PARAMETERS | $R^2 = 1.000$ | α (deg) = 26.8 | a (psi) = 0.9 |
| PROJECT: Gregg County Parking Garage | TYPE OF SPECIMEN: Trimmed Shelby Tube Sample | | |
| LOCATION: Longview, Texas | BORING: B-1 | | |
| PROJECT NO: G 5470-205 | DEPTH: 5'-7' (5 & 20 psi), 8'-10' (10 psi) | | |



ETTL Engineers & Consultants, Inc

ASTM 4767, CU Triaxial Compression of Soil



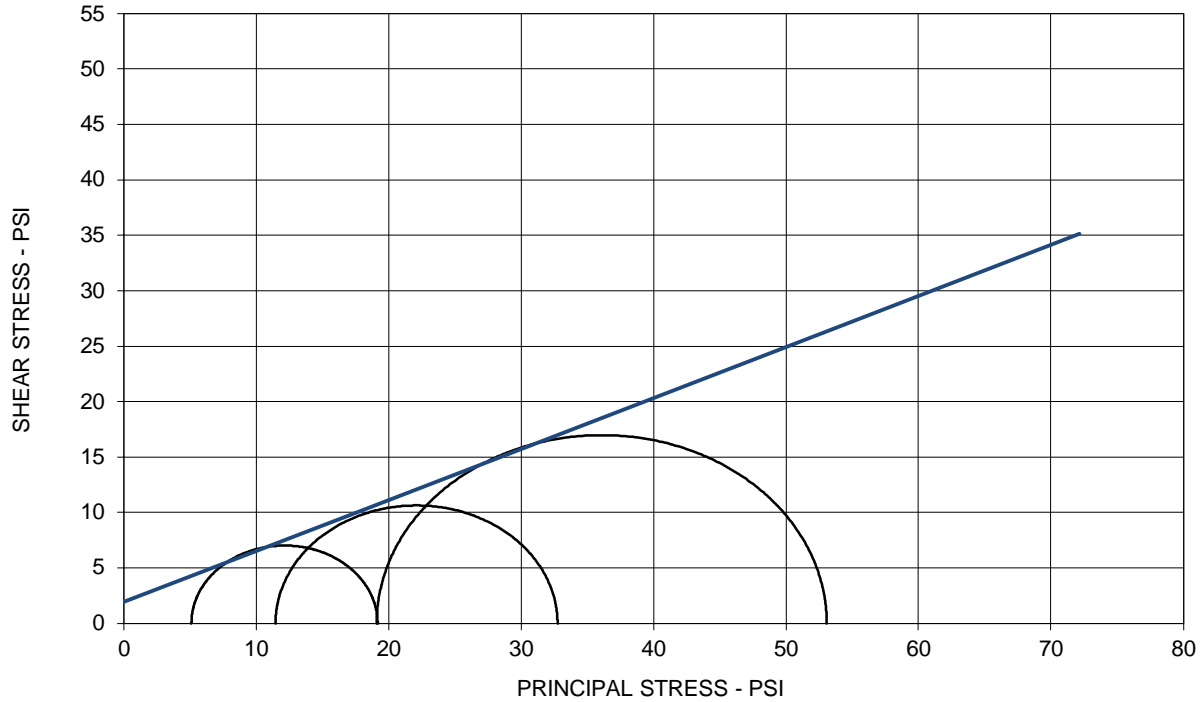
Page 3

| TOTAL STRESS PARAMETERS | | $\phi = 15.5 \text{ deg}$ | | $c = 2.0 \text{ psi}$ | | | |
|---|---------------------------|---------------------------|--------------------------------------|-----------------------|--|---|--|
| | SPECIMEN NO. | | 1 | 2 | 3 | 4 | |
| | INITIAL | | | | | | |
| | Moisture Content - % | | 34.1 | 33.6 | 30.8 | | |
| | Dry Density - pcf | | 86.6 | 86.3 | 91.2 | | |
| | Diameter - inches | | 2.00 | 2.00 | 2.01 | | |
| | Height - inches | | 4.47 | 4.49 | 4.48 | | |
| | AT TEST | | | | | | |
| | Final Moisture - % | | 38.2 | 37.7 | 33.8 | | |
| | Dry Density - pcf | | 86.7 | 87.0 | 92.7 | | |
| | Calculated Diameter (in.) | | 2.01 | 1.99 | 2.02 | | |
| Height - inches | | 4.50 | 4.46 | 4.51 | | | |
| Effect. Cell Pressure - psi | | 5.0 | 10.0 | 19.9 | | | |
| Failure Stress - psi | | 8.67 | 13.08 | 19.68 | | | |
| Total Pore Pressure - psi | | 62.5 | 65.5 | 72.1 | | | |
| Strain Rate - inches/min. | | 0.0005 | 0.0005 | 0.0005 | | | |
| Failure Strain - % | | 0.9 | 2.0 | 2.9 | | | |
| σ_1 Failure - psi | | 13.67 | 23.08 | 39.58 | | | |
| σ_3 Failure - psi | | 5.00 | 10.00 | 19.90 | | | |
| TEST / SAMPLE DESCRIPTION | | | PROJECT / SAMPLE INFORMATION | | | | |
| TYPE OF SPECIMEN: Trimmed Shelby Tube Sample | | | PROJECT: Gregg County Parking Garage | | | | |
| DISCRIPTION: Brown with Lt. Gray & Red Fat Clay, (CH) | | | CLIENT: Gregg County, Texas | | | | |
| BORING: B-1 | | | LOCATION: Longview, Texas | | | | |
| DEPTH: 5'-7' (5 & 20 psi), 8'-10' (10 psi) | | | PROJECT NO: G 5470-205 | | | | |
| LL: 100 | 31 | PI: 69 | Percent -200: 90 | | DATE SAMPLED: 8/31/2020 DATE TESTED: 9/2/2020 | | |
| REMARKS: Calculated at the maximum Obliquity | | | SAMPLED BY: E TTL Drilling | | | | |
| | | | TESTED BY: Hermann Walka, P.E. | | | | |
| | | | REPORTED BY: Owen Sanderson, P.E. | | | | |



ETTL Engineers & Consultants, Inc

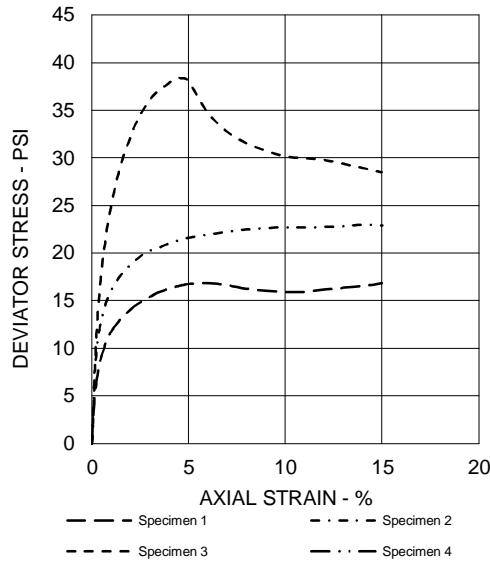
ASTM 4767, CU Triaxial Compression of Soil



Page 1

EFFECTIVE STRESS PARAMETERS

$\phi' = 24.7 \text{ deg}$ $c' = 1.9 \text{ psi}$



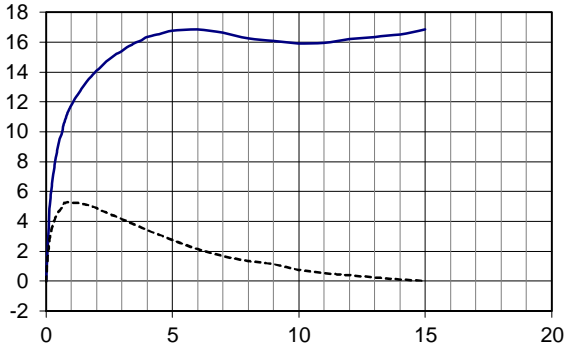
| SPECIMEN NO. | 1 | 2 | 3 | 4 |
|-----------------------------|--------|--------|--------|---|
| INITIAL | | | | |
| Moisture Content - % | 34.6 | 34.7 | 33.3 | |
| Dry Density - pcf | 85.1 | 84.7 | 86.4 | |
| Diameter - inches | 2.00 | 1.99 | 1.99 | |
| Height - inches | 4.47 | 4.48 | 4.50 | |
| AT TEST | | | | |
| Final Moisture - % | 37.8 | 36.2 | 33.7 | |
| Dry Density - pcf | 85.9 | 86.8 | 89.7 | |
| Calculated Diameter (in.) | 2.00 | 1.98 | 1.97 | |
| Height - inches | 4.49 | 4.43 | 4.44 | |
| Effect. Cell Pressure - psi | 10.0 | 19.9 | 39.6 | |
| Failure Stress - psi | 14.06 | 21.29 | 33.98 | |
| Total Pore Pressure - psi | 64.9 | 68.5 | 80.8 | |
| Strain Rate - inches/min. | 0.0005 | 0.0005 | 0.0005 | |
| Failure Strain - % | 2.0 | 4.4 | 2.4 | |
| σ_1' Failure - psi | 19.16 | 32.74 | 53.07 | |
| σ_3' Failure - psi | 5.09 | 11.45 | 19.09 | |

TEST / SAMPLE DESCRIPTION

PROJECT / SAMPLE INFORMATION

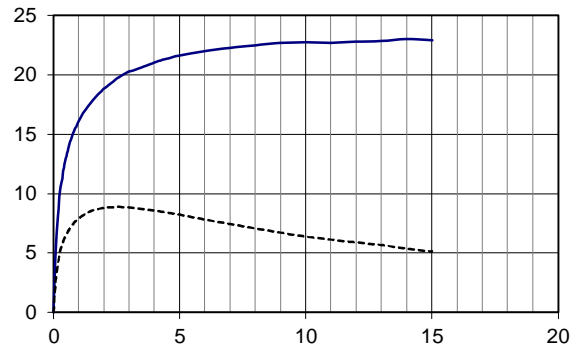
| | | | | | |
|---|--------|--------|------------------|--------------------------------------|-----------------------|
| TYPE OF SPECIMEN: Trimmed Shelby Tube Sample | | | | PROJECT: Gregg County Parking Garage | |
| DISCRIPTION: Brown with Lt. Gray & Red Fat Clay, (CH) | | | | CLIENT: Gregg County, Texas | |
| BORING: B-5 | | | | LOCATION: Longview, Texas | |
| DEPTH: 3'-5' (10, 20 & 40 psi) | | | | PROJECT NO: G 5470-205 | |
| LL: 91 | PL: 26 | PI: 65 | Percent -200: 89 | DATE SAMPLED: 8/31/2020 | DATE TESTED: 9/3/2020 |
| REMARKS: Calculated at the maximum Obliquity | | | | SAMPLED BY: ETTL Drilling | |
| | | | | TESTED BY: Hermann Walka, P.E. | |
| | | | | REPORTED BY: Owen Sanderson, P.E. | |

SPECIMEN NO. 1



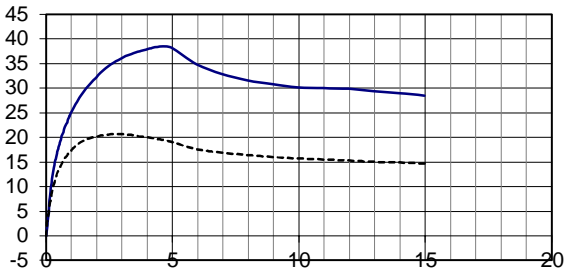
— Deviator Stress - psi - - - - - Excess Pore Pressure - psi

SPECIMEN NO. 2



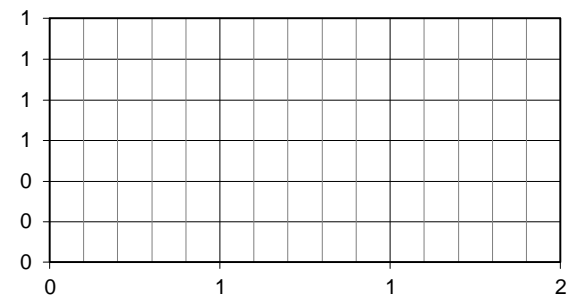
— Deviator Stress - psi - - - - - Excess Pore Pressure - psi

SPECIMEN NO. 3



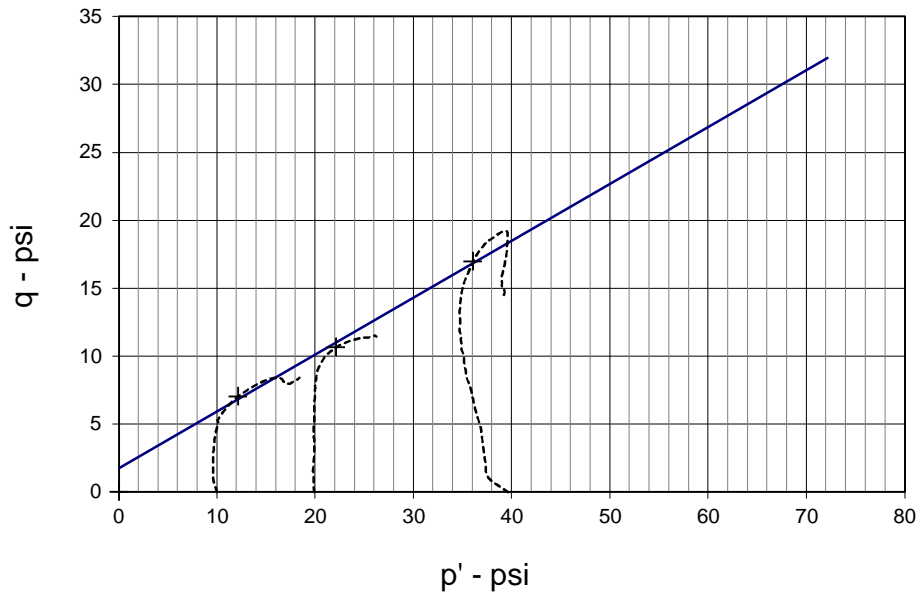
— Deviator Stress - psi - - - - - Excess Pore Pressure - psi

SPECIMEN NO. 4



— Deviator Stress - psi - - - - - Excess Pore Pressure - psi

p - q DIAGRAM

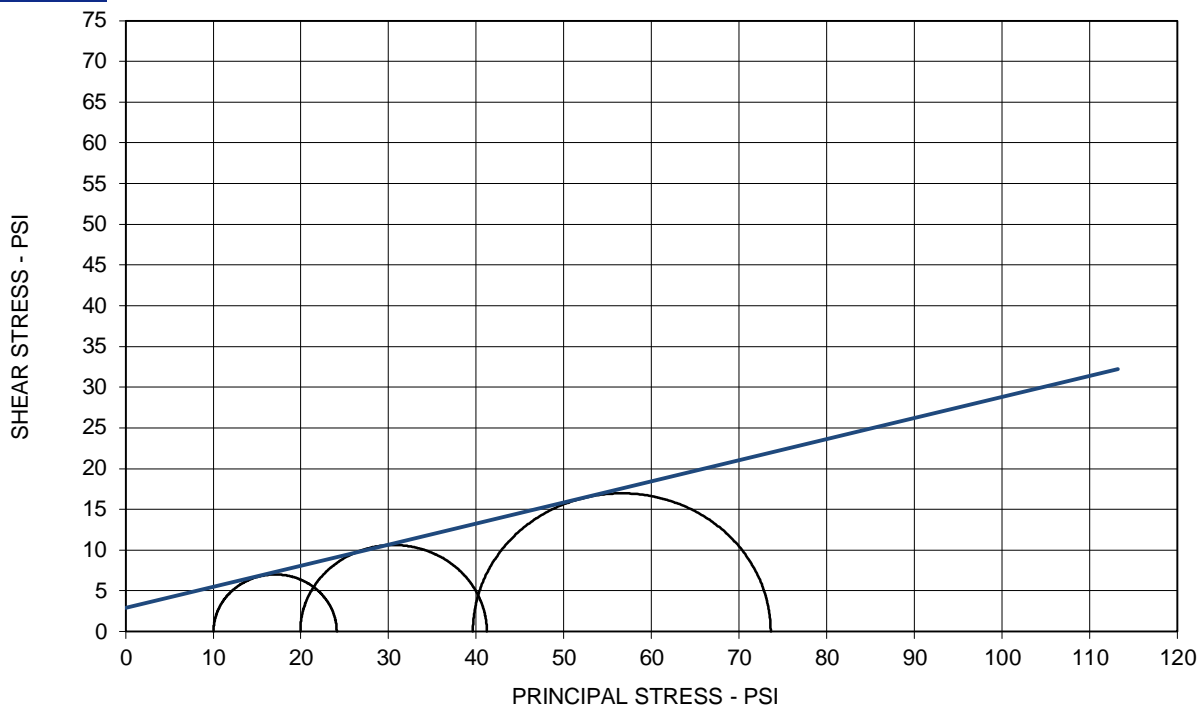


| | | | |
|--------------------------------------|---------------|--|---------------|
| EFFECTIVE STRESS PARAMETERS | $R^2 = 0.996$ | α (deg) = 22.7 | a (psi) = 1.8 |
| PROJECT: Gregg County Parking Garage | | TYPE OF SPECIMEN: Trimmed Shelby Tube Sample | |
| LOCATION: Longview, Texas | | BORING: B-5 | |
| PROJECT NO: G 5470-205 | | DEPTH: 3'-5' (10, 20 & 40 psi) | |



ETTL Engineers & Consultants, Inc

ASTM 4767, CU Triaxial Compression of Soil



Page 3

| TOTAL STRESS PARAMETERS | | $\phi = 14.5 \text{ deg}$ | | $c = 2.9 \text{ psi}$ | | |
|---|---------------------------|---------------------------|--------------------------------------|-----------------------|-------------------------|--|
| | SPECIMEN NO. | 1 | 2 | 3 | 4 | |
| | INITIAL | | | | | |
| | Moisture Content - % | 34.6 | 34.7 | 33.3 | | |
| | Dry Density - pcf | 85.1 | 84.7 | 86.4 | | |
| | Diameter - inches | 2.00 | 1.99 | 1.99 | | |
| | Height - inches | 4.47 | 4.48 | 4.50 | | |
| | AT TEST | | | | | |
| | Final Moisture - % | 37.8 | 36.2 | 33.7 | | |
| | Dry Density - pcf | 85.9 | 86.8 | 89.7 | | |
| | Calculated Diameter (in.) | 2.00 | 1.98 | 1.97 | | |
| Height - inches | 4.49 | 4.43 | 4.44 | | | |
| Effect. Cell Pressure - psi | 10.0 | 19.9 | 39.6 | | | |
| Failure Stress - psi | 14.06 | 21.29 | 33.98 | | | |
| Total Pore Pressure - psi | 64.9 | 68.5 | 80.8 | | | |
| Strain Rate - inches/min. | 0.0005 | 0.0005 | 0.0005 | | | |
| Failure Strain - % | 2.0 | 4.4 | 2.4 | | | |
| σ_1 Failure - psi | 24.06 | 41.19 | 73.58 | | | |
| σ_3 Failure - psi | 10.00 | 19.90 | 39.60 | | | |
| TEST / SAMPLE DESCRIPTION | | | PROJECT / SAMPLE INFORMATION | | | |
| TYPE OF SPECIMEN: Trimmed Shelby Tube Sample | | | PROJECT: Gregg County Parking Garage | | | |
| DISCRIPTION: Brown with Lt. Gray & Red Fat Clay, (CH) | | | CLIENT: Gregg County, Texas | | | |
| BORING: B-5 | | | LOCATION: Longview, Texas | | | |
| DEPTH: 3'-5' (10, 20 & 40 psi) | | | PROJECT NO: G 5470-205 | | | |
| LL: 91 | PL: 26 | PI: 65 | Percent -200: 89 | | DATE SAMPLED: 8/31/2020 | |
| REMARKS: Calculated at the maximum Obliquity | | | DATE TESTED: 9/3/2020 | | | |
| | | | SAMPLED BY: E TTL Drilling | | | |
| | | | TESTED BY: Hermann Walka, P.E. | | | |
| | | | REPORTED BY: Owen Sanderson, P.E. | | | |



ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Particle-Size Distribution of Fine-Grained Soils (Hydrometer ASTM D 7928) Mechanical Sieve Analysis (ASTM D 6913)

| | |
|--|--|
| Project: <u>Gregg County Parking Garage</u> | Material Origin: <u>Geotechnical Boring</u> |
| Client: <u>Gregg County, Texas</u> | Date Sampled: <u>8/31/2020</u> |
| Job Location: <u>Longview, Texas</u> | Sampled By: <u>ETTL Drilling Department</u> |
| ETTL Job No.: <u>G 5470-205</u> | Sample Info. Provided By: <u>Evan Felker</u> |
| Boring / Sample Location: <u>B-5</u> | Testing Technician: <u>Tommy Burns</u> |
| Sample No.: _____ Depth (ft.): <u>5'-7'</u> | Test Starting Date: <u>8/8/2020</u> |
| Description: <u>Brown with Gray and Redd. Brown Fat Clay, (CH)</u> | Test Finishing Date: <u>8/9/2020</u> |

| Starting Mass and Sample Preparation | | M.C. of Whole Sample | | Sieve No. | Mass Retained (g) | %Retained | Grain Dia. (mm) | %Passing |
|---|----------------|----------------------|--------|--|-------------------|-----------|-----------------|----------|
| Dispersion Device: | Device A | | | Sieve Analysis of Material Retaining on No. 10 (Separation D6913) | | | | |
| Dispersion Time: | 1 min | Pan No.: | G | 2" | 0.00 | 0.0 | 50.0 | 100.0 |
| Dispersion Agent: | 5.5 (g) Na-Hex | Tare Mass (g): | 71.02 | 1" | 0.00 | 0.0 | 25.0 | 100.0 |
| Soaking Time: | Min. 16hrs. | Tare + Wet Mass (g): | 146.89 | 3/4" | 0.00 | 0.0 | 19.0 | 100.0 |
| Hydrometer Type: | 152H | Tare + Dry Mass (g): | 125.21 | 3/8" | 4.55 | 1.0 | 9.50 | 99.0 |
| Sample Condition: | Moist | M.C. %: | 40.01% | No 4 | 11.17 | 2.4 | 4.75 | 97.6 |
| Starting Mass of (whole) sample (g): | 599.79 | | | No 10 | 25.27 | 5.4 | 2.00 | 94.6 |
| M _d - Dry Mass (whole) sample (g): | 470.05 | | | Sieve Analysis of Material Retaining on No. 200 (Hydrometer Wash) | | | | |
| Starting Mass Sedimentation Sample (g): | 69.58 | Pan No.: | 1008 | 40 | 1.88 | 8.4 | 0.425 | 91.6 |
| Dry Mass Sedimentation Sample (g): | 58.03 | Tare Mass (g): | 31.71 | 60 | 2.50 | 9.5 | 0.250 | 90.5 |
| Separation Sieve: | No. 10 | Tare + Wet Mass (g): | 45.92 | 100 | 3.15 | 10.5 | 0.150 | 89.5 |
| Estimated Specific Gravity: | 2.70 | Tare + Dry Mass (g): | 42.85 | 140 | 4.30 | 12.4 | 0.106 | 87.6 |
| Sedimentation Cylinder: I/HC #: | G154 | M.C. %: | 27.6% | 200 | 8.20 | 18.7 | 0.075 | 81.3 |

| Particle Uniformity | |
|-----------------------|-----------------------|
| D 10 (mm)= | N/A |
| D 15 (mm)= | N/A |
| D 30 (mm)= | N/A |
| D 50 (mm)= | 0.0037 |
| D 60 (mm)= | 0.0323 |
| D 85 (mm)= | 0.0920 |
| Cu = | N/A |
| Cc = | N/A |
| Per USDA Soil Texture | |
| % Gravel = | 2.4 > 4.75 mm |
| % Sand = | 30.5 4.75 < > 0.05 mm |
| % Silt = | 23.7 0.05 < > 0.002mm |
| % Clay = | 43.4 < 0.002 mm |
| PTI Clay Fraction: | 53 |

| Hydrometer Analysis of Material Passing No. 10 Sieve | | | | | | |
|--|--------------------|----------------------|----------------------------------|----------------------------------|------------------------------------|--------------------------------|
| Time (min) | Hydrometer Reading | Temperature Deg. (C) | Offset Reading - r _{dm} | Effective Depth - H _m | Particle Diameter - D _m | Percent Finer - N _m |
| 1 | 42.8 | 22.4 | 6.4 | 9.2 | 0.041 | 61.8 |
| 2 | 41.3 | 22.4 | 6.4 | 9.4 | 0.029 | 59.2 |
| 4 | 40.5 | 22.4 | 6.4 | 9.6 | 0.021 | 57.9 |
| 15 | 40.1 | 22.3 | 6.5 | 9.7 | 0.011 | 57.1 |
| 30 | 39.2 | 22.3 | 6.5 | 9.8 | 0.008 | 55.6 |
| 60 | 38.0 | 22.3 | 6.5 | 10.0 | 0.005 | 53.6 |
| 120 | 36.2 | 22.5 | 6.4 | 10.4 | 0.004 | 50.6 |
| 240 | 34.0 | 22.4 | 6.4 | 10.8 | 0.003 | 46.8 |
| 1440 | 30.2 | 22.0 | 6.6 | 11.5 | 0.001 | 40.1 |

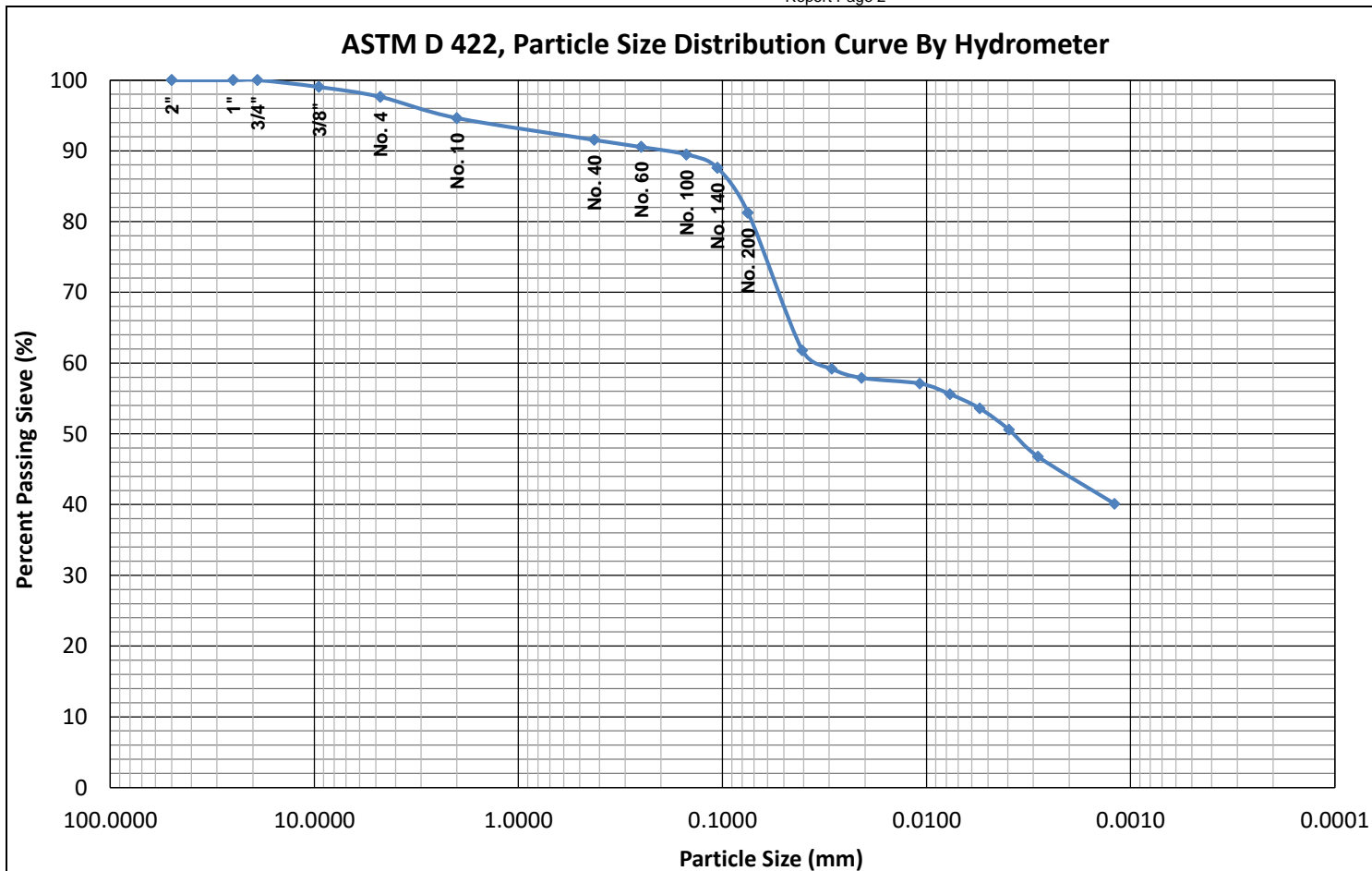
| Atterberg Limits | | |
|------------------|----|----|
| LL | PL | PI |
| 115 | 24 | 91 |



ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

Report Page 2



| Sieve No. | Dia. (mm) | % Passing |
|---------------------|-----------|-----------|
| 2" | 50.0 | 100.0 |
| 1" | 25.0 | 100.0 |
| 3/4" | 19.0 | 100.0 |
| 3/8" | 9.50 | 99.0 |
| No. 4 | 4.75 | 97.6 |
| No. 10 | 2.00 | 94.6 |
| No. 40 | 0.425 | 91.6 |
| No. 60 | 0.250 | 90.5 |
| No. 100 | 0.150 | 89.5 |
| No. 140 | 0.106 | 87.6 |
| No. 200 | 0.075 | 81.3 |
| Hydrometer Analysis | 0.0406 | 61.8 |
| | 0.0292 | 59.2 |
| | 0.0208 | 57.9 |
| | 0.0108 | 57.1 |
| | 0.0077 | 55.6 |
| | 0.0055 | 53.6 |
| | 0.0039 | 50.6 |
| | 0.0028 | 46.8 |
| 0.0012 | 40.1 | |
| L.L. | 115 | |
| P.L. | 24 | |
| P.I. | 91 | |
| % Sand | | 0.0 |
| % Silt | | 2.4 |
| % Clay | | 30.5 |
| D ₈₅ | 0.0920 | |
| D ₆₀ | 0.0323 | |
| D ₅₀ | 0.0037 | |
| D ₃₀ | N/A | |
| D ₁₅ | N/A | |
| D ₁₀ | N/A | |
| C _u | N/A | |
| C _c | N/A | |

| | | | | | | | |
|-----------------|-----------------------------|-----------------|------------|------------|--|--------------|-------------|
| Project Name: | Gregg County Parking Garage | Boring Location | Sample No. | Depth (ft) | Description and Classification | Estimated SG | Technician |
| Client: | Gregg County, Texas | | | | Brown with Gray and Redd. Brown Fat Clay, (CH) | 2.70 | Tommy Burns |
| ETTL Inc. Job # | G 5470-205 | B-5 | | 5'-7' | | | Date: |



ETTL Engineers & Consultants Inc.

GEOTECHNICAL ★ MATERIALS ★ ENVIRONMENTAL ★ DRILLING ★ LANDFILLS

ASTM D 4546 One-Dimensional Swell or Settlement of Cohesive Soils, Method A/B Modified

Project Information

Project: Gregg County Parking Garage
 Client/Arch./Engr: Gregg County, Texas
 Project Location: Longview, Texas
 ETTL Job No: G 5470-205

Sample Information

Location / Boring No: B-1
 Sample No: _____ Depth: 1'-3' ft.
 Material Origin: Geotechnical Boring
 Sampling Info. provided By: Evan Felker
 Material Description: Brown, Lt. Brown with Reddish Brown Sandy Lean Clay, (CL)
 Sample Type: Undisturbed Shelby Tube trimmed at In-situ M.C.
 Sampled By: ETTL Drilling Date Sampled: 8/26/2020
 Technician: Tommy Burns Test Date: 9/3/2020

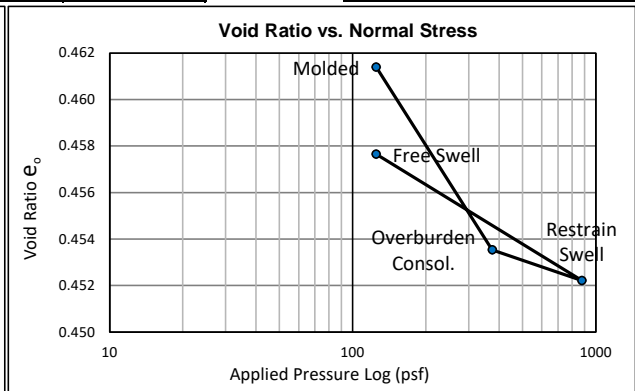
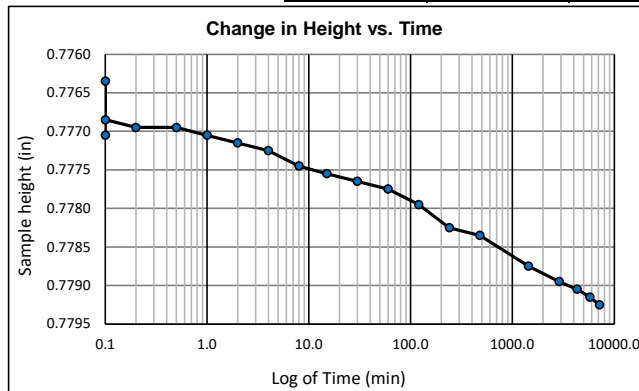
Test Data

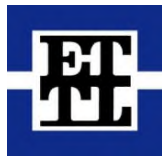
| | Sample Data | | | | |
|------------------------------|--------------|--------------------|----------------|--------------|-----------------|
| | Molded | Overburden Consol. | Restrain Swell | Free Swell | |
| Wt. of mold + Wet Wt.: | 199.57 | 199.57 | 199.57 | 202.65 | grams |
| Wt. of mold: | 68.9 | 68.9 | 68.9 | 68.9 | grams |
| Wet Wt. of sample: | 130.67 | 130.67 | 130.67 | 133.75 | grams |
| Dry Wt. of sample: | 114.77 | 114.77 | 114.77 | 114.77 | grams |
| Height of sample: | 0.7813 | 0.7771 | 0.7764 | 0.7793 | inches |
| Diameter of sample: | 2.500 | 2.500 | 2.500 | 2.500 | inches |
| Area of sample: | 4.909 | 4.909 | 4.909 | 4.909 | in ² |
| Volume of sample: | 3.835 | 3.814 | 3.811 | 3.825 | in ³ |
| Degree of Saturation: | 80.2% | 81.6% | 81.8% | 96.5% | |
| Void Ratio e: | 0.461 | 0.454 | 0.452 | 0.458 | |
| Applied Pressure: | 125 | 375 | 876 | 125 | psf |
| Assumed Specific Gravity: | 2.67 | 2.67 | 2.67 | 2.67 | |
| Wet Unit Weight: | 129.8 | 130.5 | 130.6 | 133.2 | pcf |
| Dry Unit Weight: | 114.0 | 114.6 | 114.7 | 114.3 | pcf |
| Moisture Content: | 13.9% | 13.9% | 13.9% | 16.5% | |

| Atterberg Limits | |
|------------------|-------|
| L.L. | P.L. |
| 39 | 13 |
| P.I. | -200% |
| 26 | 64 |

*N/T = Not Tested

| Pocket Penetrometer (tsf) | |
|-----------------------------|------------|
| Before Test | After Test |
| 4.5+ | 4.00 |
| USACE Swelling Index - Cs | |
| 0.006 | |
| Percent Moisture Absorption | |
| 2.7% | |
| Percent Free Swell | |
| 0.4% | |
| Restrain Pressure (psf) | |
| 876 | |





ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 4546 One-Dimensional Swell or Settlement of Cohesive Soils, Method A/B Modified

Project Information

Project: Greg County Parking Garage
 Client/Arch./Engr: Gregg County, Texas
 Project Location: Longview, Texas
 ETTL Job No: G 5470-205

Sample Information

Location / Boring No: B-2
 Sample No: _____ Depth: 5'-7' ft.
 Material Origin: Geotechnical Boring
 Sampling Info. provided By: Evan Felker
 Material Description: Brown with Lt. Gray & Red Fat Clay, (CH)
 Sample Type: Undisturbed Shelby Tube dried below In-situ M.C.
 Sampled By: ETTL Drilling Date Sampled: 8/26/2020
 Technician: Tommy Burns Test Date: 9/3/2020

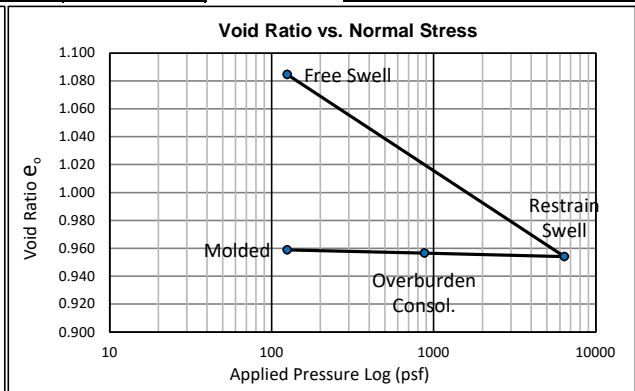
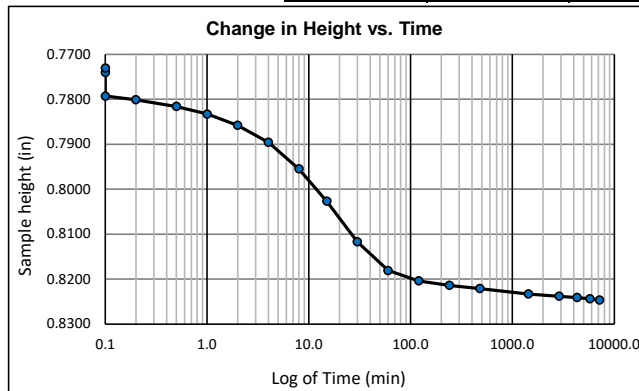
Test Data

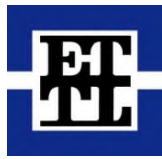
| | Sample Data | | | | |
|------------------------------|--------------|--------------------|----------------|---------------|-----------------|
| | Molded | Overburden Consol. | Restrain Swell | Free Swell | |
| Wt. of mold + Wet Wt.: | 180.48 | 180.48 | 180.48 | 187.67 | grams |
| Wt. of mold: | 67.21 | 67.21 | 67.21 | 67.21 | grams |
| Wet Wt. of sample: | 113.27 | 113.27 | 113.27 | 120.46 | grams |
| Dry Wt. of sample: | 84.93 | 84.93 | 84.93 | 84.93 | grams |
| Height of sample: | 0.7750 | 0.7741 | 0.7731 | 0.8247 | inches |
| Diameter of sample: | 2.500 | 2.500 | 2.500 | 2.500 | inches |
| Area of sample: | 4.909 | 4.909 | 4.909 | 4.909 | in ² |
| Volume of sample: | 3.804 | 3.800 | 3.795 | 4.048 | in ³ |
| Degree of Saturation: | 92.9% | 93.1% | 93.4% | 100.0% | |
| Void Ratio e: | 0.959 | 0.957 | 0.954 | 1.085 | |
| Applied Pressure: | 125 | 877 | 6412 | 125 | psf |
| Assumed Specific Gravity: | 2.67 | 2.67 | 2.67 | 2.67 | |
| Wet Unit Weight: | 113.4 | 113.6 | 113.7 | 113.4 | pcf |
| Dry Unit Weight: | 85.1 | 85.2 | 85.3 | 79.9 | pcf |
| Moisture Content: | 33.4% | 33.4% | 33.4% | 41.8% | |

| Atterberg Limits | |
|------------------|-------|
| L.L. | P.L. |
| 97 | 30 |
| P.I. | -200% |
| 67 | 86 |

*N/T = Not Tested

| Pocket Penetrometer (tsf) | |
|-----------------------------|------------|
| Before Test | After Test |
| 4.25 | 4.00 |
| USACE Swelling Index - Cs | |
| 0.076 | |
| Percent Moisture Absorption | |
| 8.5% | |
| Percent Free Swell | |
| 6.7% | |
| Restrain Pressure (psf) | |
| 6412 | |





ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 4546 One-Dimensional Swell or Settlement of Cohesive Soils, Method A/B Modified

Project Information

Project: Greg County Parking Garage
 Client/Arch./Engr: Gregg County, Texas
 Project Location: Longview, Texas
 ETTL Job No: G 5470-205

Sample Information

Location / Boring No: B-2
 Sample No: _____ Depth: 8'-10' ft.
 Material Origin: Geotechnical Boring
 Sampling Info. provided By: Evan Felker
 Material Description: Brown with Lt. Gray & Red Fat Clay, (CH)
 Sample Type: Undisturbed Shelby Tube trimmed at In-situ M.C.
 Sampled By: ETTL Drilling Date Sampled: 8/26/2020
 Technician: Tommy Burns Test Date: 9/3/2020

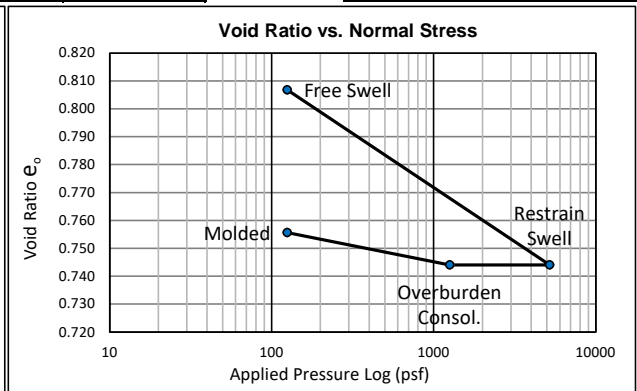
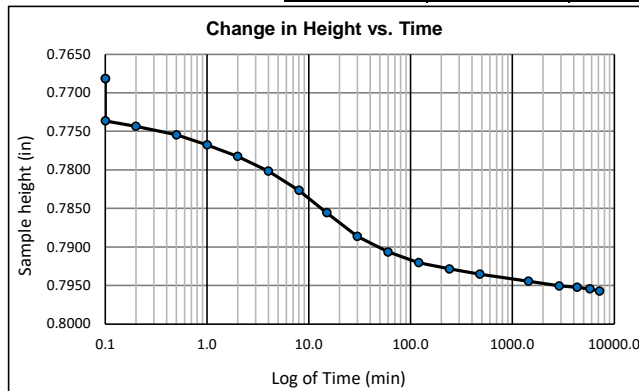
Test Data

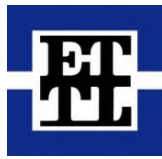
| | Sample Data | | | | |
|------------------------------|--------------|--------------------|----------------|---------------|-----------------|
| | Molded | Overburden Consol. | Restrain Swell | Free Swell | |
| Wt. of mold + Wet Wt.: | 186.76 | 186.76 | 186.76 | 191.40 | grams |
| Wt. of mold: | 67.21 | 67.21 | 67.21 | 67.21 | grams |
| Wet Wt. of sample: | 119.55 | 119.55 | 119.55 | 124.19 | grams |
| Dry Wt. of sample: | 94.55 | 94.55 | 94.55 | 94.55 | grams |
| Height of sample: | 0.7733 | 0.7682 | 0.7682 | 0.7958 | inches |
| Diameter of sample: | 2.500 | 2.500 | 2.500 | 2.500 | inches |
| Area of sample: | 4.909 | 4.909 | 4.909 | 4.909 | in ² |
| Volume of sample: | 3.796 | 3.771 | 3.771 | 3.906 | in ³ |
| Degree of Saturation: | 93.4% | 94.9% | 94.9% | 100.0% | |
| Void Ratio e: | 0.756 | 0.744 | 0.744 | 0.807 | |
| Applied Pressure: | 125 | 1256 | 5187 | 125 | psf |
| Assumed Specific Gravity: | 2.67 | 2.67 | 2.67 | 2.67 | |
| Wet Unit Weight: | 120.0 | 120.8 | 120.8 | 121.1 | pcf |
| Dry Unit Weight: | 94.9 | 95.5 | 95.5 | 92.2 | pcf |
| Moisture Content: | 26.4% | 26.4% | 26.4% | 31.3% | |

| Atterberg Limits | |
|------------------|-------|
| L.L. | P.L. |
| 70 | 23 |
| P.I. | -200% |
| 47 | 85 |

*N/T = Not Tested

| Pocket Penetrometer (tsf) | |
|-----------------------------|------------|
| Before Test | After Test |
| 4.5+ | 4.00 |
| USACE Swelling Index - Cs | |
| 0.039 | |
| Percent Moisture Absorption | |
| 4.9% | |
| Percent Free Swell | |
| 3.6% | |
| Restrain Pressure (psf) | |
| 5187 | |





ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 4546 One-Dimensional Swell or Settlement of Cohesive Soils, Method A/B Modified

Project Information

Project: Greg County Parking Garage
 Client/Arch./Engr: Gregg County, Texas
 Project Location: Longview, Texas
 ETTL Job No: G 5470-205

Sample Information

Location / Boring No: B-4
 Sample No: _____ Depth: 3'-5' ft.
 Material Origin: Geotechnical Boring
 Sampling Info. provided By: Evan Felker
 Material Description: Reddish Brown and Lt Gray Fat Clay, (CH)
 Sample Type: Undisturbed Shelby Tube trimmed at In-situ M.C.
 Sampled By: ETTL Drilling Date Sampled: 8/26/2020
 Technician: Tommy Burns Test Date: 9/10/2020

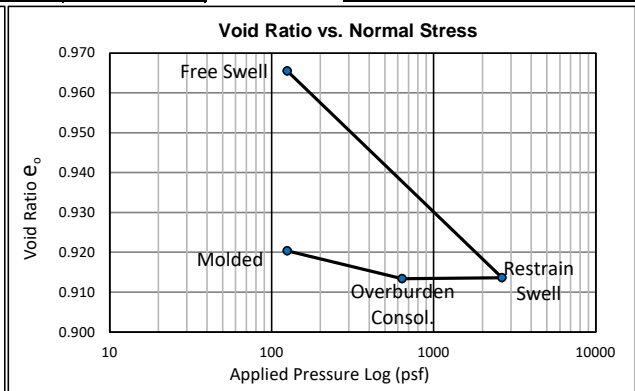
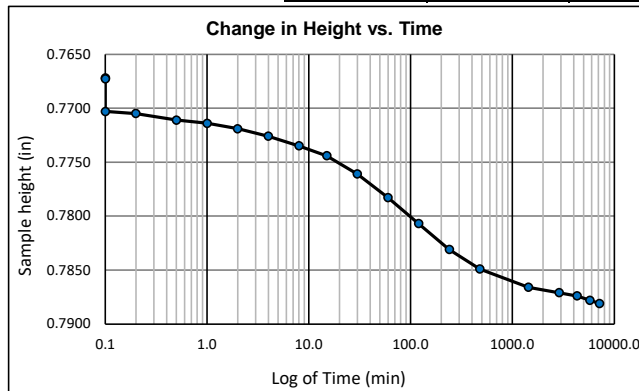
Test Data

| | Sample Data | | | | |
|------------------------------|--------------|--------------------|----------------|---------------|-----------------|
| | Molded | Overburden Consol. | Restrain Swell | Free Swell | |
| Wt. of mold + Wet Wt.: | 182.14 | 182.14 | 182.14 | 185.74 | grams |
| Wt. of mold: | 66.97 | 66.97 | 66.97 | 66.97 | grams |
| Wet Wt. of sample: | 115.17 | 115.17 | 115.17 | 118.77 | grams |
| Dry Wt. of sample: | 86.08 | 86.08 | 86.08 | 86.08 | grams |
| Height of sample: | 0.7700 | 0.7672 | 0.7673 | 0.7881 | inches |
| Diameter of sample: | 2.500 | 2.500 | 2.500 | 2.500 | inches |
| Area of sample: | 4.909 | 4.909 | 4.909 | 4.909 | in ² |
| Volume of sample: | 3.780 | 3.766 | 3.766 | 3.869 | in ³ |
| Degree of Saturation: | 98.0% | 98.8% | 98.8% | 100.0% | |
| Void Ratio e: | 0.920 | 0.913 | 0.914 | 0.965 | |
| Applied Pressure: | 125 | 639 | 2635 | 125 | psf |
| Assumed Specific Gravity: | 2.67 | 2.67 | 2.67 | 2.67 | |
| Wet Unit Weight: | 116.1 | 116.5 | 116.5 | 117.0 | pcf |
| Dry Unit Weight: | 86.8 | 87.1 | 87.1 | 84.8 | pcf |
| Moisture Content: | 33.8% | 33.8% | 33.8% | 38.0% | |

| Atterberg Limits | |
|------------------|-------|
| L.L. | P.L. |
| 100 | 75 |
| P.I. | -200% |
| 25 | 93 |

*N/T = Not Tested

| Pocket Penetrometer (tsf) | |
|-----------------------------|------------|
| Before Test | After Test |
| 3.50 | 1.75 |
| USACE Swelling Index - Cs | |
| 0.039 | |
| Percent Moisture Absorption | |
| 4.2% | |
| Percent Free Swell | |
| 2.7% | |
| Restrain Pressure (psf) | |
| 2635 | |





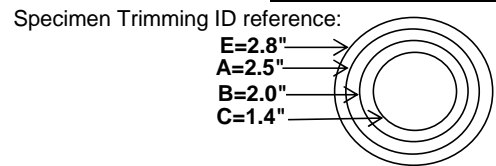
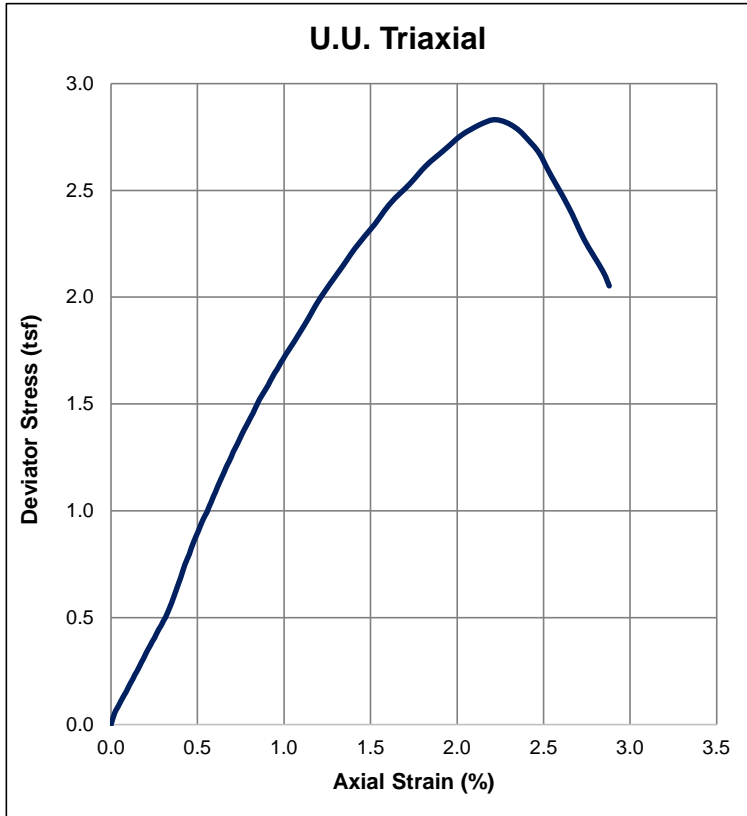
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2850 Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

Project: Gregg County Parking Lot
 Client: Gregg County, TX
 Location: Longview, TX
 Material: Lt. Gray with Red Fat Clay, (CH)

ETTL Project No.: G 5470-205
 Boring No.: B-1
 Sample No. / Depth (ft.): 3.0'-5.0'
 Specimen Trimming ID: E (whole)
 Height: 6.100 inches
 Diameter: 2.743 inches
 Height / Diameter Ratio: 2.22
Initial Moisture Content: 21.9% (trimmings)
Initial Dry Unit Weight: 100.3 lbs./ft³
 Initial Total Unit Weight: 122.3 lbs./ft³
 Specific Gravity: 2.670 (assumed)
 Initial Void Ratio: 0.661
 Initial Saturation: 88.4 %
 Pocket Pentrometer: 4.5+ tsf
 Hand Torvane: N/T tsf
 Rate of Strain: 1.0 %/min
Chamber Pressure: 2.94 psi
Peak Strain: 2.23 %
Cor. Maximum Deviator Stress: 2.83 tsf
 Cor. Maximum Deviator Stress: 5663 psf
 Cor. Maximum Deviator Stress: 39.3 psi
 Cor. Secant Modulus at 1/2 Peak Stress: 357 ksf
 Strain at 50% Max Stress (e₅₀): 0.008 in/in
 Initial Tangent Modulus: 530 ksf
 Atterbergs LL / PI: 68 | 48
 Passing No. 200 Sieve: 93.0 %
 Sampling Method: 2.8 in. Shelby Tube
 Type of Specimen: Undisturbed
 Date Sampled: 8/26-31/2020



Membrane Correction Factor Applied to Deviator Stress (tsf) = 0.009

This test has been run to a maximum % strain of: 2.9

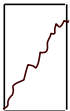
Measured Angle of Fracture from Horizontal: 65

Remarks:

Sketch of Fracture:

Technician: Tommy Burns Test Date: 9/2/2020

Report Date: 9/16/2020



Shear



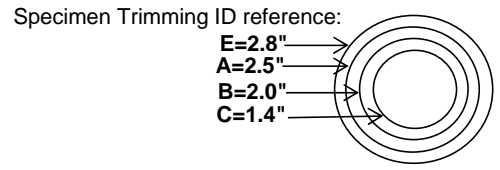
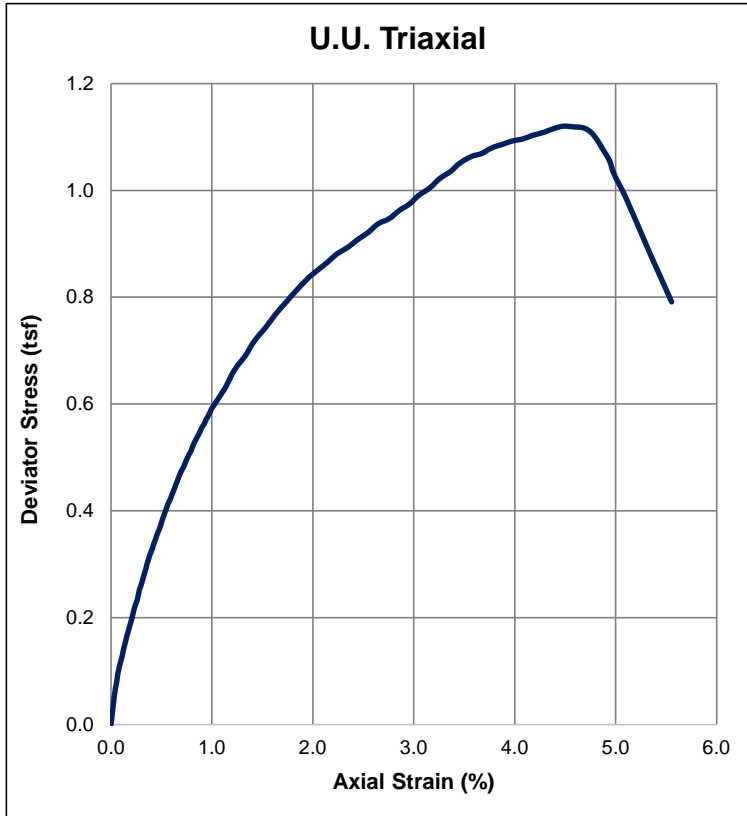
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2850 Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

Project: Gregg County Parking Lot
 Client: Gregg County, TX
 Location: Longview, TX
 Material: Lt. Gray with Red Fat Clay, (CH)

ETTL Project No.: G 5470-205
 Boring No.: B-1
 Sample No. / Depth (ft.): 13.0'-15.0'
 Specimen Trimming ID: E (whole)
 Height: 5.955 inches
 Diameter: 2.751 inches
 Height / Diameter Ratio: 2.16
Initial Moisture Content: 30.6% (trimmings)
Initial Dry Unit Weight: 88.1 lbs./ft³
 Initial Total Unit Weight: 115.0 lbs./ft³
 Specific Gravity: 2.670 (assumed)
 Initial Void Ratio: 0.892
 Initial Saturation: 91.5 %
 Pocket Pentrometer: 3.25 tsf
 Hand Torvane: N/T tsf
 Rate of Strain: 1.0 %/min
Chamber Pressure: 9.14 psi
Peak Strain: 4.48 %
Cor. Maximum Deviator Stress: 1.120 tsf
 Cor. Maximum Deviator Stress: 2241 psf
 Cor. Maximum Deviator Stress: 15.6 psi
 Cor. Secant Modulus at 1/2 Peak Stress: 123 ksf
 Strain at 50% Max Stress (e₅₀): 0.009 in/in
 Initial Tangent Modulus: 324 ksf
 Atterbergs LL / PI: 68 | 48
 Passing No. 200 Sieve: 93.0 %
 Sampling Method: 2.8 in. Shelby Tube
 Type of Specimen: Undisturbed
 Date Sampled: 8/26-31/2020



Membrane Correction Factor Applied to Deviator Stress (tsf) = 0.018

This test has been run to a maximum % strain of: 5.6

Measured Angle of Fracture from Horizontal: N/A

Remarks:

Sketch of Fracture:

Technician: Tommy Burns Test Date: 9/2/2020

Report Date: 9/16/2020



Crumbled



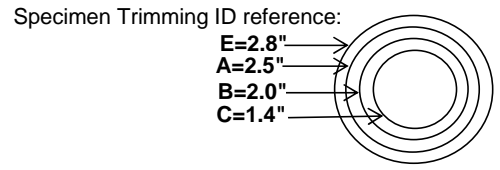
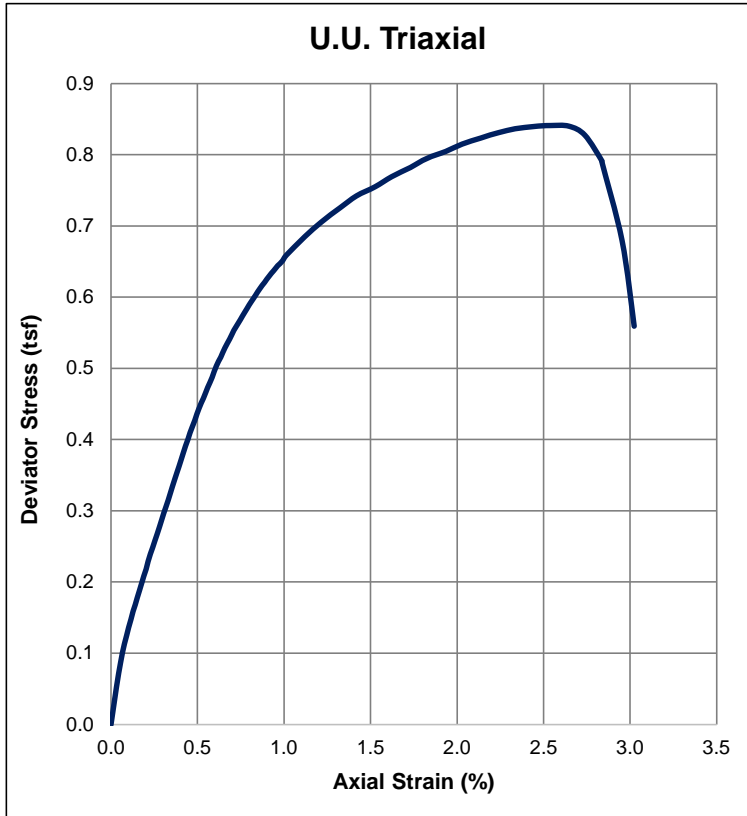
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2850 Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

Project: Gregg County Parking Lot
 Client: Gregg County, TX
 Location: Longview, TX
 Material: Lt. Gray with Red Fat Clay, (CH)

ETTL Project No.: G 5470-205
 Boring No.: B-2
 Sample No. / Depth (ft.): 3.0'-5.0'
 Specimen Trimming ID: E (whole)
 Height: 6.145 inches
 Diameter: 2.737 inches
 Height / Diameter Ratio: 2.25
Initial Moisture Content: 33.7% (trimmings)
Initial Dry Unit Weight: 86.3 lbs./ft³
 Initial Total Unit Weight: 115.3 lbs./ft³
 Specific Gravity: 2.670 (assumed)
 Initial Void Ratio: 0.931
 Initial Saturation: 96.6 %
 Pocket Pentrometer: 2.50 tsf
 Hand Torvane: N/T tsf
 Rate of Strain: 1.0 %/min
Chamber Pressure: 3.00 psi
Peak Strain: 2.54 %
Cor. Maximum Deviator Stress: 0.841 tsf
 Cor. Maximum Deviator Stress: 1682 psf
 Cor. Maximum Deviator Stress: 11.7 psi
 Cor. Secant Modulus at 1/2 Peak Stress: 178 ksf
 Strain at 50% Max Stress (e₅₀): 0.005 in/in
 Initial Tangent Modulus: 321 ksf
 Atterbergs LL / PI: 90 | 65
 Passing No. 200 Sieve: 92.0 %
 Sampling Method: 2.8 in. Shelby Tube
 Type of Specimen: Undisturbed
 Date Sampled: 8/26-31/2020



Membrane Correction Factor Applied to Deviator Stress (tsf) = 0.010

This test has been run to a maximum % strain of: 3.0

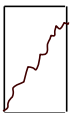
Measured Angle of Fracture from Horizontal: 45

Remarks: Slickensided

Sketch of Fracture:

Technician: Tommy Burns Test Date: 9/3/2020

Report Date: 9/15/2020



Shear



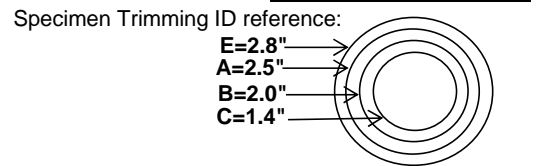
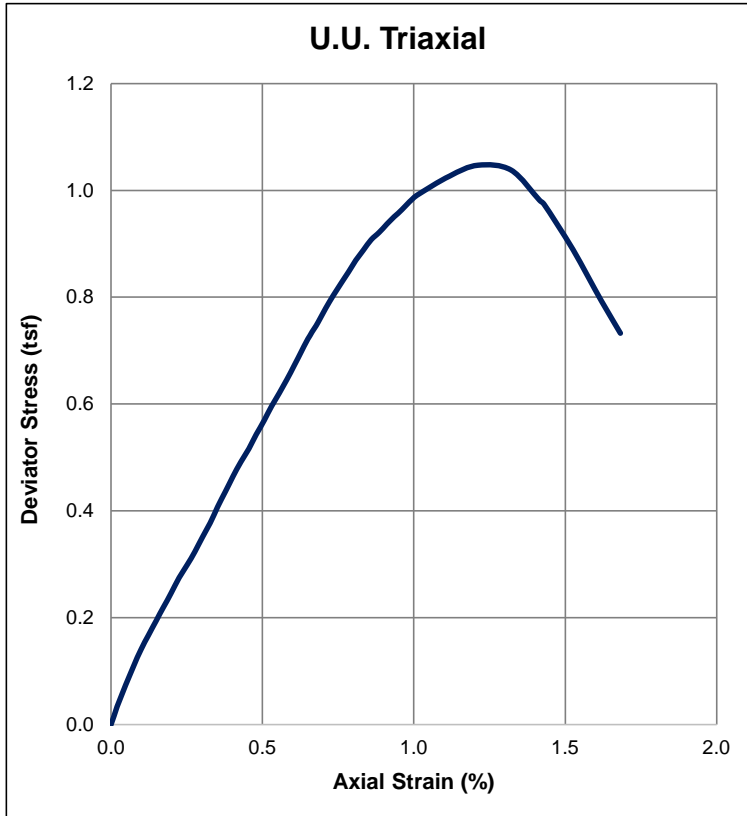
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2850 Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

Project: Gregg County Parking Garage
 Client: Gregg County, TX
 Location: Longview, TX
 Material: Brown with Lt. Gray & Red Fat Clay, (CH)

ETTL Project No.: G 5470-205
 Boring No.: B-2
 Sample No. / Depth (ft.): 8.0'-10.0'
 Specimen Trimming ID: E (whole)
 Height: 6.151 inches
 Diameter: 2.720 inches
 Height / Diameter Ratio: 2.26
Initial Moisture Content: 30.0% (trimmings)
Initial Dry Unit Weight: 92.4 lbs./ft³
 Initial Total Unit Weight: 120.1 lbs./ft³
 Specific Gravity: 2.670 (assumed)
 Initial Void Ratio: 0.803
 Initial Saturation: 99.7 %
 Pocket Penetrometer: 4.50 tsf
 Hand Torvane: N/T tsf
 Rate of Strain: 1.0 %/min
Chamber Pressure: 6.10 psi
Peak Strain: 1.21 %
Cor. Maximum Deviator Stress: 1.05 tsf
 Cor. Maximum Deviator Stress: 2095 ksf
 Cor. Maximum Deviator Stress: 14.5 psi
 Cor. Secant Modulus at 1/2 Peak Stress: 227 ksf
 Strain at 50% Max Stress (e₅₀): 0.005 in/in
 Initial Tangent Modulus: 295 psf
 Atterbergs LL / PI: 70 | 47
 Passing No. 200 Sieve: 85.0 %
 Sampling Method: 2.8 in. Shelby Tube
 Type of Specimen: Undisturbed
 Date Sampled: 8/26-31/2020



Membrane Correction Factor Applied to Deviator Stress (tsf) = 0.005

This test has been run to a maximum % strain of: 1.7

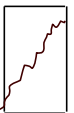
Measured Angle of Fracture from Horizontal: 45

Remarks: Slickensided

Sketch of Fracture:

Technician: Tommy Burns Test Date: 9/3/2020

Report Date: 9/15/2020



Shear





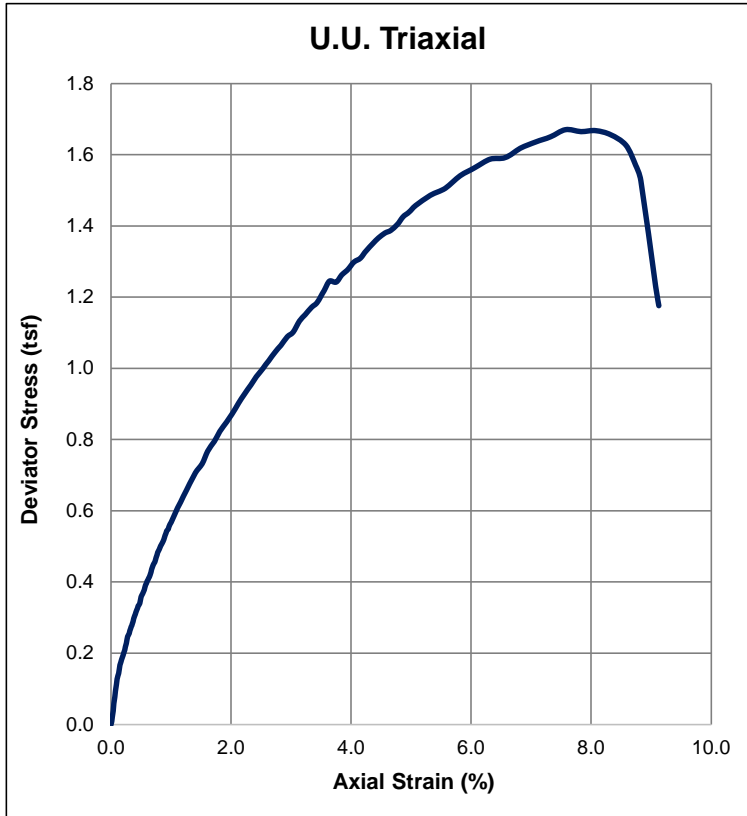
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2850 Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

Project: Gregg County Parking Garage
 Client: Gregg County, TX
 Location: Longview, TX
 Material: Dk. Brown Sandy Fat Clay, (CH)

ETTL Project No.: G 5470-205
 Boring No.: B-2
 Sample No. / Depth (ft.): 23.0'-25.0'
 Specimen Trimming ID: E (whole)
 Height: 3.400 inches
 Diameter: 1.417 inches
 Height / Diameter Ratio: 2.40
Initial Moisture Content: 23.8% (trimmings)
Initial Dry Unit Weight: 99.4 lbs./ft³
 Initial Total Unit Weight: 123.1 lbs./ft³
 Specific Gravity: 2.670 (assumed)
 Initial Void Ratio: 0.676
 Initial Saturation: 94.0 %
 Pocket Pentrometer: 2.50 tsf
 Hand Torvane: N/T tsf
 Rate of Strain: 1.0 %/min
Chamber Pressure: 15.2 psi
Peak Strain: 8.08 %
Cor. Maximum Deviator Stress: 1.67 tsf
 Cor. Maximum Deviator Stress: 3341 psf
 Cor. Maximum Deviator Stress: 23.2 psi
 Cor. Secant Modulus at 1/2 Peak Stress: 90 ksf
 Strain at 50% Max Stress (e₅₀): 0.019 in/in
 Initial Tangent Modulus: 253 ksf
 Atterbergs LL / PI: 50 | 33
 Passing No. 200 Sieve: 68.0 %
 Sampling Method: SPT
 Type of Specimen: Disturbed
 Date Sampled: 8/26-31/2020

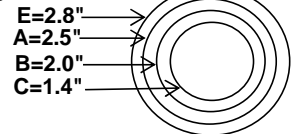


Note: Trimmed SPT Sample (Sample Considered disturbed)

Membrane Correction Factor Applied to Deviator Stress (tsf) = 0.064

This test has been run to a maximum % strain of: 9.1

Specimen Trimming ID reference:



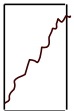
Measured Angle of Fracture from Horizontal: 60

Remarks:

Sketch of Fracture:

Technician: Tommy Burns Test Date: 9/4/2020

Report Date: 9/22/2020



Shear



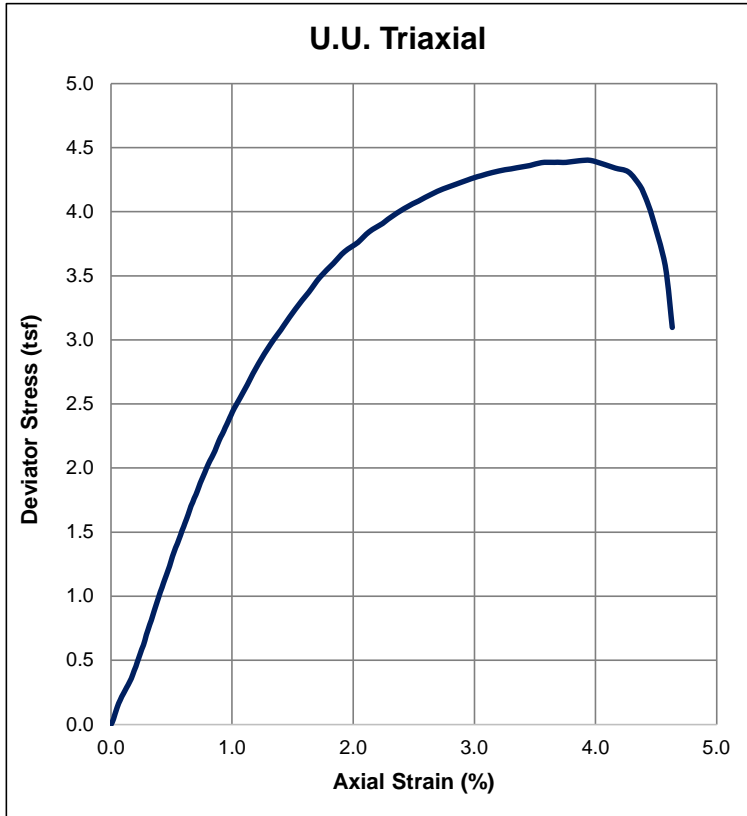
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2850 Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

Project: Gregg County Parking Lot
 Client: Gregg County, TX
 Location: Longview, TX
 Material: Dark Brown Fat Clay, (CH)

ETTL Project No.: G 5470-205
 Boring No.: B-2
 Sample No. / Depth (ft.): 33.0'-35.0'
 Specimen Trimming ID: E (whole)
 Height: 3.452 inches
 Diameter: 1.418 inches
 Height / Diameter Ratio: 2.43
Initial Moisture Content: 32.9% (trimmings)
Initial Dry Unit Weight: 89.5 lbs./ft³
 Initial Total Unit Weight: 119.0 lbs./ft³
 Specific Gravity: 2.670 (assumed)
 Initial Void Ratio: 0.861
 Initial Saturation: 100.0 %
 Pocket Pentrometer: 4.50 tsf
 Hand Torvane: N/T tsf
 Rate of Strain: 1.0 %/min
Chamber Pressure: 21.3 psi
Peak Strain: 3.96 %
Cor. Maximum Deviator Stress: 4.40 tsf
 Cor. Maximum Deviator Stress: 8800 psf
 Cor. Maximum Deviator Stress: 61.1 psi
 Cor. Secant Modulus at 1/2 Peak Stress: 524 ksf
 Strain at 50% Max Stress (e₅₀): 0.008 in/in
 Initial Tangent Modulus: 573 ksf
 Atterbergs LL / PI: 101 | 72
 Passing No. 200 Sieve: 94.0 %
 Sampling Method: SPT
 Type of Specimen: Disturbed
 Date Sampled: 8/26-31/2020

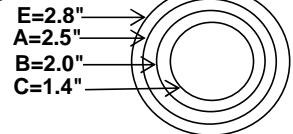


Note: Trimmed SPT Sample (Sample Considered disturbed)

Membrane Correction Factor Applied to Deviator Stress (tsf) = 0.032

This test has been run to a maximum % strain of: 4.6

Specimen Trimming ID reference:



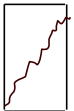
Measured Angle of Fracture from Horizontal: 50

Remarks: Slickensided

Sketch of Fracture:

Technician: Tommy Burns Test Date: 9/4/2020

Report Date: 9/15/2020



Shear



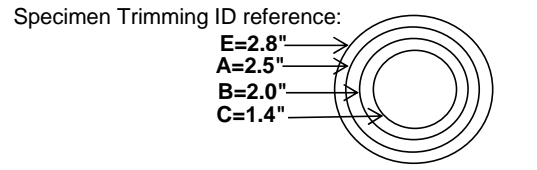
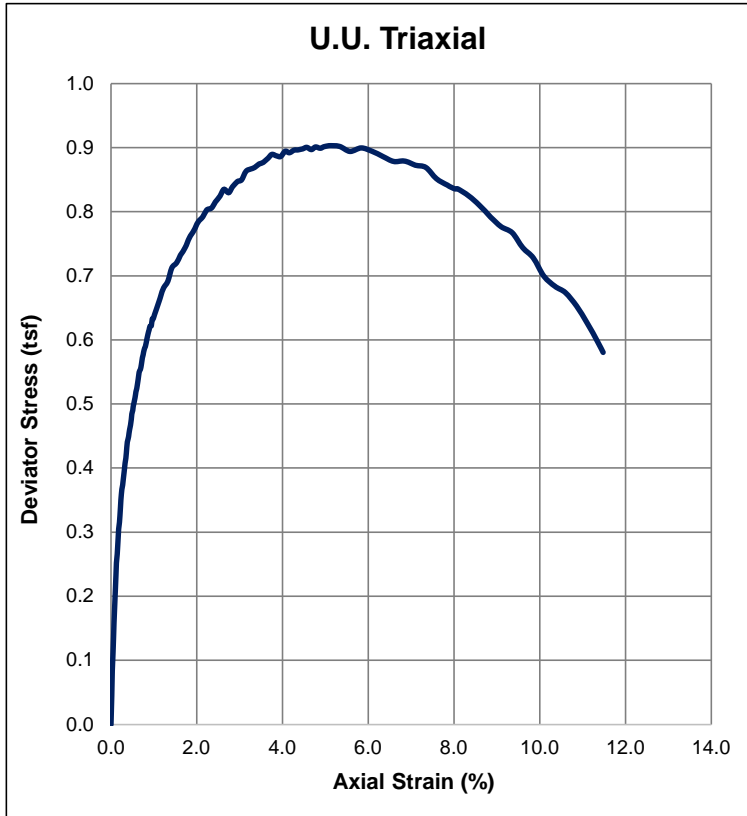
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2850 Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

Project: Gregg County Parking Lot
 Client: Gregg County, TX
 Location: Longview, TX
 Material: Dark Gray Fat Clay, (CH)

ETTL Project No.: G 5470-205
 Boring No.: B-3
 Sample No. / Depth (ft.): 33.0'-35.0'
 Specimen Trimming ID: E (whole)
 Height: 3.543 inches
 Diameter: 1.440 inches
 Height / Diameter Ratio: 2.46
Initial Moisture Content: 26.0% (trimmings)
Initial Dry Unit Weight: 96.9 lbs./ft³
 Initial Total Unit Weight: 122.1 lbs./ft³
 Specific Gravity: 2.670 (assumed)
 Initial Void Ratio: 0.719
 Initial Saturation: 96.4 %
 Pocket Penetrometer: 2.75 tsf
 Hand Torvane: N/T tsf
 Rate of Strain: 1.0 %/min
Chamber Pressure: 21.3 psi
Peak Strain: 5.84 %
Cor. Maximum Deviator Stress: 0.903 tsf
 Cor. Maximum Deviator Stress: 1806 psf
 Cor. Maximum Deviator Stress: 12.5 psi
 Cor. Secant Modulus at 1/2 Peak Stress: 220 ksf
 Strain at 50% Max Stress (e₅₀): 0.004 in/in
 Initial Tangent Modulus: 495 ksf
 Atterbergs LL / PI: 65 | 47
 Passing No. 200 Sieve: 92.0 %
 Sampling Method: SPT
 Type of Specimen: Disturbed
 Date Sampled: 8/26-31/2020



Note: Trimmed SPT Sample (Sample Considered disturbed)

Membrane Correction Factor Applied to Deviator Stress (tsf) = 0.046

This test has been run to a maximum % strain of: 11.5

Measured Angle of Fracture from Horizontal: 50

Remarks: Slickensided

Sketch of Fracture:

Technician: Tommy Burns Test Date: 9/4/2020

Report Date: 9/15/2020

Shear



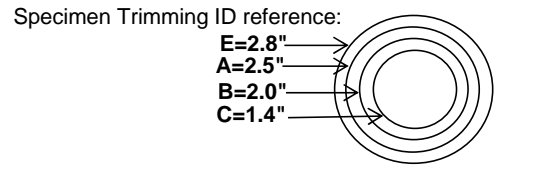
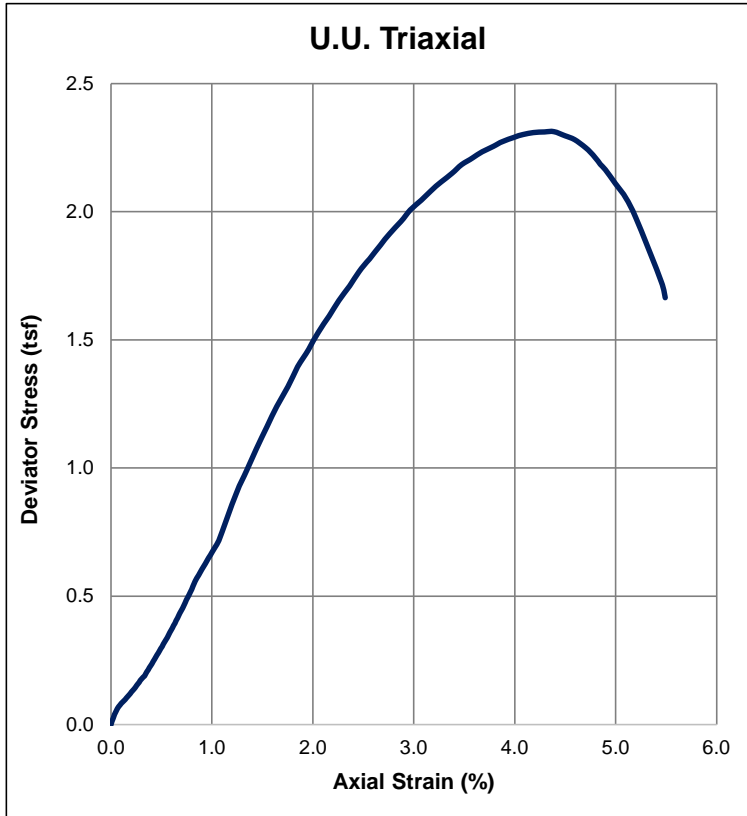
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2850 Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

Project: Gregg County Parking Garage
 Client: Gregg County, TX
 Location: Longview, TX
 Material: Brown with Grayish Brown Sandy Fat Clay, (CH)

ETTL Project No.: G 5470-205
 Boring No.: B-4
 Sample No. / Depth (ft.): 8.0'-10.0'
 Specimen Trimming ID: E (whole)
 Height: 6.060 inches
 Diameter: 2.739 inches
 Height / Diameter Ratio: 2.21
Initial Moisture Content: 32.0% (trimmings)
Initial Dry Unit Weight: 87.1 lbs./ft³
 Initial Total Unit Weight: 115.0 lbs./ft³
 Specific Gravity: 2.670 (assumed)
 Initial Void Ratio: 0.913
 Initial Saturation: 93.8 %
 Pocket Pentrometer: 3.50 tsf
 Hand Torvane: N/T tsf
 Rate of Strain: 1.0 %/min
Chamber Pressure: 6.20 psi
Peak Strain: 4.39 %
Cor. Maximum Deviator Stress: 2.31 tsf
 Cor. Maximum Deviator Stress: 4625 psf
 Cor. Maximum Deviator Stress: 32.1 psi
 Cor. Secant Modulus at 1/2 Peak Stress: 164 ksf
 Strain at 50% Max Stress (e₅₀): 0.014 in/in
 Initial Tangent Modulus: 157 ksf
 Atterbergs LL / PI: 90 | 64
 Passing No. 200 Sieve: 70.0 %
 Sampling Method: 2.8 in. Shelby Tube
 Type of Specimen: Undisturbed
 Date Sampled: 8/26-31/2020



Membrane Correction Factor Applied to Deviator Stress (tsf) = 0.018

This test has been run to a maximum % strain of: 5.5

Measured Angle of Fracture from Horizontal: N/A

Remarks:

Sketch of Fracture:

Technician: Tommy Burns Test Date: 9/8/2020

Report Date: 9/15/2020



Crumbled



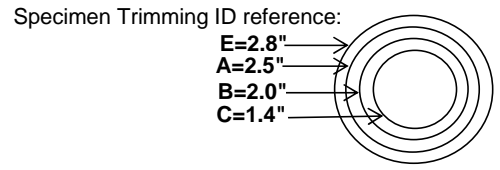
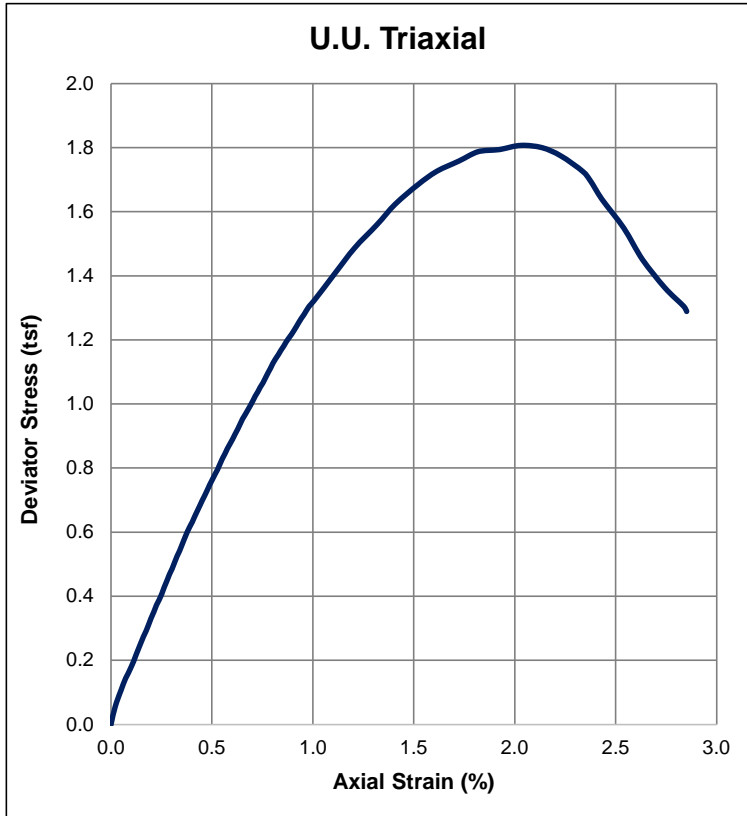
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2850 Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

Project: Gregg County Parking Garage
 Client: Gregg County, TX
 Location: Longview, TX
 Material: Brown with Grayish Brown Fat Clay with sand, (CH)

ETTL Project No.: G 5470-205
 Boring No.: B-4
 Sample No. / Depth (ft.): 13.0'-15.0'
 Specimen Trimming ID: B (trimmed)
 Height: 4.080 inches
 Diameter: 2.026 inches
 Height / Diameter Ratio: 2.01
Initial Moisture Content: 36.7% (trimmings)
Initial Dry Unit Weight: 84.3 lbs./ft³
 Initial Total Unit Weight: 115.3 lbs./ft³
 Specific Gravity: 2.670 (assumed)
 Initial Void Ratio: 0.976
 Initial Saturation: 100.0 %
 Pocket Pentrometer: 4.50 tsf
 Hand Torvane: N/T tsf
 Rate of Strain: 1.0 %/min
Chamber Pressure: 9.10 psi
Peak Strain: 2.03 %
Cor. Maximum Deviator Stress: 1.81 tsf
 Cor. Maximum Deviator Stress: 3615 psf
 Cor. Maximum Deviator Stress: 25.1 psi
 Cor. Secant Modulus at 1/2 Peak Stress: 295 ksf
 Strain at 50% Max Stress (e₅₀): 0.006 in/in
 Initial Tangent Modulus: 439 ksf
 Atterbergs LL / PI: 91 | 59
 Passing No. 200 Sieve: 78.0 %
 Sampling Method: Sample Trimmed, Shelby Tube
 Type of Specimen: Undisturbed
 Date Sampled: 8/26-31/2020



Membrane Correction Factor Applied to Deviator Stress (tsf) = 0.011

This test has been run to a maximum % strain of: 2.9

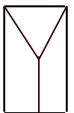
Measured Angle of Fracture from Horizontal: N/A

Remarks:

Sketch of Fracture:

Technician: Tommy Burns Test Date: 9/9/2020

Report Date: 9/15/2020



Cone



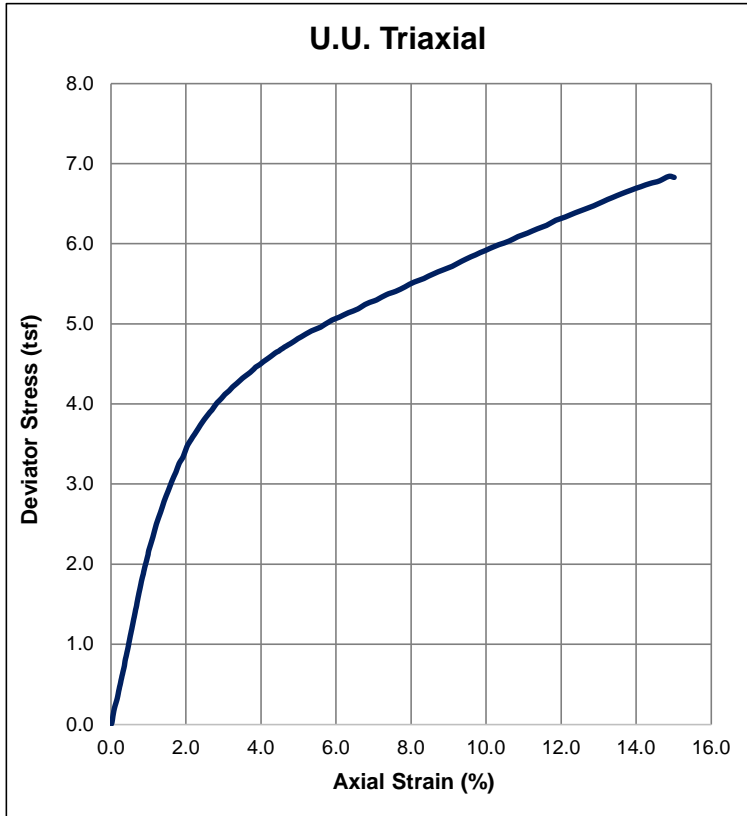
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2850 Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

Project: Gregg County Parking Garage
 Client: Gregg County, TX
 Location: Longview, TX
 Material: Dk. Brown with Dk. Gray Fat Clay with sand, (CH)

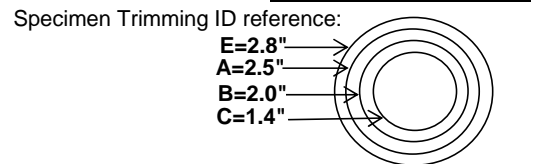
ETTL Project No.: G 5470-205
 Boring No.: B-4
 Sample No. / Depth (ft.): 38.0'-40.0'
 Specimen Trimming ID: E (whole)
 Height: 3.445 inches
 Diameter: 1.415 inches
 Height / Diameter Ratio: 2.43
Initial Moisture Content: 21.1% (trimmings)
Initial Dry Unit Weight: 109.2 lbs./ft³
 Initial Total Unit Weight: 132.2 lbs./ft³
 Specific Gravity: 2.670 (assumed)
 Initial Void Ratio: 0.527
 Initial Saturation: 100.0 %
 Pocket Penetrometer: 4.5+ tsf
 Hand Torvane: N/T tsf
 Rate of Strain: 1.0 %/min
Chamber Pressure: 24.3 psi
Peak Strain: 14.9 %
Cor. Maximum Deviator Stress: 6.84 tsf
 Cor. Maximum Deviator Stress: 13683 psf
 Cor. Maximum Deviator Stress: 95.0 psi
 Cor. Secant Modulus at 1/2 Peak Stress: 344 ksf
 Strain at 50% Max Stress (e₅₀): 0.020 in/in
 Initial Tangent Modulus: 422 ksf
 Atterbergs LL / PI: 60 | 41
 Passing No. 200 Sieve: 82.0 %
 Sampling Method: SPT
 Type of Specimen: Distrubed
 Date Sampled: 8/26-31/2020



Note: Trimmed SPT Sample (Sample Considered disturbed)

Membrane Correction Factor Applied to Deviator Stress (tsf) = 0.119

This test has been run to a maximum % strain of: 15.0



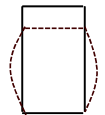
Measured Angle of Fracture from Horizontal: N/A

Remarks: _____

Sketch of Fracture: _____

Technician: Tommy Burns Test Date: 9/9/2020

Report Date: 9/15/2020



Barrel



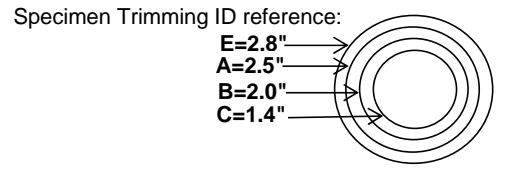
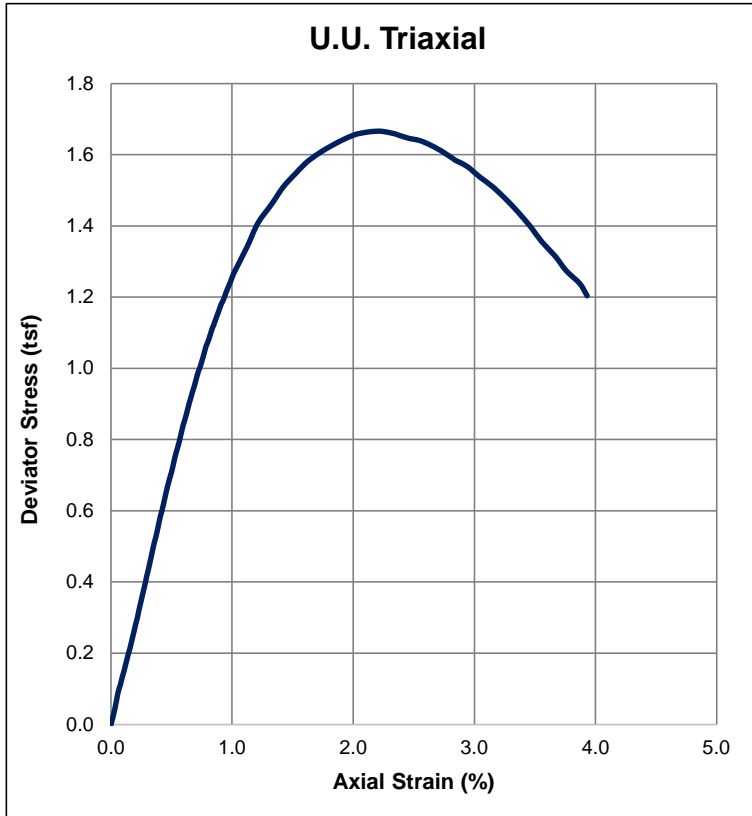
ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

ASTM D 2850 Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

Project: Gregg County Parking Garage
 Client: Gregg County, TX
 Location: Longview, TX
 Material: Brown wih Gray & Red. Brown Fat Clay, (CH)

ETTL Project No.: G 5470-205
 Boring No.: B-5
 Sample No. / Depth (ft.): 5.0'-7.0'
 Specimen Trimming ID: E (whole)
 Height: 5.899 inches
 Diameter: 2.710 inches
 Height / Diameter Ratio: 2.18
Initial Moisture Content: 40.0% (trimmings)
Initial Dry Unit Weight: 81.5 lbs./ft³
 Initial Total Unit Weight: 114.1 lbs./ft³
 Specific Gravity: 2.670 (assumed)
 Initial Void Ratio: 1.045
 Initial Saturation: 100.0 %
 Pocket Pentrometer: 3.75 tsf
 Hand Torvane: N/T tsf
 Rate of Strain: 1.0 %/min
Chamber Pressure: 4.30 psi
Peak Strain: 2.24 %
Cor. Maximum Deviator Stress: 1.67 tsf
 Cor. Maximum Deviator Stress: 3332 psf
 Cor. Maximum Deviator Stress: 23.1 psi
 Cor. Secant Modulus at 1/2 Peak Stress: 282 psf
 Strain at 50% Max Stress (e₅₀): 0.006 in/in
 Initial Tangent Modulus: 281 psf
 Atterbergs LL / PI: 115 | 91
 Passing No. 200 Sieve: 91.0 %
 Sampling Method: 2.8 in. Shelby Tube
 Type of Specimen: Undisturbed
 Date Sampled: 8/26-31/2020



Membrane Correction Factor Applied to Deviator Stress (tsf) = 0.009

This test has been run to a maximum % strain of: 3.9

Measured Angle of Fracture from Horizontal: N/A

Remarks:

Sketch of Fracture:

Technician: Tommy Burns Test Date: 9/8/2020

Report Date: 9/15/2020

Cone

Appendix C

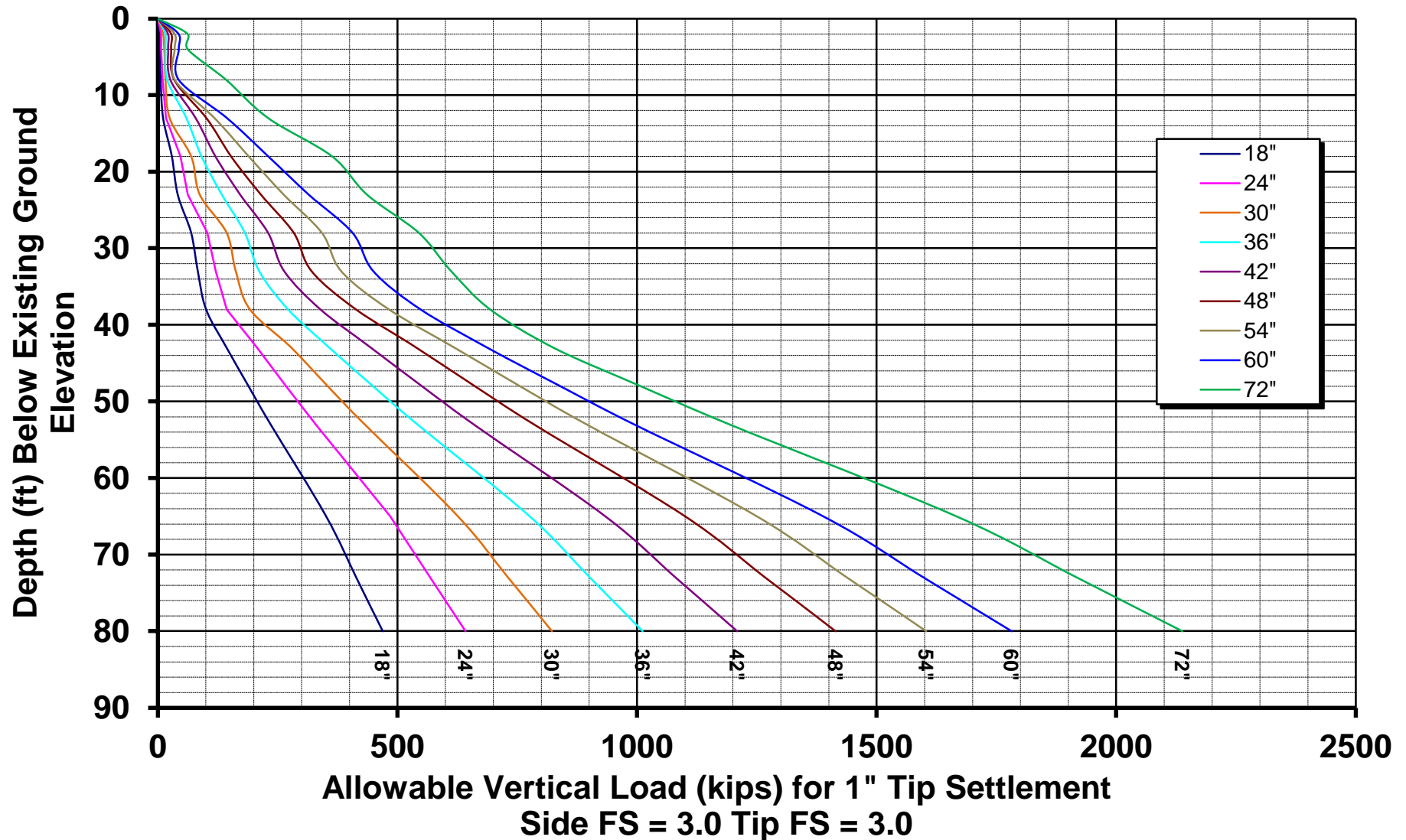
Drilled Shaft Capacity Curves



ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

DRILLED SHAFT CAPACITIES

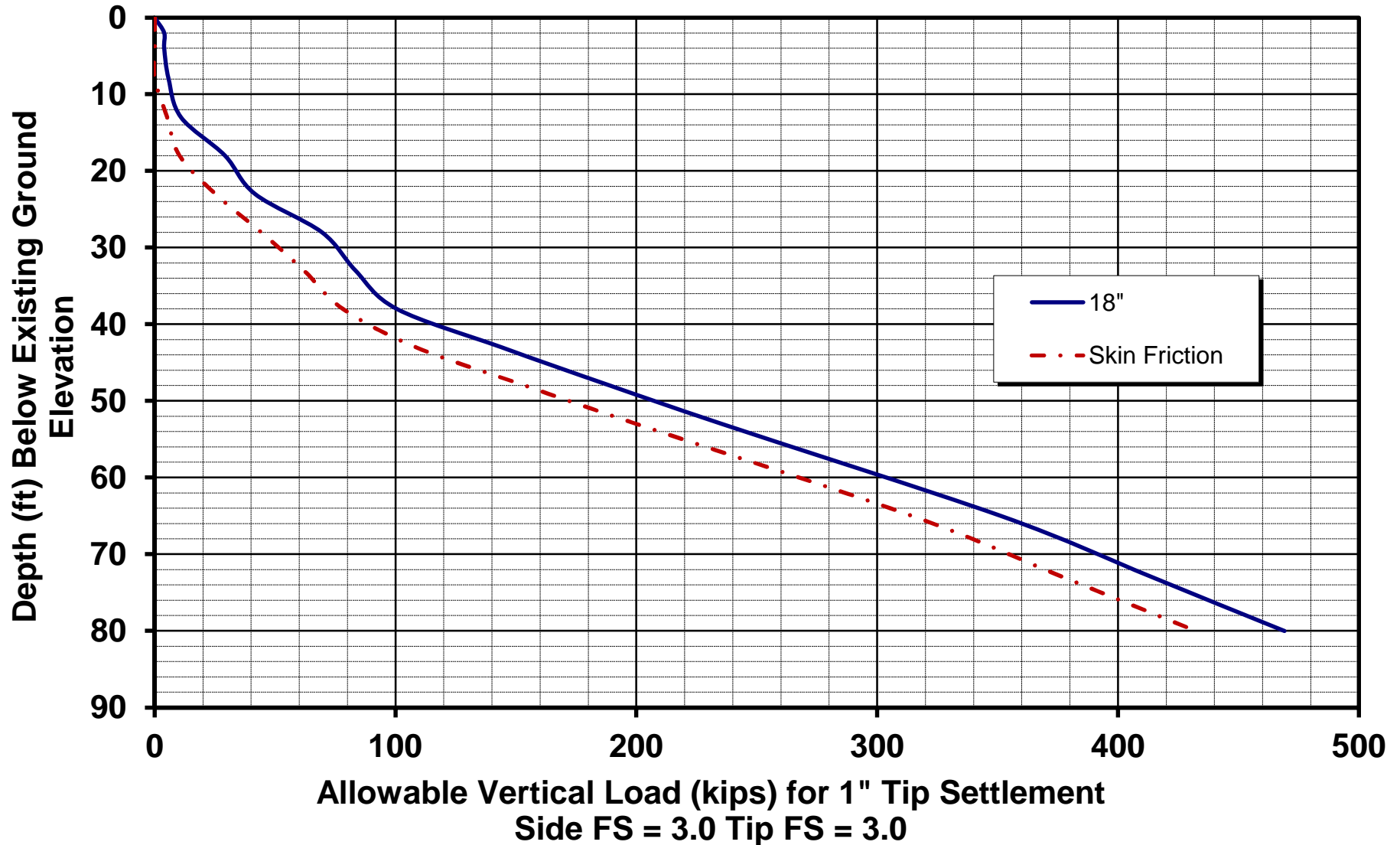


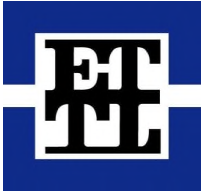


ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

DRILLED SHAFT CAPACITIES

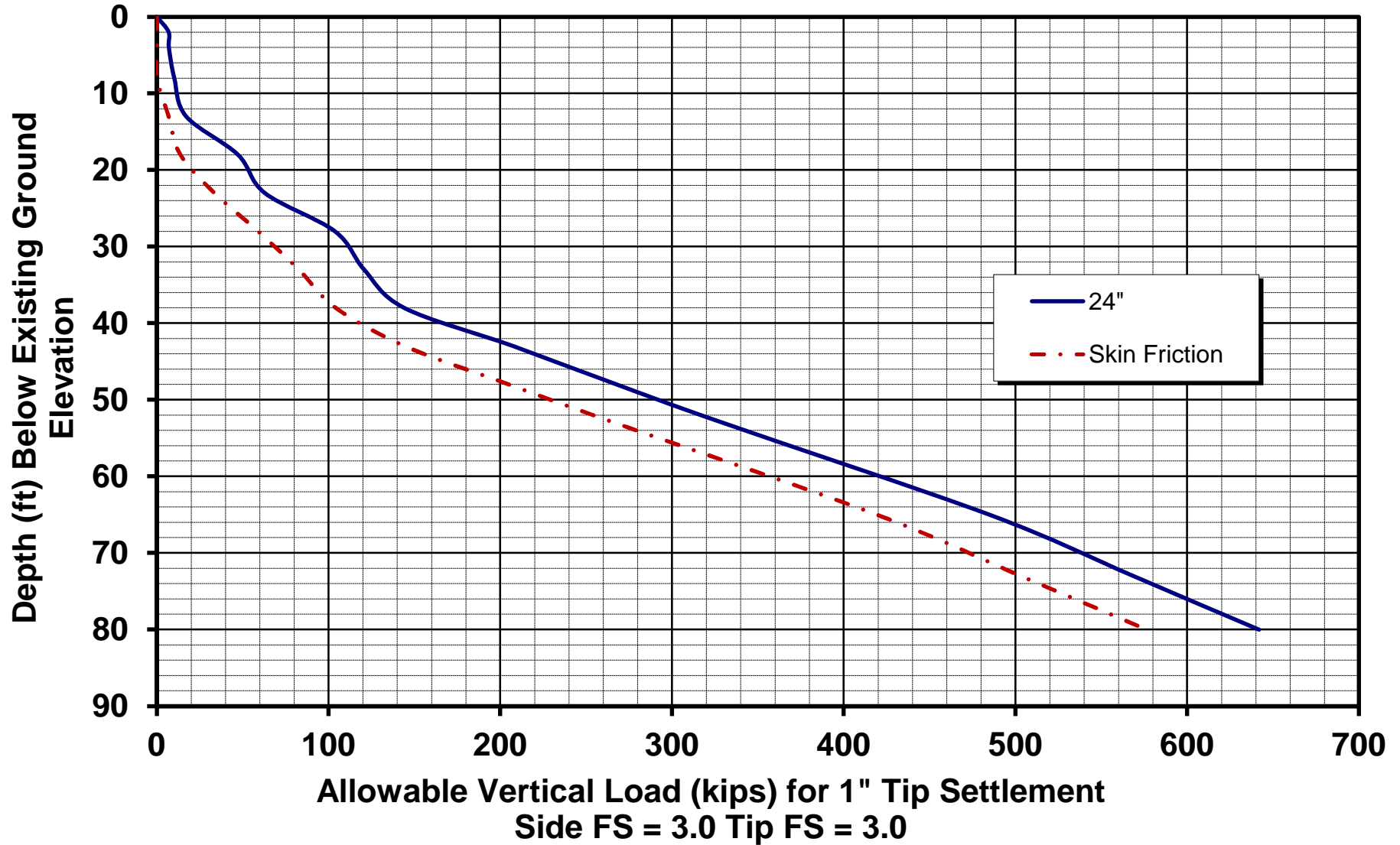


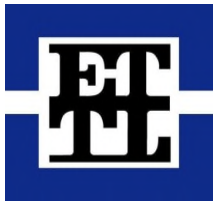


ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

DRILLED SHAFT CAPACITIES

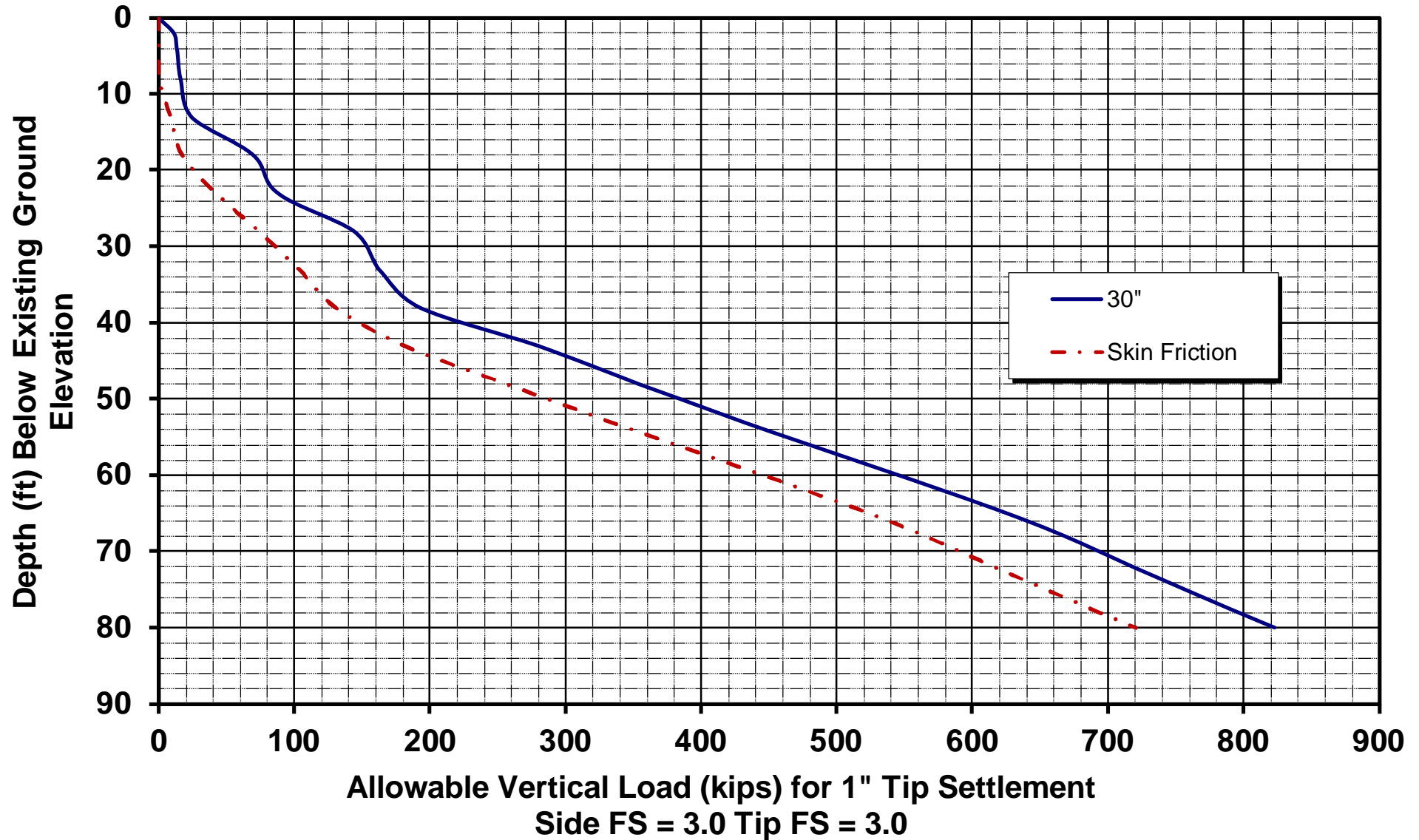


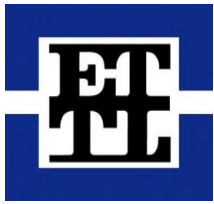


ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

DRILLED SHAFT CAPACITIES

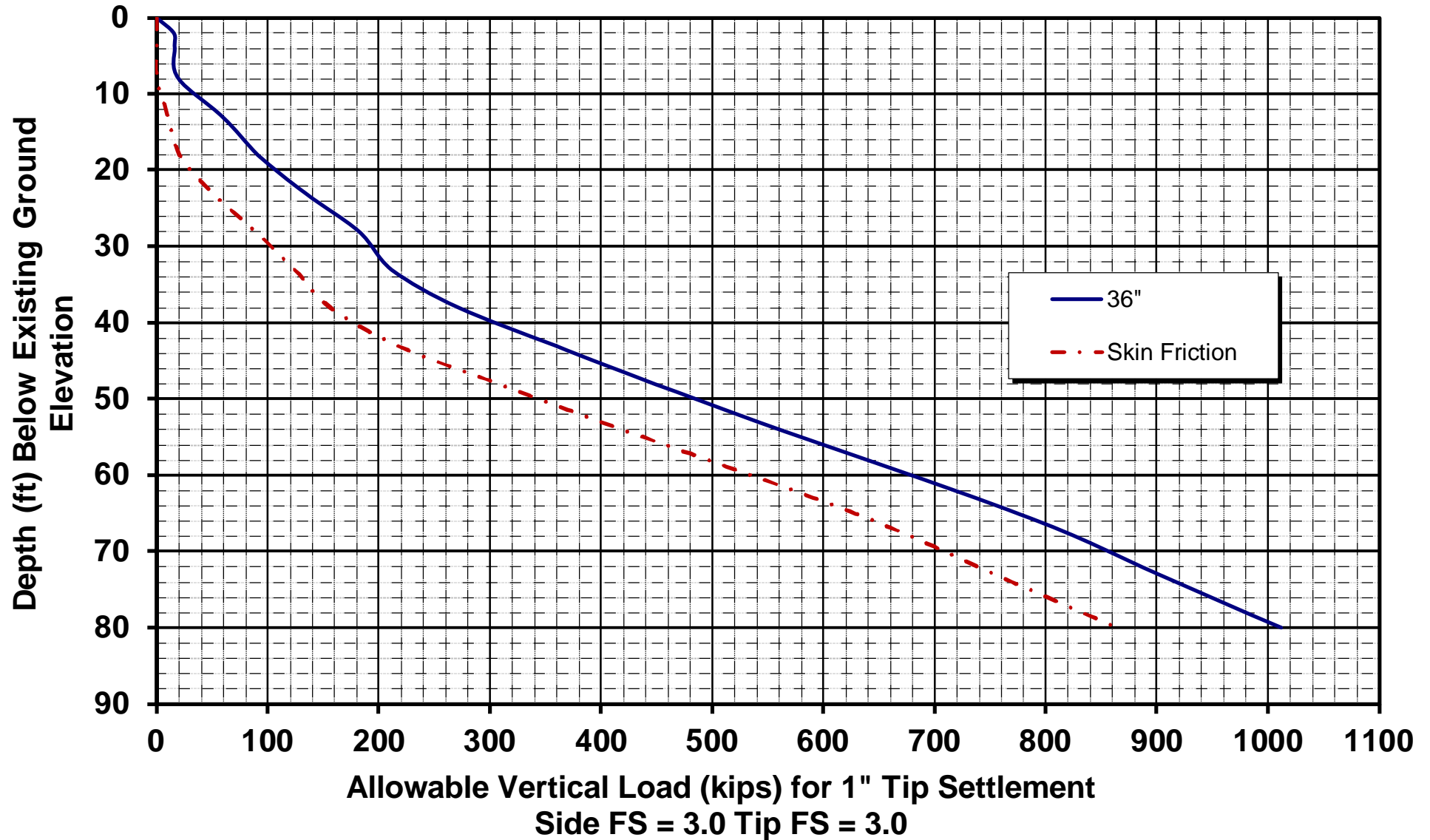


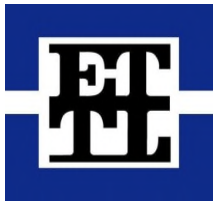


ETTL Engineers & Consultants Inc.

GEOTECHNICAL ★ MATERIALS ★ ENVIRONMENTAL ★ DRILLING ★ LANDFILLS

DRILLED SHAFT CAPACITIES

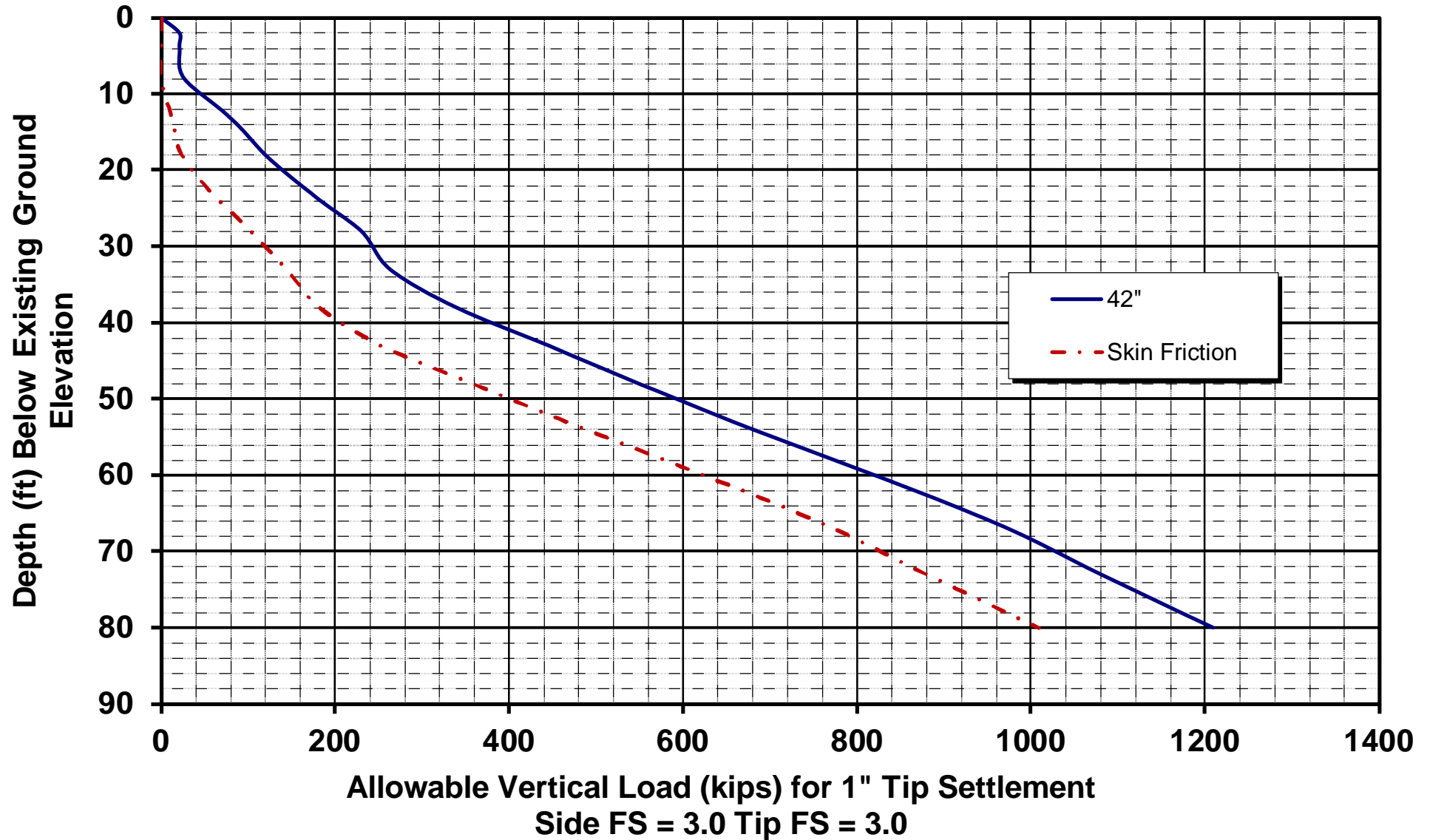


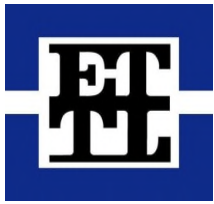


ETTL Engineers & Consultants Inc.

GEOTECHNICAL ★ MATERIALS ★ ENVIRONMENTAL ★ DRILLING ★ LANDFILLS

DRILLED SHAFT CAPACITIES

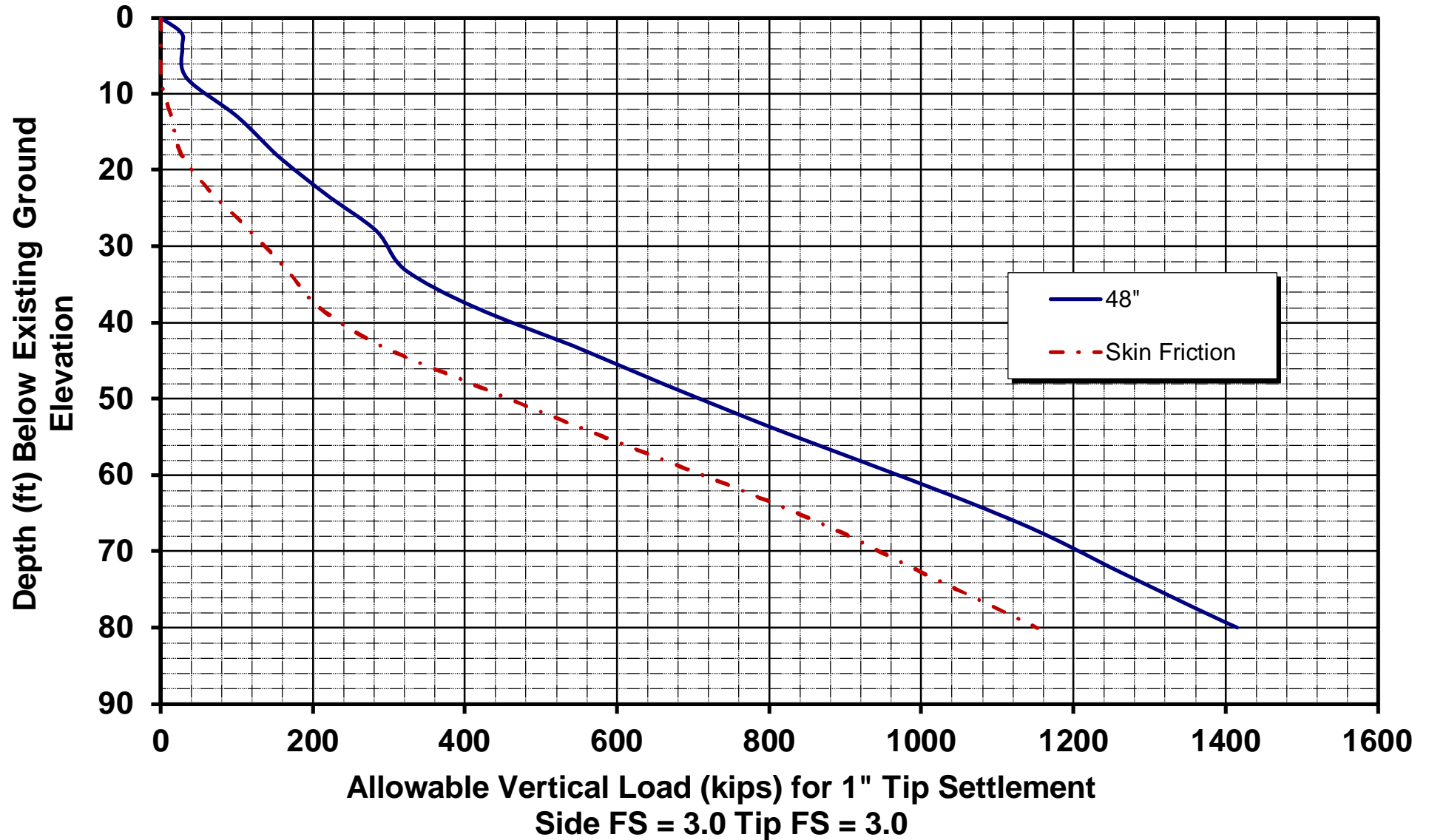


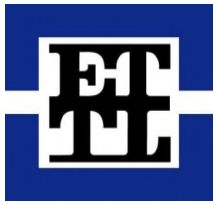


ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

DRILLED SHAFT CAPACITIES

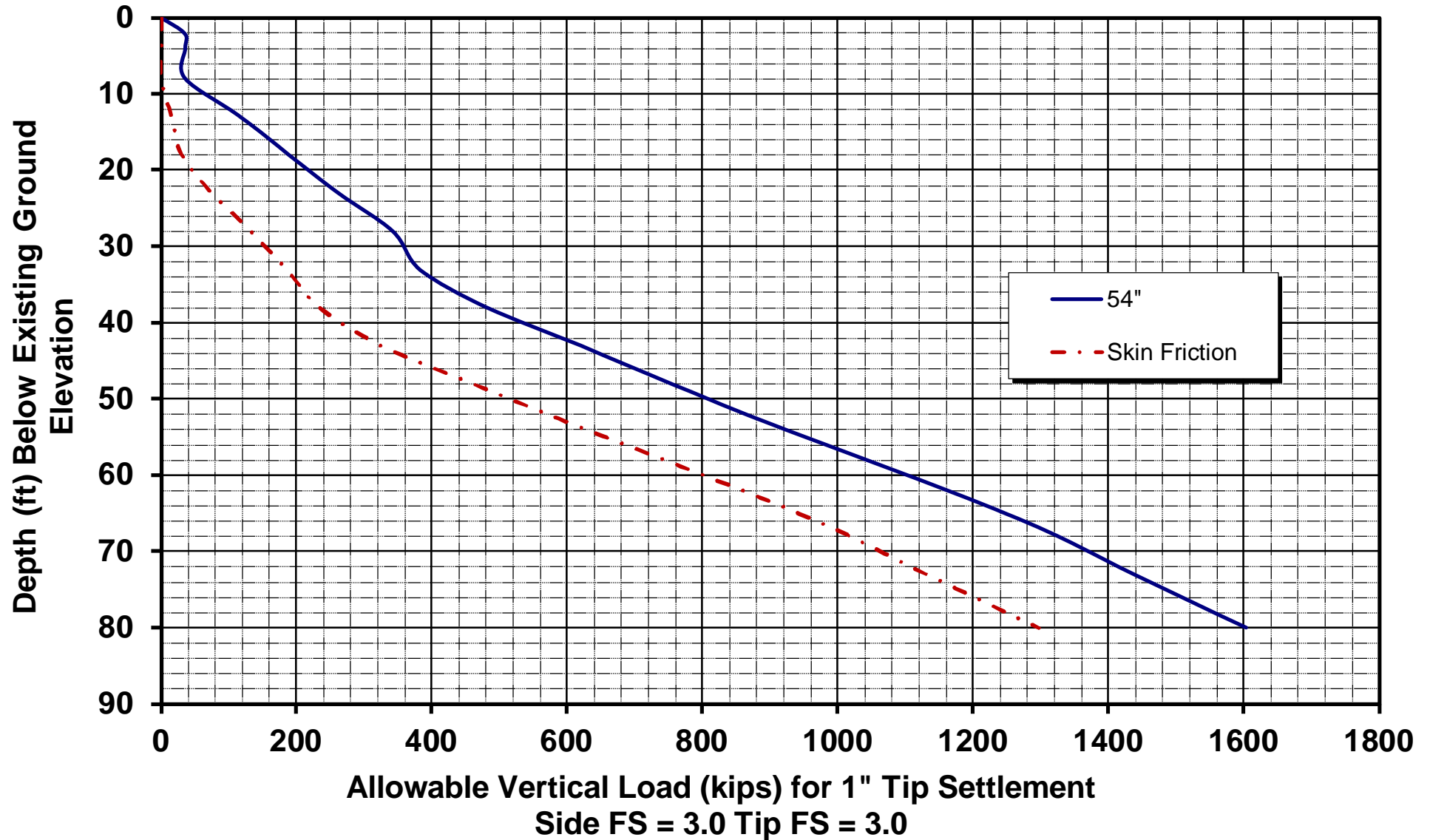


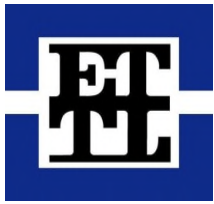


ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

DRILLED SHAFT CAPACITIES

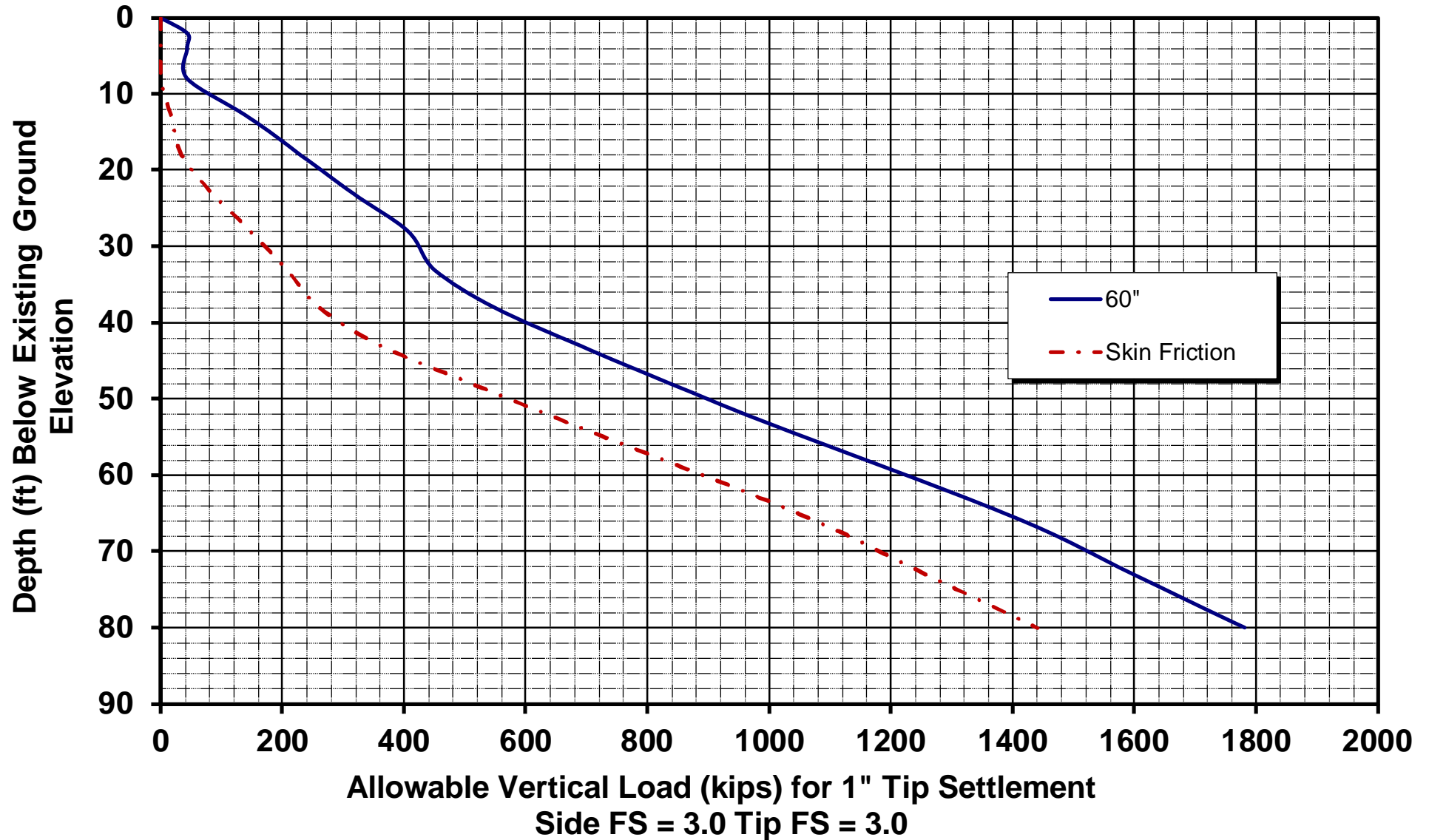




ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

DRILLED SHAFT CAPACITIES

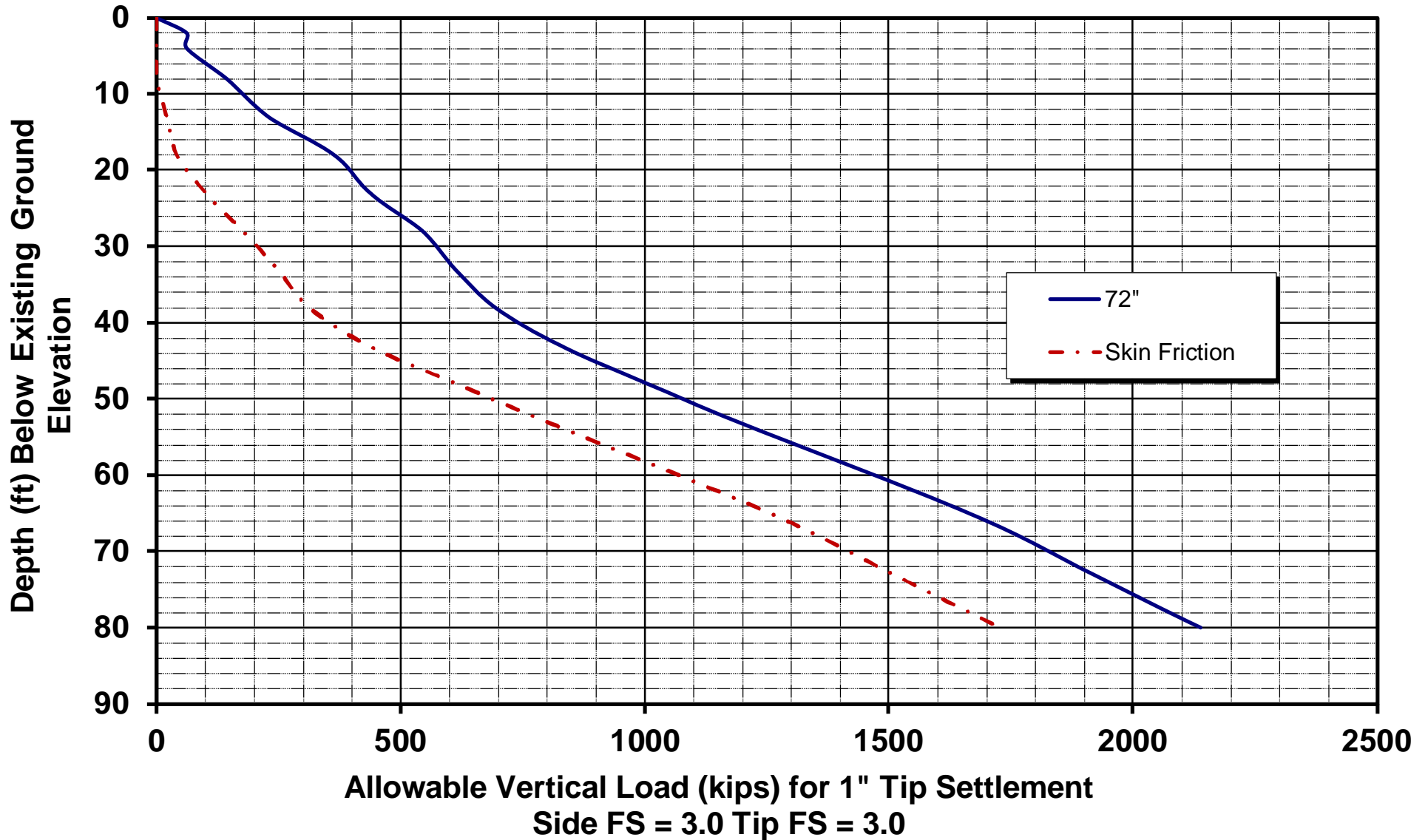




ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

DRILLED SHAFT CAPACITIES



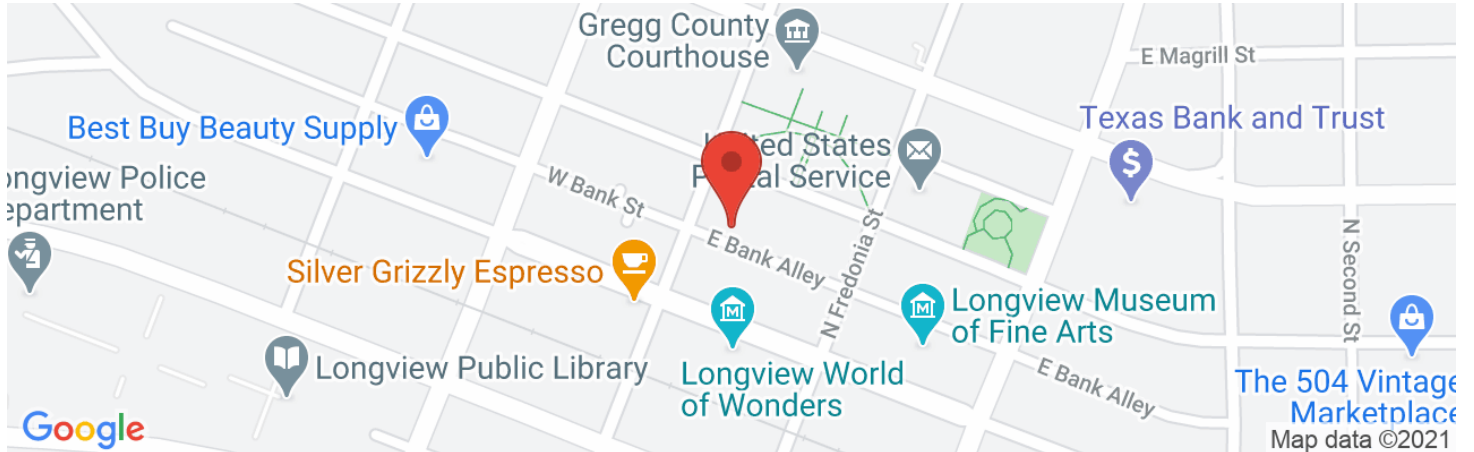
Appendix D

Seismic Design Parameters, Rev.01



Gregg County Parking Garage

Latitude, Longitude: 32.495799, -94.739572



| | |
|---------------------------------------|-----------------------------------|
| Date | 4/8/2021, 2:01:36 PM |
| Design Code Reference Document | IBC-2012 |
| Risk Category | II |
| Site Class | C - Very Dense Soil and Soft Rock |

| Type | Value | Description |
|----------|-------|--|
| S_S | 0.117 | MCE_R ground motion. (for 0.2 second period) |
| S_1 | 0.063 | MCE_R ground motion. (for 1.0s period) |
| S_{MS} | 0.141 | Site-modified spectral acceleration value |
| S_{M1} | 0.107 | Site-modified spectral acceleration value |
| S_{DS} | 0.094 | Numeric seismic design value at 0.2 second SA |
| S_{D1} | 0.072 | Numeric seismic design value at 1.0 second SA |

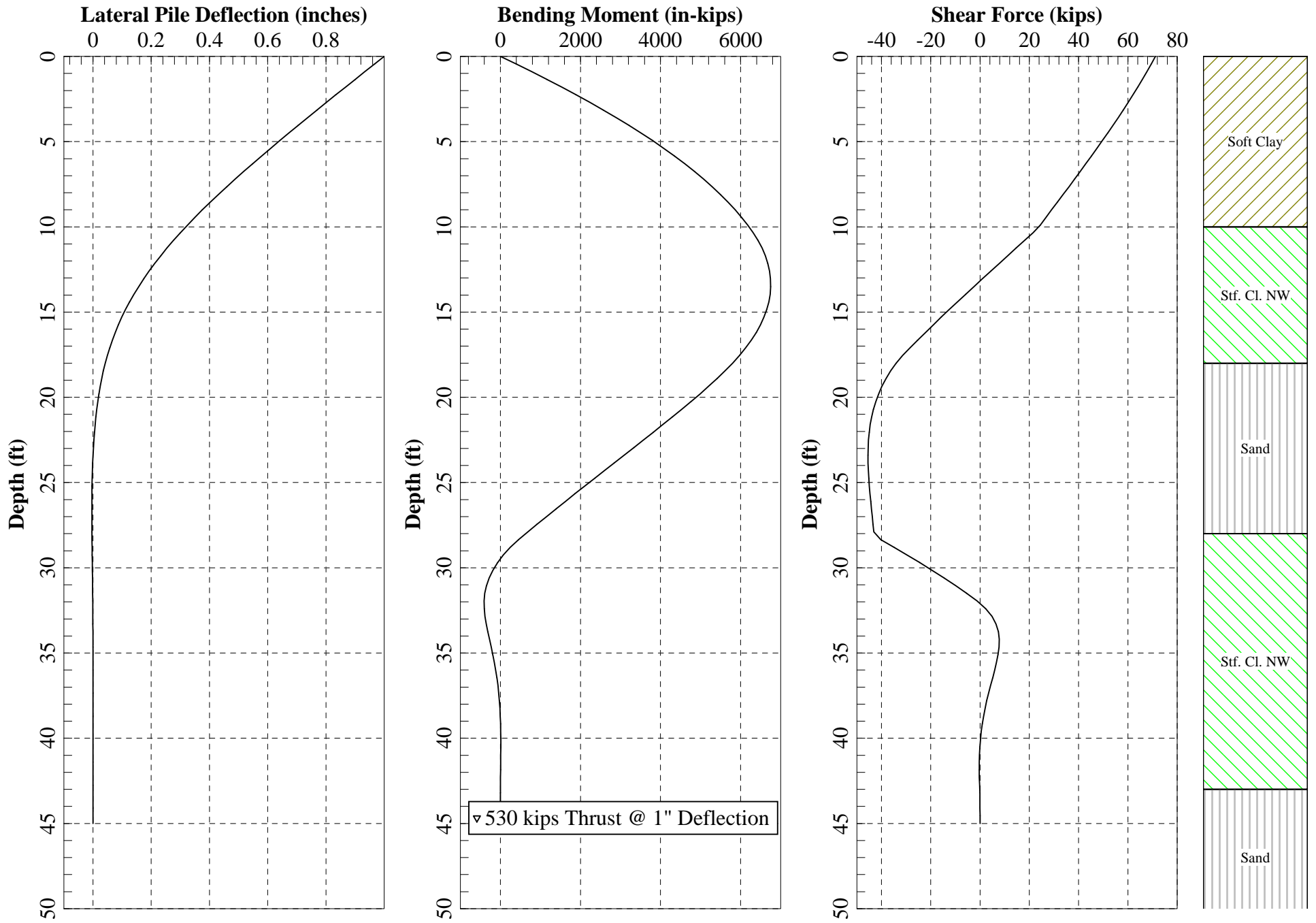
| Type | Value | Description |
|-----------|-------|---|
| SDC | B | Seismic design category |
| F_a | 1.2 | Site amplification factor at 0.2 second |
| F_v | 1.7 | Site amplification factor at 1.0 second |
| PGA | 0.056 | MCE_G peak ground acceleration |
| F_{PGA} | 1.2 | Site amplification factor at PGA |
| PGA_M | 0.067 | Site modified peak ground acceleration |
| T_L | 12 | Long-period transition period in seconds |
| $SsRT$ | 0.117 | Probabilistic risk-targeted ground motion. (0.2 second) |
| $SsUH$ | 0.129 | Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration |
| SsD | 1.5 | Factored deterministic acceleration value. (0.2 second) |
| $S1RT$ | 0.063 | Probabilistic risk-targeted ground motion. (1.0 second) |
| $S1UH$ | 0.074 | Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration. |
| $S1D$ | 0.6 | Factored deterministic acceleration value. (1.0 second) |
| $PGAd$ | 0.6 | Factored deterministic acceleration value. (Peak Ground Acceleration) |
| C_{RS} | 0.91 | Mapped value of the risk coefficient at short periods |
| C_{R1} | 0.856 | Mapped value of the risk coefficient at a period of 1 s |

DISCLAIMER

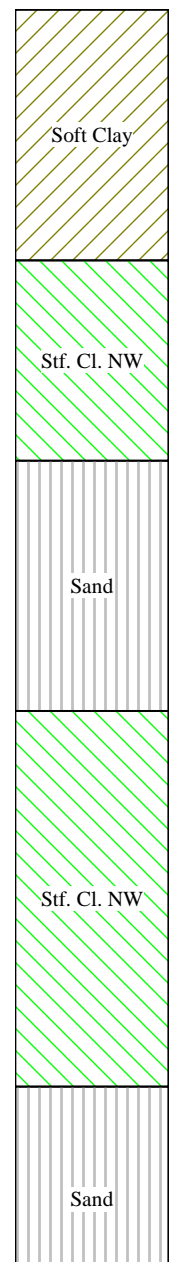
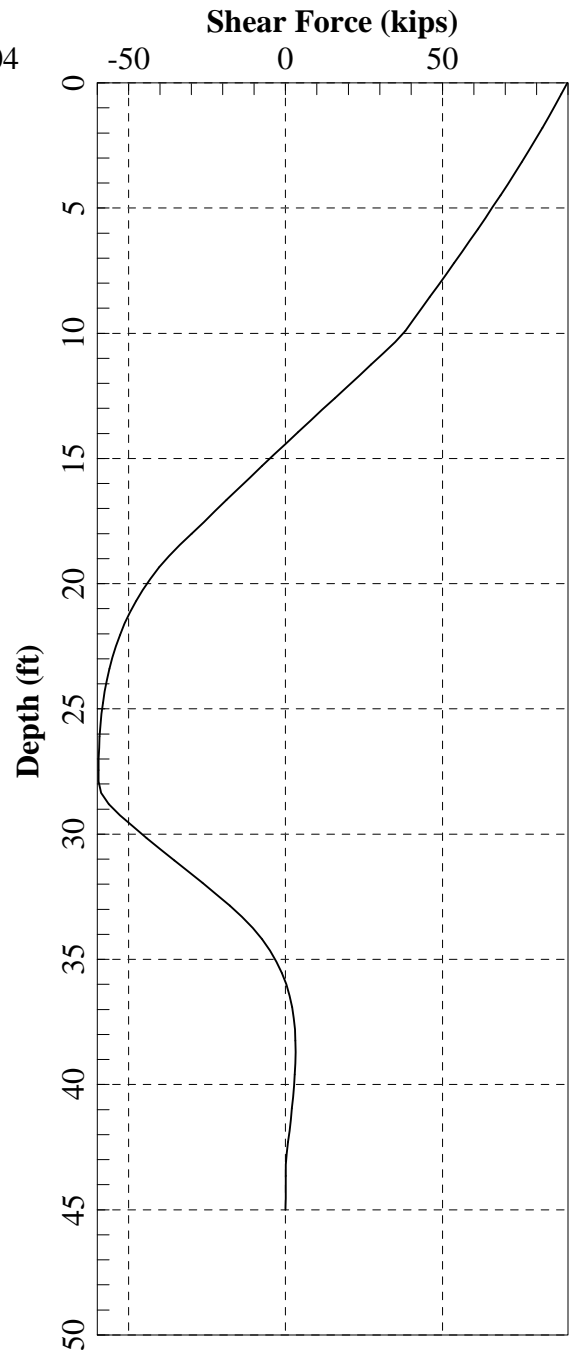
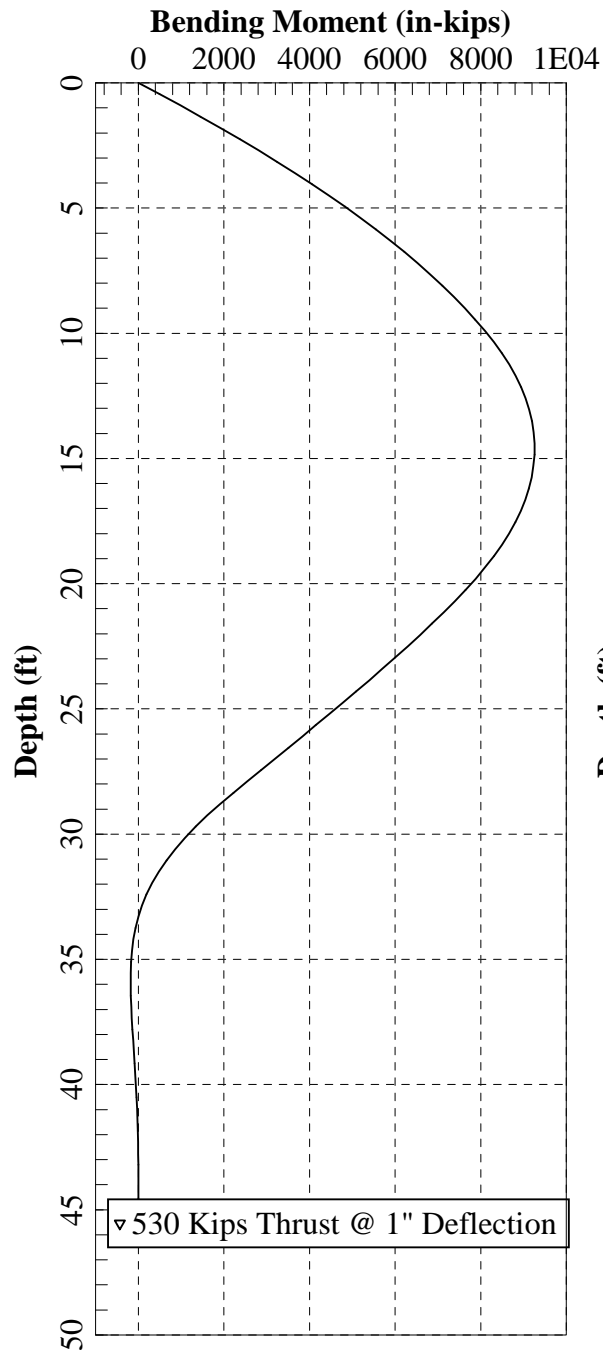
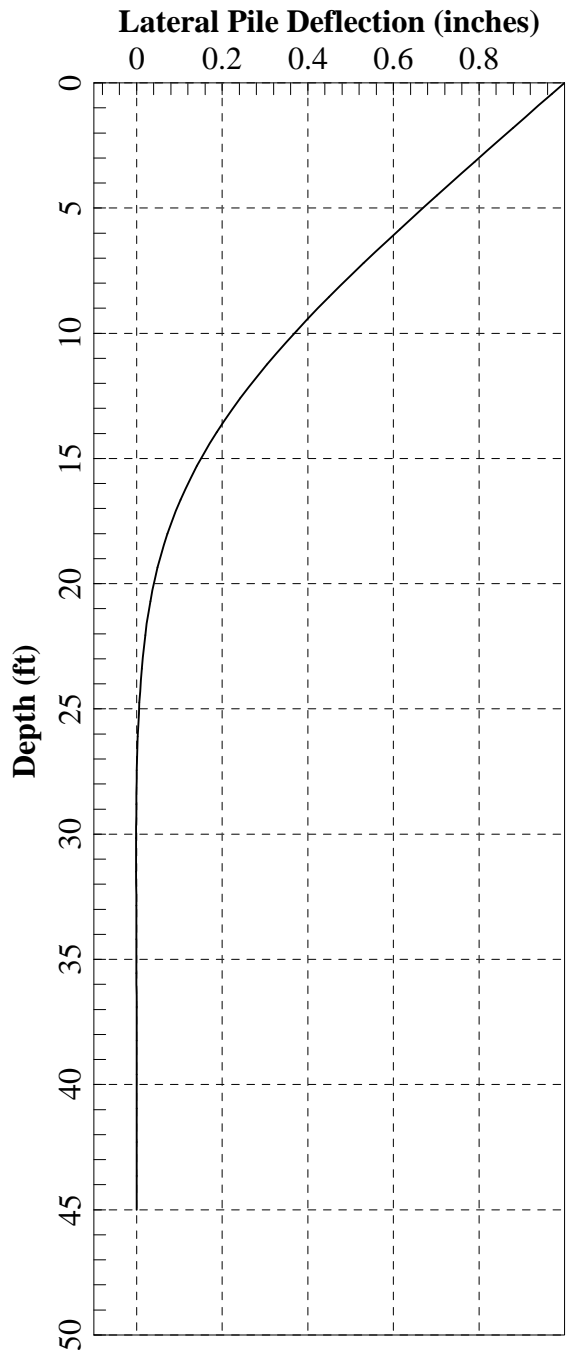
While the information presented on this website is believed to be correct, SEAOC / OSHPD and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in this web application should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. SEAOC / OSHPD do not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the seismic data provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the search results of this website.

Appendix E

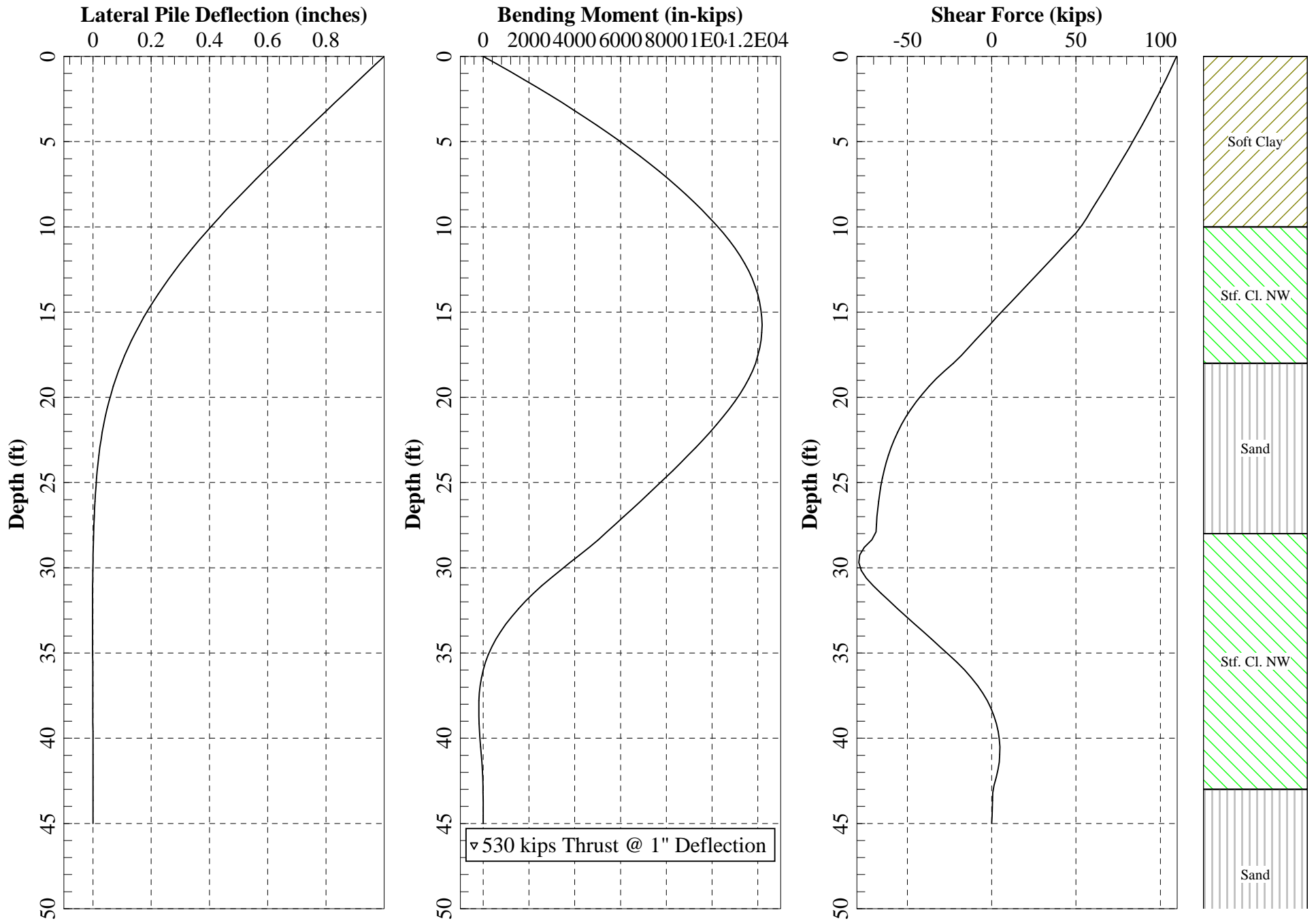
LPile Shear, Moment and Deflection Diagrams



Isolated 36" X 45' w/ 1% Steel - 530 Kips Thrust @ 1" Deflection (Free Head)



Isolated 42" X 45' w/ 1% Steel - 530 Kips Thrust @ 1" Deflection (Free Head)



Isolated 48" X 45' w/ 1% Steel - 530 Kips Thrust @ 1" Deflection (Free Head)

DC 99 8

ENERGY COMPLIANCE REPORT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Energy compliance report follows in this section.

END OF SECTION



COMcheck Software Version 4.1.5.1

Envelope Compliance Certificate

Project Information

Energy Code: 2012 IECC
 Project Title: A New Facility for Gregg County Parking Garage and Office
 Location: Longview, Texas
 Climate Zone: 3a
 Project Type: New Construction
 Vertical Glazing / Wall Area: 17%

Construction Site:
 100 E. Methvin St.
 Longview, TX 75601

Owner/Agent:
 Gregg County
 101 East Methvin
 Longview, TX 75601
 903-758-6181

Designer/Contractor:
 Brad Naeher
 Schwarz-Hanson
 2570 River Park Plaza
 Suite 100
 Fort Worth, TX 76116
 817-377-3600
 tod@schwarz-hanson.com

Additional Efficiency Package(s)

High efficiency HVAC. Systems that do not meet the performance requirement will be identified in the mechanical requirements checklist report.

| Building Area | Floor Area |
|---------------------------|------------|
| 1-Office : Nonresidential | 13701 |

Envelope Assemblies

| Assembly | Gross Area or Perimeter | Cavity R-Value | Cont. R-Value | Proposed U-Factor | Budget U- Factor ^(a) |
|---|-------------------------------|-------------------|------------------|----------------------|------------------------------------|
| Office Floor: Concrete Floor (over unconditioned space), [Bldg. Use 1 - Office] | 13338 | --- | 10.0 | 0.076 | 0.076 |
| Office Garage Deck Roof: Other Attic Roof, [Bldg. Use 1 - Office] (b) | 9623 | --- | --- | 0.027 | 0.027 |
| Office Parapet Roof: Insulation Entirely Above Deck: High Albedo Roof Required, 3-Year-Aged Solar Reflectance = 0.55, Thermal Emittance = 0.75 (d), [Bldg. Use 1 - Office] | 3385 | --- | 25.0 | 0.039 | 0.048 |
| 1st Floor Elev. Lobby: Concrete Floor (over unconditioned space), [Bldg. Use 1 - Office] | 216 | --- | 10.0 | 0.076 | 0.076 |
| 2nd Floor Elev. Lobby: Concrete Floor (over unconditioned space), [Bldg. Use 1 - Office] | 127 | --- | 0.0 | 0.322 | 0.076 |
| 3rd Floor Elev. Lobby: Concrete Floor (over unconditioned space), [Bldg. Use 1 - Office] | 127 | --- | 0.0 | 0.322 | 0.076 |
| Top Floor Elev. Lobby: Concrete Floor (over unconditioned space), [Bldg. Use 1 - Office] | 138 | --- | 0.0 | 0.322 | 0.076 |
| Top Floor Elev. Lobby Roof: Insulation Entirely Above Deck: High Albedo Roof Required, 3-Year-Aged Solar Reflectance = 0.55, Thermal Emittance = 0.75 (d), [Bldg. Use 1 - Office] | 143 | --- | 25.0 | 0.039 | 0.048 |
| NORTH | | | | | |
| North Elevation: Solid Concrete:9" Thickness, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 2476 | 0.0 | 7.6 | 0.097 | 0.110 |
| W05 x 3: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 432 | --- | --- | 0.460 | 0.460 |

| Assembly | Gross Area or Perimeter | Cavity R-Value | Cont. R-Value | Proposed U-Factor | Budget U- Factor_(a) |
|---|--|---------------------------|--------------------------|------------------------------|---|
| W04 x 3: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 444 | --- | --- | 0.460 | 0.460 |
| W03: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 45 | --- | --- | 0.460 | 0.460 |
| Door 100: Glass (> 50% glazing):Metal Frame, Entrance Door, Perf. Specs.: Product ID PENDING ID, SHGC 0.25, PF 0.40, [Bldg. Use 1 - Office] (c) | 42 | --- | --- | 0.770 | 0.770 |
| 1st Floor Elev. LobbyNorth Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 336 | 0.0 | 7.6 | 0.093 | 0.110 |
| W19: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, PF 1.00, [Bldg. Use 1 - Office] (c) | 12 | --- | --- | 0.460 | 0.460 |
| Door 160: Glass (> 50% glazing):Metal Frame, Entrance Door, Perf. Specs.: Product ID pendin id, SHGC 0.25, PF 1.00, [Bldg. Use 1 - Office] (c) | 42 | --- | --- | 0.770 | 0.770 |
| 2nd Floor Elev. Lobby North Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 125 | 0.0 | 7.6 | 0.093 | 0.110 |
| 3rd Floor Elev. Lobby North Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 125 | 0.0 | 7.6 | 0.093 | 0.110 |
| Top Floor Elev. Lobby North Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 138 | 0.0 | 7.6 | 0.093 | 0.110 |
| EAST | | | | | |
| East Elevation: Solid Concrete:9" Thickness, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 881 | 0.0 | 7.6 | 0.097 | 0.110 |
| W05: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 12 | --- | --- | 0.460 | 0.460 |
| Door 157: Glass (> 50% glazing):Metal Frame, Entrance Door, Perf. Specs.: Product ID pending id, SHGC 0.25, PF 1.00, [Bldg. Use 1 - Office] (c) | 42 | --- | --- | 0.770 | 0.770 |
| 1st Floor Elev. Lobby East Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 157 | 0.0 | 7.6 | 0.093 | 0.110 |
| 2nd Floor Elev. Lobby East Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 116 | 0.0 | 7.6 | 0.093 | 0.110 |
| 3rd Floor Elev. Lobby East Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 116 | 0.0 | 7.6 | 0.093 | 0.110 |
| Top Floor Elev. Lobby East Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 104 | 0.0 | 7.6 | 0.093 | 0.110 |
| SOUTH | | | | | |
| South Elevation: Solid Concrete:9" Thickness, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 2653 | 0.0 | 7.6 | 0.097 | 0.110 |
| Door 137B: Insulated Metal, Swinging, [Bldg. Use 1 - Office] | 42 | --- | --- | 0.610 | 0.610 |
| 1st Floor Elev. Lobby South Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 252 | 0.0 | 7.6 | 0.093 | 0.110 |
| W21: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID PENDING ID, SHGC 0.25, PF 1.00, [Bldg. Use 1 - Office] (c) | 85 | --- | --- | 0.460 | 0.460 |
| 2nd Floor Elev. Lobby South Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 125 | 0.0 | 7.6 | 0.093 | 0.110 |
| W29: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 29 | --- | --- | 0.460 | 0.460 |
| Door 260: Glass (> 50% glazing):Metal Frame, Entrance Door, Perf. Specs.: Product ID pending id, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 21 | --- | --- | 0.770 | 0.770 |
| 3rd Floor Elev. Lobby South Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 125 | 0.0 | 7.6 | 0.093 | 0.110 |
| W29: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 29 | --- | --- | 0.460 | 0.460 |
| Door 360: Glass (> 50% glazing):Metal Frame, Entrance Door, Perf. Specs.: Product ID pending id, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 21 | --- | --- | 0.770 | 0.770 |
| Top Floor Elev. Lobby South Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 138 | 0.0 | 7.6 | 0.093 | 0.110 |

| Assembly | Gross Area or Perimeter | Cavity R-Value | Cont. R-Value | Proposed U-Factor | Budget U- Factor ^(a) |
|--|-------------------------------|-------------------|------------------|----------------------|------------------------------------|
| W25: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 45 | --- | --- | 0.460 | 0.460 |
| Door 460: Glass (> 50% glazing):Metal Frame, Entrance Door, Perf. Specs.: Product ID pending id, SHGC 0.25, PF 0.88, [Bldg. Use 1 - Office] (c) | 21 | --- | --- | 0.770 | 0.770 |
| WEST | | | | | |
| West Elevation: Solid Concrete:9" Thickness, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 1274 | 0.0 | 7.6 | 0.097 | 0.110 |
| W01: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 24 | --- | --- | 0.460 | 0.460 |
| W02 x 6: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID PENDING ID, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 174 | --- | --- | 0.460 | 0.460 |
| Door 137A: Glass (> 50% glazing):Metal Frame, Entrance Door, Perf. Specs.: Product ID PENDING ID, SHGC 0.25, PF 0.38, [Bldg. Use 1 - Office] (c) | 21 | --- | --- | 0.770 | 0.770 |
| 1st Floor Elev. Lobby West Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 157 | 0.0 | 7.6 | 0.093 | 0.110 |
| 2nd Floor Elev. Lobby West Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 116 | 0.0 | 7.6 | 0.093 | 0.110 |
| W22: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, PF 1.00, [Bldg. Use 1 - Office] (c) | 28 | --- | --- | 0.460 | 0.460 |
| 3rd Floor Elev. Lobby West Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 116 | 0.0 | 7.6 | 0.093 | 0.110 |
| W22: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, PF 1.00, [Bldg. Use 1 - Office] (c) | 28 | --- | --- | 0.460 | 0.460 |
| Top Floor Elev. Lobby West Wall: Concrete Block:8", Partially Grouted, Cells Empty, Normal Density, Furring: Metal, [Bldg. Use 1 - Office] | 104 | 0.0 | 7.6 | 0.093 | 0.110 |
| W24: Metal Frame with Thermal Break:Fixed, Perf. Specs.: Product ID pending id, SHGC 0.25, [Bldg. Use 1 - Office] (c) | 28 | --- | --- | 0.460 | 0.460 |

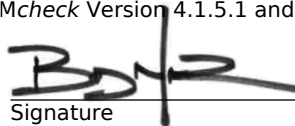
- (a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.
(b) 'Other' components require supporting documentation for proposed U-factors.
(c) Fenestration product performance must be certified in accordance with NFRC and requires supporting documentation.
(d) High albedo roof requirement options: 1) 3-year aged solar reflectance ≥ 0.55 thermal emittance ≥ 0.75 , 2) 3-year aged solar reflectance index ≥ 64.0 , 3) Initial year aged solar reflectance ≥ 0.70 thermal emittance ≥ 0.75 , 4) Initial year aged solar reflectance index ≥ 82.0 .

Envelope PASSES: Design 2% better than code

Envelope Compliance Statement

Compliance Statement: The proposed envelope design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed envelope systems have been designed to meet the 2012 IECC requirements in COMcheck Version 4.1.5.1 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Brad Naeher - Senior Associate
Name - Title


Signature

01-14-2022
Date



Inspection Checklist

Energy Code: 2012 IECC

Requirements: 0.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

| Section # & Req.ID | Plan Review | Complies? | Comments/Assumptions |
|--------------------------------|---|--|----------------------|
| C103.2 [PR1] ¹ | Plans and/or specifications provide all information with which compliance can be determined for the building envelope and document where exceptions to the standard are claimed. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C402.3.1 [PR10] ¹ | The vertical fenestration area <= 30 percent of the gross above-grade wall area. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C402.3.1 [PR11] ¹ | The skylight area <= 3 percent of the gross roof area. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C402.3.2 [PR14] ¹ | In enclosed spaces > 10,000 ft ² directly under a roof with ceiling heights > 15 ft. and used as an office, lobby, atrium, concourse, corridor, storage, gymnasium/exercise center, convention center, automotive service, manufacturing, non-refrigerated warehouse, retail store, distribution/sorting area, transportation, or workshop, the following requirements apply: (a) the daylight zone under skylights is >= half the floor area; (b) the skylight area to daylight zone is >= 3 percent with a skylight VT >= 0.40; or a minimum skylight effective aperture >= 1 percent. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C402.3.2.2 [PR15] ¹ | Skylights in office, storage, automotive service, manufacturing, non-refrigerated warehouse, retail store, and distribution/sorting area have a measured haze value > 90 percent unless designed to exclude direct sunlight. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |

Additional Comments/Assumptions:

| | | | | | |
|---|----------------------|---|------------------------|---|---------------------|
| 1 | High Impact (Tier 1) | 2 | Medium Impact (Tier 2) | 3 | Low Impact (Tier 3) |
|---|----------------------|---|------------------------|---|---------------------|

| Section # & Req.ID | Footing / Foundation Inspection | Complies? | Comments/Assumptions |
|----------------------------------|---|--|--|
| C403.2.8.1 [FO6] ¹ | Exterior insulation protected against damage, sunlight, moisture, wind, landscaping and equipment maintenance activities. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C402.2.8 [FO12] ³ | Bottom surface of floor structures incorporating radiant heating insulated to $\geq R-3.5$. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | <i>See the Envelope Assemblies table for values.</i> |

Additional Comments/Assumptions:

| | | |
|------------------------|--------------------------|-----------------------|
| 1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3) |
|------------------------|--------------------------|-----------------------|

| Section # & Req.ID | Framing / Rough-In Inspection | Complies? | Comments/Assumptions |
|--|--|--|--|
| C402.4.3, C402.4.4 [FR18] ³ | Factory-built fenestration and doors are labeled as meeting air leakage requirements. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C402.4.7 [FR17] ³ | Vestibules are installed on all building entrances. Doors have self-closing devices. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C402.3.3, C402.3.4 [FR8] ¹ | Vertical fenestration U-Factor. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | <i>See the Envelope Assemblies table for values.</i> |
| C402.3.3 [FR10] ¹ | Vertical fenestration SHGC value. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | <i>See the Envelope Assemblies table for values.</i> |
| C303.1.3 [FR12] ² | Fenestration products rated in accordance with NFRC. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C303.1.3 [FR13] ¹ | Fenestration products are certified as to performance labels or certificates provided. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |

Additional Comments/Assumptions:

| | | |
|------------------------|--------------------------|-----------------------|
| 1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3) |
|------------------------|--------------------------|-----------------------|

| Section # & Req.ID | Mechanical Rough-In Inspection | Complies? | Comments/Assumptions |
|----------------------------------|---|--|----------------------|
| C402.4.5.1 [ME3] ³ | Stair and elevator shaft vents have motorized dampers that automatically close. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |

Additional Comments/Assumptions:

| | | |
|------------------------|--------------------------|-----------------------|
| 1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3) |
|------------------------|--------------------------|-----------------------|

| Section # & Req.ID | Insulation Inspection | Complies? | Comments/Assumptions |
|----------------------------------|--|--|--|
| C402.4.1.1 [IN1] ¹ | All sources of air leakage in the building thermal envelope are sealed, caulked, gasketed, weather stripped or wrapped with moisture vapor-permeable wrapping material to minimize air leakage. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C402.4.2.1 [IN2] ¹ | Roof R-value. For some ceiling systems, verification may need to occur during Framing Inspection. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | <i>See the Envelope Assemblies table for values.</i> |
| C303.2 [IN3] ¹ | Roof insulation installed per manufacturer's instructions. Blown or poured loose-fill insulation is installed only where the roof slope is ≤ 3 in 12. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C402.2.1.1 [IN5] ³ | High-albedo roofs satisfy one of the following: 3-year-aged solar reflectance ≥ 0.55 and thermal emittance ≥ 0.75 , 3-year-aged solar reflectance index ≥ 64.0 , initial year solar reflectance ≥ 0.70 and thermal emittance ≥ 0.75 , or initial year solar reflectance index ≥ 82.0 . | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C303.2 [IN7] ¹ | Above-grade wall insulation installed per manufacturer's instructions. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C104 [IN8] ² | Installed floor insulation type and R-value consistent with insulation specifications reported in plans and COMcheck reports. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | <i>See the Envelope Assemblies table for values.</i> |
| C303.2 [IN9] ² | Floor insulation installed per manufacturer's instructions. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C303.1 [IN10] ² | Building envelope insulation is labeled with R-value or insulation certificate providing R-value and other relevant data. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C303.2.1 [IN14] ² | Exterior insulation is protected from damage with a protective material. Verification for exposed foundation insulation may need to occur during Foundation Inspection. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |

Additional Comments/Assumptions:

| | | | | | |
|---|----------------------|---|------------------------|---|---------------------|
| 1 | High Impact (Tier 1) | 2 | Medium Impact (Tier 2) | 3 | Low Impact (Tier 3) |
|---|----------------------|---|------------------------|---|---------------------|

| Section # & Req.ID | Final Inspection | Complies? | Comments/Assumptions |
|------------------------------|--|--|----------------------|
| C402.4.6 [FI37] ¹ | Weatherseals installed on all loading dock cargo doors. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| C402.4.8 [FI26] ³ | Recessed luminaires in thermal envelope to limit infiltration and be IC rated and labeled. Seal between interior finish and luminaire housing. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |

Additional Comments/Assumptions:

| | | |
|------------------------|--------------------------|-----------------------|
| 1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3) |
|------------------------|--------------------------|-----------------------|



Interior Lighting Compliance Certificate

Project Information

Energy Code: 90.1 (2016) Standard
 Project Title: Gregg County - Parking Garage & Office
 Project Type: New Construction

Construction Site: 100 E. Methvin St.
 Longview, TX 75601
 Owner/Agent:
 Designer/Contractor:

Allowed Interior Lighting Power

| A Area Category | B Floor Area (ft2) | C Allowed Watts / ft2 | D Allowed Watts (B X C) |
|-----------------------|--------------------------|-----------------------------|-------------------------------|
| 1-Parking Garage | 93638 | 0.15 | 14046 |
| Total Allowed Watts = | | | 14046 |

Proposed Interior Lighting Power

| A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast | B Lamps/ Fixture | C # of Fixtures | D Fixture Watt. | E (C X D) |
|---|------------------------|-----------------------|-----------------------|--------------|
| <u>1-Parking Garage</u> | | | | |
| LED 1: F1: LED Roadway-Parking Unit 54W: | 1 | 99 | 56 | 5544 |
| LED 2: F4: LED Panel 60W: | 1 | 12 | 60 | 720 |
| LED 3: F7: LED Panel 70W: | 1 | 2 | 73 | 146 |
| LED 3 copy 1: F7A: LED Panel 70W: | 1 | 2 | 73 | 146 |
| LED 5: F8: LED A Lamp 25W: | 1 | 12 | 25 | 300 |
| LED 6: A1: LED Panel 19W: | 1 | 192 | 16 | 3072 |
| LED 7: H: LED MR 4W: | 1 | 9 | 4 | 40 |
| LED 8: E: LED Other Fixture Unit 25W: | 1 | 4 | 21 | 84 |
| LED 9: C1: LED Linear 20W: | 1 | 24 | 19 | 461 |
| LED 10: C2: LED Linear 33W: | 1 | 21 | 30 | 630 |
| LED 11: C3: LED Linear 33W: | 1 | 16 | 40 | 640 |
| LED 12: C4: LED Linear 33W: | 1 | 17 | 38 | 643 |
| LED 13: LED Other Fixture Unit 13W: | 2 | 4 | 14 | 56 |
| Total Proposed Watts = | | | | 12482 |

Interior Lighting PASSES: Design 11% better than code

Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 90.1 (2016) Standard requirements in COMcheck Version 4.1.1.0 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

GABRIEL SALAZAR PE

10-20-2021

Name - Title

Signature

Date



Exterior Lighting Compliance Certificate

Project Information

Energy Code: 90.1 (2016) Standard
 Project Title: Gregg County - Parking Garage & Office
 Project Type: New Construction
 Exterior Lighting Zone: 3 (Other)

Construction Site: 100 E. Methvin St.
 Longview, TX 75601
 Owner/Agent: _____
 Designer/Contractor: _____

Allowed Exterior Lighting Power

| A Area/Surface Category | B Quantity | C Allowed Watts / Unit | D Tradable Wattage | E Allowed Watts (B X C) |
|--|---------------|------------------------------|--------------------------|-------------------------------|
| Parking area | 31100 ft2 | 0.06 | Yes | 1866 |
| Total Tradable Watts (a) = | | | | 1866 |
| Total Allowed Watts = | | | | 1866 |
| Total Allowed Supplemental Watts (b) = | | | | 500 |

- (a) Wattage tradeoffs are only allowed between tradable areas/surfaces.
- (b) A supplemental allowance equal to 500 watts may be applied toward compliance of both non-tradable and tradable areas/surfaces.

Proposed Exterior Lighting Power

| A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast | B Lamps/ Fixture | C # of Fixtures | D Fixture Watt. | E (C X D) |
|---|------------------------|-----------------------|-----------------------|--------------|
| Parking area (31100 ft2): Tradable Wattage | | | | |
| LED 1: F2: LED Roadway-Parking Unit 220W: | 1 | 6 | 187 | 1122 |
| LED 2: F3: LED Roadway-Parking Unit 106W: | 1 | 1 | 102 | 102 |
| LED 3: B: LED Other Fixture Unit 36W: | 1 | 2 | 35 | 70 |
| LED 4: I: LED A Lamp 25W: | 2 | 7 | 50 | 350 |
| Total Tradable Proposed Watts = | | | | 1644 |

Exterior Lighting PASSES: Design 31% better than code

Exterior Lighting Compliance Statement

Compliance Statement: The proposed exterior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed exterior lighting systems have been designed to meet the 90.1 (2016) Standard requirements in COMcheck Version 4.1.1.0 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

GABRIEL SALAZAR PE

Name - Title

Signature

10-20-2021

Date





Inspection Checklist

Energy Code: 90.1 (2016) Standard

Requirements: 0.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

| Section # & Req.ID | Plan Review | Complies? | Comments/Assumptions |
|---|---|--|----------------------|
| 4.2.2, 8.4.1.1, 8.4.1.2, 8.7 [PR6] ² | Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Feeder connectors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 4.2.2, 9.4.3, 9.7 [PR4] ¹ | Plans, specifications, and/or calculations provide all information with which compliance can be determined for the interior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.7 [PR8] ¹ | Plans, specifications, and/or calculations provide all information with which compliance can be determined for the exterior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include exterior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |

Additional Comments/Assumptions:

| | | | | | |
|---|----------------------|---|------------------------|---|---------------------|
| 1 | High Impact (Tier 1) | 2 | Medium Impact (Tier 2) | 3 | Low Impact (Tier 3) |
|---|----------------------|---|------------------------|---|---------------------|

| Section # & Req.ID | Rough-In Electrical Inspection | Complies? | Comments/Assumptions |
|------------------------------|---|--|----------------------|
| 8.4.2 [EL10] ² | At least 50% of all 125 volt 15- and 20-Amp receptacles are controlled by an automatic control device. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 8.4.3 [EL11] ² | New buildings have electrical energy use measurement devices installed. Where tenant spaces exist, each tenant is monitored separately. In buildings with a digital control system the energy use is transmitted to control system and displayed graphically. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.4.1.1 [EL1] ² | Automatic control requirements prescribed in Table 9.6.1, for the appropriate space type, are installed. Mandatory lighting controls (labeled as 'REQ') and optional choice controls (labeled as 'ADD1' and 'ADD2') are implemented. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.4.1.1 [EL2] ² | Independent lighting controls installed per approved lighting plans and all manual controls readily accessible and visible to occupants. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.4.1.2a [EL22] ² | Parking garage lighting is equipped with automatic shutoff controls per Section 9.4.1.1(i). | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.4.1.2b [EL23] ² | Parking garage luminaire power is automatically reduced by $\geq 30\%$ when zone $< 3600 \text{ ft}^2$ has no occupancy after 20 minutes. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.4.1.2c [EL24] ² | Parking garage luminaires in or around covered entrances/exits between building and garage automatically reduced by $\geq 50\%$ from sunset to sunrise. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.4.1.2d [EL25] ² | Parking garage: Power to luminaires $\leq 20 \text{ ft}$ of any perimeter wall that has a net opening-to-wall ratio $\geq 40\%$ and no exterior obstructions within 20 ft, is automatically reduced in response to daylight $\geq 50\%$. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.4.1.1f [EL13] ¹ | Daylight areas under skylights and roof monitors that have more than 150 W combined input power for general lighting are controlled by photocontrols. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.4.1.4 [EL3] ² | Automatic lighting controls for exterior lighting installed. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.4.1.4d [EL21] ² | Outdoor parking area luminaires $\geq 78\text{W}$ and $\leq 24 \text{ ft}$ height controlled to reduce wattage by 50% when area unoccupied over 15 minutes. Controlled power limited to $\leq 1500\text{W}$. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |

1 High Impact (Tier 1)
 2 Medium Impact (Tier 2)
 3 Low Impact (Tier 3)

| Section # & Req.ID | Rough-In Electrical Inspection | Complies? | Comments/Assumptions |
|----------------------------|---|--|----------------------|
| 9.4.1.3 [EL4] ¹ | Separate lighting control devices for specific uses installed per approved lighting plans. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.6.2 [EL8] ¹ | Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |

Additional Comments/Assumptions:

| | | |
|------------------------|--------------------------|-----------------------|
| 1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3) |
|------------------------|--------------------------|-----------------------|

| Section # & Req.ID | Final Inspection | Complies? | Comments/Assumptions |
|-----------------------------|---|--|---|
| 8.7.1 [FI16] ³ | Furnished as-built drawings for electric power systems within 30 days of system acceptance. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 8.7.2 [FI17] ³ | Furnished O&M instructions for systems and equipment to the building owner or designated representative. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 9.2.2.3 [FI18] ¹ | Interior installed lamp and fixture lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | <i>See the Interior Lighting fixture schedule for values.</i> |
| 9.4.2 [FI19] ¹ | Exterior lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | <i>See the Exterior Lighting fixture schedule for values.</i> |
| 9.4.4 [FI20] ¹ | At least 75% of all permanently installed lighting fixtures in dwelling units have ≥ 55 lm/W efficacy or a ≥ 45 lm/W total luminaire efficacy. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |

Additional Comments/Assumptions:

| | | | | | |
|---|----------------------|---|------------------------|---|---------------------|
| 1 | High Impact (Tier 1) | 2 | Medium Impact (Tier 2) | 3 | Low Impact (Tier 3) |
|---|----------------------|---|------------------------|---|---------------------|



Mechanical Compliance Certificate

Project Information

Energy Code: 90.1 (2013) Standard
Project Title: Gregg County Parking Garage and Office
Location: Longview, Texas
Climate Zone: 3a
Project Type: New Construction

Construction Site:
100 E. Methvin St
Longview, TX 75601

Owner/Agent:
James Brooks
Walker Consultants
2525 Bay Area Blvd
Suite 400
Houston, TX 77058
281-280-0068
jbroks@walkerconsultant.com

Designer/Contractor:
Tom Frey
Progressive AE
1811 4 Mile Rd.
Grand Rapids, MI 49525
6163612664
freyt@progressiveae.com

Mechanical Systems List

Quantity System Type & Description

- 5 HP-1, 3, 4, 5, 6 (Single Zone):
Split System Heat Pump
Heating Mode: Capacity = 55 kBtu/h,
Proposed Efficiency = 8.50 HSPF, Required Efficiency = 8.20 HSPF
Cooling Mode: Capacity = 53 kBtu/h,
Proposed Efficiency = 16.00 SEER, Required Efficiency: 14.00 SEER
Fan System: None
- 1 HP-2 (Single Zone):
Split System Heat Pump
Heating Mode: Capacity = 31 kBtu/h,
Proposed Efficiency = 9.00 HSPF, Required Efficiency = 8.20 HSPF
Cooling Mode: Capacity = 30 kBtu/h,
Proposed Efficiency = 16.00 SEER, Required Efficiency: 14.00 SEER
Fan System: None
- 1 HP-7 (Single Zone):
Split System Heat Pump
Heating Mode: Capacity = 55 kBtu/h,
Proposed Efficiency = 8.50 HSPF, Required Efficiency = 8.20 HSPF
Cooling Mode: Capacity = 53 kBtu/h,
Proposed Efficiency = 16.00 SEER, Required Efficiency: 14.00 SEER
Fan System: None
- 4 AC-160,260, 360, 460 (Single Zone):
Split System Heat Pump
Heating Mode: Capacity = 12 kBtu/h,
Proposed Efficiency = 9.50 HSPF, Required Efficiency = 8.20 HSPF
Cooling Mode: Capacity = 12 kBtu/h,
Proposed Efficiency = 19.00 SEER, Required Efficiency: 14.00 SEER
Fan System: None
- 2 AC-1, 2 (Single Zone):
Cooling: 2 each - Split System, Capacity = 18 kBtu/h, Air-Cooled Condenser
Proposed Efficiency = 19.00 SEER, Required Efficiency: 13.00 SEER
Fan System: None
- 1 HVAC System 7 (Single Zone):

Quantity System Type & Description

Heating: 1 each - Duct Furnace, Electric, Capacity = 31 kBtu/h

No minimum efficiency requirement applies

Cooling: 1 each - Single Package DX Unit, Capacity = 72 kBtu/h, Air-Cooled Condenser, Air Economizer

Proposed Efficiency = 12.20 EER, Required Efficiency: 11.20 EER + 12.9 IEER

Fan System: None

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 90.1 (2013) Standard requirements in COMcheck Version 4.1.5.3 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Name - Title

Signature

Date



Inspection Checklist

Energy Code: 90.1 (2013) Standard

Requirements: 96.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

| Section # & Req.ID | Plan Review | Complies? | Comments/Assumptions |
|---|--|--|--|
| 4.2.2, 6.4.4.2.1, 6.7.2 [PR2] ¹ | Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: SEE ALL |
| 4.2.2, 8.4.1.1, 8.4.1.2, 8.7 [PR6] ² | Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Feeder connectors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 6.7.2.4 [PR5] ¹ | Detailed instructions for HVAC systems commissioning included on the plans or specifications for projects >=50,000 ft ² . | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |

Additional Comments/Assumptions:

| | | | | | |
|---|----------------------|---|------------------------|---|---------------------|
| 1 | High Impact (Tier 1) | 2 | Medium Impact (Tier 2) | 3 | Low Impact (Tier 3) |
|---|----------------------|---|------------------------|---|---------------------|

| Section # & Req.ID | Footing / Foundation Inspection | Complies? | Comments/Assumptions |
|----------------------------|--|--|---|
| 6.4.3.7 [FO9] ³ | Freeze protection and snow/ice melting system sensors for future connection to controls. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |

Additional Comments/Assumptions:

| | | |
|------------------------|--------------------------|-----------------------|
| 1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3) |
|------------------------|--------------------------|-----------------------|

| Section # & Req.ID | Mechanical Rough-In Inspection | Plans Verified Value | Field Verified Value | Complies? | Comments/Assumptions |
|-------------------------------------|--|----------------------|----------------------|--|---|
| 6.4.1.4, 6.4.1.5 [ME1] ² | HVAC equipment efficiency verified. Non-NAECA HVAC equipment labeled as meeting 90.1. | Efficiency: _____ | Efficiency: _____ | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | See the Mechanical Systems list for values. |
| 6.4.3.4.1 [ME3] ³ | Stair and elevator shaft vents have motorized dampers that automatically close. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. |
| 6.4.3.4.5 [ME39] ³ | Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: ALL M DWGS |
| 6.4.3.4.4 [ME5] ³ | Ventilation fans >0.75 hp have automatic controls to shut off fan when not required. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: M-001 |
| 6.4.3.8 [ME6] ¹ | Demand control ventilation provided for spaces >500 ft ² and >25 people/1000 ft ² occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: M-001 |
| 6.5.3.2.1 [ME40] ² | DX cooling systems >= 75 kBtu/h (>= 65 kBtu/h effective 1/2016) and chilled-water and evaporative cooling fan motor hp >= ¼ designed to vary indoor fan airflow as a function of load and comply with operational requirements. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: M-001 See the Mechanical Systems list for values. |
| 6.4.4.1.1 [ME7] ³ | Insulation exposed to weather protected from damage. Insulation outside of the conditioned space and associated with cooling systems is vapor retardant. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. |
| 6.4.4.1.2 [ME8] ² | HVAC ducts and plenums insulated. Where ducts or plenums are installed in or under a slab, verification may need to occur during Foundation Inspection. | R- _____ | R- _____ | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. |
| 6.4.4.1.3 [ME9] ² | HVAC piping insulation thickness. Where piping is installed in or under a slab, verification may need to occur during Foundation Inspection. | _____ in. | _____ in. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.4.4.1.4 [ME41] ³ | Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.4.4.2.1 [ME10] ² | Ducts and plenums sealed based on static pressure and location. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: ALL M DWGS |

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

| Section # & Req.ID | Mechanical Rough-In Inspection | Plans Verified Value | Field Verified Value | Complies? | Comments/Assumptions |
|-------------------------------|--|----------------------|----------------------|--|---|
| 6.4.4.2.2 [ME11] ³ | Ductwork operating >3 in. water column requires air leakage testing. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.4.4.2.2 [ME11] ³ | Ductwork operating >3 in. water column requires air leakage testing. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.4.4.2.2 [ME11] ³ | Ductwork operating >3 in. water column requires air leakage testing. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.4.4.2.2 [ME11] ³ | Ductwork operating >3 in. water column requires air leakage testing. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.4.4.2.2 [ME11] ³ | Ductwork operating >3 in. water column requires air leakage testing. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.4.4.2.2 [ME11] ³ | Ductwork operating >3 in. water column requires air leakage testing. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.5.2.3 [ME19] ³ | Dehumidification controls provided to prevent reheating, recooling, mixing of hot and cold airstreams or concurrent heating and cooling of the same airstream. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Cooling capacity 80 kBtu/h and capability to unload cooling equipment. |
| 6.5.2.4.1 [ME68] ³ | Humidifiers with airstream mounted preheating jackets have preheat auto-shutoff value set to activate when humidification is not required. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.5.2.4.2 [ME69] ³ | Humidification system dispersion tube hot surfaces in the airstreams of ducts or air-handling units insulated \geq R-0.5. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.5.2.5 [ME70] ³ | Preheat coils controlled to stop heat output whenever mechanical cooling, including economizer operation, is active. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: M-001 |
| 6.5.3.3 [ME42] ³ | Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. <i>See the Mechanical Systems list for values.</i> |
| 6.5.3.3 [ME42] ³ | Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. <i>See the Mechanical Systems list for values.</i> |

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

| Section # & Req.ID | Mechanical Rough-In Inspection | Plans Verified Value | Field Verified Value | Complies? | Comments/Assumptions |
|-------------------------------|--|----------------------|----------------------|--|---|
| 6.5.3.3 [ME42] ³ | Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. <i>See the Mechanical Systems list for values.</i> |
| 6.5.3.3 [ME42] ³ | Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. <i>See the Mechanical Systems list for values.</i> |
| 6.5.3.3 [ME42] ³ | Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. <i>See the Mechanical Systems list for values.</i> |
| 6.5.3.3 [ME42] ³ | Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. <i>See the Mechanical Systems list for values.</i> |
| 6.5.4.2 [ME25] ³ | HVAC pumping systems >10 hp designed for variable fluid flow. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: NA |
| 6.5.6.1 [ME56] ¹ | Exhaust air energy recovery on systems meeting Tables 6.5.6.1-1, and 6.5.6.1-2. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.5.7.1.1 [ME32] ² | Kitchen hoods >5,000 cfm have make up air >=50% of exhaust air volume. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.5.7.1.5 [ME49] ³ | Approved field test used to evaluate design air flow rates and demonstrate proper capture and containment of kitchen exhaust systems. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. |
| 6.5.8.1 [ME34] ² | Unenclosed spaces that are heated use only radiant heat. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Exception: Requirement does not apply. |
| 6.5.9 [ME35] ¹ | Hot gas bypass limited to: <=240 kBtu/h - 15% >240 kBtu/h - 10% | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: M-001 |
| 6.5.9 [ME35] ¹ | Hot gas bypass limited to: <=240 kBtu/h - 15% >240 kBtu/h - 10% | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: M-001 |
| 6.4.3.9 [ME63] ² | Heating for vestibules and air curtains include automatic controls that shut off the heating system when outdoor air temperatures > 45F. Vestibule heating systems controlled by a thermostat in the vestibule with setpoint <= 60F. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. |

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

| Section # & Req.ID | Mechanical Rough-In Inspection | Plans Verified Value | Field Verified Value | Complies? | Comments/Assumptions |
|----------------------------|---|----------------------|----------------------|--|---|
| 6.5.10 [ME73] ³ | Doors separating conditioned space from the outdoors have controls that disable/reset heating and cooling system when open. | | | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: ARCH DWGS |

Additional Comments/Assumptions:

| | | | | | |
|---|----------------------|---|------------------------|---|---------------------|
| 1 | High Impact (Tier 1) | 2 | Medium Impact (Tier 2) | 3 | Low Impact (Tier 3) |
|---|----------------------|---|------------------------|---|---------------------|

| Section # & Req.ID | Rough-In Electrical Inspection | Complies? | Comments/Assumptions |
|---------------------------|--|--|---|
| 8.4.2 [EL10] ² | At least 50% of all 125 volt 15- and 20-Amp receptacles are controlled by an automatic control device. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | |
| 10.4.1 [EL9] ² | Electric motors meet requirements where applicable. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: SPECS, 23000 |

Additional Comments/Assumptions:

| | | |
|------------------------|--------------------------|-----------------------|
| 1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3) |
|------------------------|--------------------------|-----------------------|

| Section # & Req.ID | Final Inspection | Complies? | Comments/Assumptions |
|-------------------------------|---|--|---|
| 6.4.3.1.2 [F13] ³ | Thermostatic controls have a 5 °F deadband. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. |
| 6.4.3.2 [F120] ³ | Temperature controls have setpoint overlap restrictions. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: SPECS, 23000 |
| 6.4.3.3.1 [F121] ³ | HVAC systems equipped with at least one automatic shutdown control. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. |
| 6.4.3.3.2 [F122] ³ | Setback controls allow automatic restart and temporary operation as required for maintenance. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: SPECS, 23000 |
| 6.4.3.5 [F15] ³ | Heat pump controls prevent supplemental electric resistance heat from coming on when not needed. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: M-001 |
| 6.4.3.5 [F15] ³ | Heat pump controls prevent supplemental electric resistance heat from coming on when not needed. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: M-001 |
| 6.4.3.5 [F15] ³ | Heat pump controls prevent supplemental electric resistance heat from coming on when not needed. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: M-001 |
| 6.4.3.5 [F15] ³ | Heat pump controls prevent supplemental electric resistance heat from coming on when not needed. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: M-001 |
| 6.4.3.6 [F16] ³ | When humidification and dehumidification are provided to a zone, simultaneous operation is prohibited. Humidity control prohibits the use of fossil fuel or electricity to produce RH > 30% in the warmest zone humidified and RH < 60% in the coldest zone dehumidified. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. |
| 6.7.2.1 [F17] ³ | Furnished HVAC as-built drawings submitted within 90 days of system acceptance. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. |
| 6.7.2.2 [F18] ³ | Furnished O&M manuals for HVAC systems within 90 days of system acceptance. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. |
| 6.7.2.3 [F19] ¹ | An air and/or hydronic system balancing report is provided for HVAC systems serving zones >5,000 ft ² of conditioned area. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: SPECS, 23000 |

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

| Section # & Req.ID | Final Inspection | Complies? | Comments/Assumptions |
|-----------------------------|---|--|---|
| 6.7.2.4 [FI10] ¹ | HVAC control systems have been tested to ensure proper operation, calibration and adjustment of controls. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: SPECS, 23000 |
| 10.4.3 [FI24] ² | Elevators are designed with the proper lighting, ventilation power, and standby mode. | <input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable | Requirement will be met. Location on plans/spec: M-001, M-104 |

Additional Comments/Assumptions:

| | | |
|------------------------|--------------------------|-----------------------|
| 1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3) |
|------------------------|--------------------------|-----------------------|

**SECTION 01 10 00
SUMMARY**

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: 20011 Gregg County - Parking Garage & Office
- B. Owner's Name: Project Name.
- C. Architect's Name: Schwarz Hanson Architects.
- D. The Project consists of the new construction of the development and construction of a new 4-story parking garage with 13,701 sq. ft. office.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 52 00 - Agreement Form.

1.03 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- C. Time Restrictions:
 - 1. Limit conduct of especially noisy exterior work to as outlined by City requirements. []
- D. Utility Outages and Shutdown:
 - 1. Prevent accidental disruption of utility services to other facilities.

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

- A. Section 00 50 00 - Contracting Forms and Supplements: Forms to be used.

1.03 SCHEDULE OF VALUES

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- B. Forms filled out by hand will not be accepted.
- C. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- H. Submit one electronic and three hard-copies of each Application for Payment.
- I. Include the following with the application:
 - 1. Transmittal letter as specified for submittals in Section 01 30 00.
 - 2. Construction progress schedule, revised and current as specified in Section 01 30 00.
 - 3. Partial release of liens from major subcontractors and vendors.
- J. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within [] days.
- D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 6000.
- E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 - 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
- F. Substantiation of Costs: Provide full information required for evaluation.
 - 1. On request, provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 - 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 - 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- J. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 70 00.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 25 00
SUBSTITUTION PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 00 21 13 - Instructions to Bidders: Restrictions on timing of substitution requests.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.
- C. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- D. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

1.04 REFERENCE STANDARDS

- A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage) Current Edition.
- B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase) Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.
- B. Submittal Form (before award of contract):
 - 1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 - 1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Architect will consider requests for substitutions only within 15 days after date of Agreement.
- C. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

- A. Architect will notify Contractor in writing of decision to accept or reject request.

3.05 ACCEPTANCE

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record.

END OF SECTION

**SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Progress photographs.
- F. Submittals for review, information, and project closeout.
- G. Submittal procedures.

1.02 REFERENCE STANDARDS

- A. AIA G810 - Transmittal Letter 2001.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Schedule meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Designation of personnel representing the parties to Contract, [] and .
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Contractor's superintendent.
 - 5. Major subcontractors.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of work progress.
 - 3. Field observations, problems, and decisions.

4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of RFIs log and status of responses.
 7. Maintenance of progress schedule.
 8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Coordination of projected progress.
 11. Maintenance of quality and work standards.
 12. Effect of proposed changes on progress schedule and coordination.
 13. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

- A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- C. Within 10 days after joint review, submit complete schedule.
- D. Submit updated schedule with each Application for Payment.

3.04 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- C. Photography Type: Digital; electronic files.
- D. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- E. In addition to periodic, recurring views, take photographs of each of the following events:
 1. Completion of site clearing.
 2. Excavations in progress.
 3. Foundations in progress and upon completion.
 4. Structural framing in progress and upon completion.
 5. Enclosure of building, upon completion.
 6. Final completion, minimum of ten (10) photos.
- F. Views:
 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 2. Consult with Architect for instructions on views required.
 3. Provide factual presentation.
 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- G. Digital Photographs: 24 bit color, minimum resolution of 1600 by 1200 ("2 megapixel"), in JPG format; provide files unaltered by photo editing software.
 1. Delivery Medium: Via email.
 2. File Naming: Include project identification, date and time of view, and view identification.
 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
 4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.05 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.

2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.06 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.08 SUBMITTAL PROCEDURES

- A. General Requirements:
1. Transmit using approved form.
 - a. Use Contractor's form, subject to prior approval by Architect.
 2. Sequentially identify each item. For revised submittals use original number and a sequential alphabetical suffix.
 3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 4. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 5. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 7. Provide space for Contractor and Architect review stamps.
 8. When revised for resubmission, identify all changes made since previous submission.
 9. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.

10. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 11. Submittals not requested will not be recognized or processed.
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Submit concurrently with related shop drawing submittal.
 4. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Do not reproduce Contract Documents to create shop drawings.
 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
1. Transmit related items together as single package.
 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
 3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

3.09 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 2. Not Authorizing fabrication, delivery, and installation:
 - a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.
- E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

**SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

- A. Section 01 10 00 - Summary: Work sequence.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

1.05 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.06 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
- D. Include conferences and meetings in schedule.
- E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- F. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
- G. Indicate delivery dates for owner-furnished products.
- H. Coordinate content with schedule of values specified in Section 01 20 00 - Price and Payment Procedures.
- I. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.

- B. Identify the first work day of each week.
- C. Indicate major completion milestones

3.04 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.
- G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

3.06 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 01 33 00 - SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal Procedures
- B. Construction Progress Schedules
- C. Product Data
- D. Shop Drawings
- E. Samples
- F. Design Data
- G. Test Reports
- H. Certificates
- I. Manufacturer's Instructions
- J. Manufacturer's Field Reports
- K. Erection Drawings
- L. Required Submittals and Shop Drawings

1.2 RELATED SECTIONS

- A. Section 01 45 00 - Quality Control: Manufacturer's field services and

1.3 reports. SUBMITTAL PROCEDURES

- A. Transmit each submittal with AIA Form G810 or City of Longview accepted form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project, and deliver to the project's Engineer of Record at business address. Coordinate submission of related items.

- F. For each submittal for review, allow fifteen (15) working days, excluding delivery time to and from the Contractor.
- G. Identify ALL variations from the City of Longview standards and Approved Products or system limitations which may be detrimental to successful performance of the completed Work. Variations will require City of Longview's approval.
- H. Provide space for Contractor and Engineer's review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

1.4 PRODUCT DATA

- A. Product Data for Review:
 - 1. Submitted to the project's Engineer of Record for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Plans and construction standards.
 - 2. After review, provide copies and distribute in accordance with Submittal Procedures article above.
- B. Product Data for Information:
 - 1. Submitted for the Engineer of Record's knowledge.
- C. Product Data for Project Closeout:
 - 1. Submitted for the Engineer of Record's benefit.
- D. Submit the number of copies which the Contractor requires, plus three (3) copies which will be retained by the Engineer of Record for the project.
- E. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- F. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.5 SHOP DRAWINGS

- A. Shop Drawings for Review:
 - 1. Submitted to the Engineer of Record for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, produce copies and distribute in accordance with Submittal Procedures article above.
 - B. Shop Drawings for Information:
 1. Submitted for the Engineer of Record's knowledge.
 - C. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- 1.6 DESIGN DATA
- A. Submit for the Engineer of Record's knowledge.
 - B. Submit for information for the limited purpose of assessing conformance with information given and the design concepts.
- 1.7 TEST REPORTS
- A. Submit for the Engineer of Record's knowledge.
 - B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concepts.
- 1.8 CERTIFICATES
- A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Engineer of Record.
 - B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - C. Certificates may be recent or previous test results on material or Product, but must be acceptable to City of Longview.
- 1.9 REQUIRED SUBMITTALS AND SHOP DRAWINGS: Submittals and/or Shop Drawings shall be submitted on the following items, as appropriate, for approval. The omission of any work item requiring a submittal to be furnished to the Engineer of Record prior to use in this project does not relieve the Contractor from responsibility for making all required submittals.
- A. Pipe & Fittings - All Types
 - B. Valves - All Types
 - C. Manhole Frames and Covers
 - D. Meter Boxes
 - E. Lime

20011 Gregg County Parking Garage and Office

- F. Concrete Mix Design for Each Class of Concrete
- G. HMAC Mix Design for Each Class of HMAC
- H. Reinforcing Steel
- I. Paint
- J. Reinforced Concrete Pipe (HDPE Drainage Pipe)
- K. Signs
- L. Prime Coat and Tack Coat
- M. Pre-Cast Manhole Sections
- N. Non-Shrink Grout
- O. Erosion Control Matting
- P. Geofabrics
- Q. Seed, Fertilizer and Mulching Materials
- R. Trees, Shrubs, and Miscellaneous Planting Materials
- S. Sieve Analysis of All Embedment and Foundation Material
- T. Filter Fabric Fence
- U. All Electrical
- V. All Architectural
- W. Brick Pavers
- X. All Signalization
- Y. Other Materials Required in the Technical Specifications

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

**SECTION 01 35 53
SECURITY PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Security measures including formal security program, entry control, personnel identification, guard service, miscellaneous restrictions, and [_____].

1.02 SECURITY PROGRAM

- A. Protect Work and Owner's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program at project mobilization.
- C. Maintain program throughout construction period until Owner occupancy.

1.03 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site .
- B. Allow entrance only to authorized persons with proper identification.
- C. Maintain log of workers and visitors, make available to Owner on request.

1.04 PERSONNEL IDENTIFICATION

- A. Provide identification badge to each person authorized to enter premises.
- B. Badge To Include: Personal photograph, name, assigned number , expiration date and employer.
- C. Require return of badges at expiration of their employment on the Work.

1.05 GUARD SERVICE

1.06 RESTRICTIONS

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 40 00
QUALITY REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. References and standards.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Mock-ups.
- F. Tolerances.
- G. Manufacturers' field services.
- H. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Section 01 42 16 - Definitions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 - 1. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 - 1. Submit report in duplicate within 30 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.04 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Owner will employ services of an independent testing agency to perform certain specified testing; payment for cost of services will be derived from allowance specified in Section 01 21 00; see Section 01 21 00 and applicable sections for description of services included in allowance.
- B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- D. Contractor Employed Agency:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.
- C. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- D. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- E. Accepted mock-ups shall be a comparison standard for the remaining Work.
- F. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and

clear area when directed to do so by Architect.

3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment, and [] as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

**SECTION 01 41 00
REGULATORY REQUIREMENTS**

PART 1 GENERAL

1.01 SUMMARY OF REFERENCE STANDARDS

- A. Regulatory requirements applicable to this project are the following:
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. 29 CFR 1910 - Occupational Safety and Health Standards current edition.
- D. ICC (IFC) - International Fire Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. ICC (IPC) - International Plumbing Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. ICC (IMC) - International Mechanical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. ICC (IFGC) - International Fuel Gas Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. ICC (IECC) - International Energy Conservation Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. Erosion and Sedimentation Control Regulations: Local jurisdiction..
- M. Regulatory requirements as described in each specification section.
- N. Texas Accessibility Standards (for projects with the state of Texas).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 42 16
DEFINITIONS**

PART 1 GENERAL

1.01 SUMMARY

- A. This section supplements the definitions contained in the General Conditions.
- B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

- A. Furnish: To supply, deliver, unload, and inspect for damage.
- B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. Provide: To furnish and install.
- E. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 45 00 - QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality Assurance - Control of Installation
- B. Tolerances
- C. References and Standards
- D. Inspection and Testing Laboratory Services
- E. Manufacturers' Field Services

1.2 RELATED SECTIONS

- A. Section 01 33 00 - Submittals: Schedule of construction materials testing, laboratory qualifications, test results.

1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from City of Longview before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.4 TOLERANCES

- A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer of Record before proceeding.

- C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.5 REFERENCES AND STANDARDS

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Engineer of Record or the City of Longview shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.6 INSPECTION AND TESTING LABORATORY SERVICES

- A. Employ and pay for specified services of an independent firm to perform testing for verification of compliance to contract document.
- B. The independent firm will perform tests and other services specified in individual specification sections and as required by the City of Longview.
- C. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the City of Longview.
- D. Reports will be submitted by the independent firm to the Engineer of Record or the City of Longview and Contractor, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify City of Longview and independent firm 24 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- F. Testing does not relieve Contractor to perform Work to contract requirements.
- G. Re-testing required due to non-conformance with specified requirements shall be performed by the same independent firm, and as instructed by the Engineer of Record.
- H. The Owner shall be responsible for paying for tests indicating conformance with specified requirements has been met. The Contractor shall be responsible for testing charges incurred as a result of failed tests and will be billed directly to for such charges.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specifications sections.
- D. Verify that utility services are available, of the correct characteristics and in the correct locations.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01 45 23 - TESTING SERVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Selection and Payment
- B. Quality Assurance
- C. Agency Responsibilities
- D. Agency Reports
- E. Limits on Testing Authority
- F. Contractor Responsibilities
- G. Schedule of Tests

1.2 RELATED SECTIONS

- A. Section 01 33 00 - Submittals: Manufacturer's certificates.

1.3 REFERENCES

- A. ASTM C802 - Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction.
- B. ASTM C1021 - Practice for Laboratories Engaged in the Testing of Building Sealants.
- C. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- D. ASTM D290 - Recommended Practice for Bituminous Mixing Plant Inspection.
- E. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- F. ASTM D4561 - Practice for Quality Control Systems for an Inspection and Testing Agency for Bituminous Paving Materials.
- G. ASTM E329 - Practice for Use in the Evaluation of Inspection and Testing Agencies as Used in Construction.
- H. ASTM E543 - Practice for Determining the Qualification of Nondestructive Testing Agencies.
- I. ASTM E548 - Practice for Preparation of Criteria for Use in the Evaluation of Testing Laboratories and Inspection Bodies.

- J. ASTM E699 - Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

1.4 SELECTION AND PAYMENT

- A. Employ and pay for services of an independent testing agency or laboratory to perform specified testing.
- B. Employment of testing agency or laboratory in no way relieves Contractor of obligation to perform Work in accordance with requirements of the City of Longview.

1.5 QUALITY ASSURANCE

- A. Laboratory: Authorized to operate in State in which Project is located.
- B. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
- C. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.6 AGENCY RESPONSIBILITIES

- A. Test samples of mixes submitted by Contractor.
- B. Provide qualified personnel at site. Cooperate with the Engineer of Record representative(s) and Contractor in performance of services.
- C. Perform specified sampling and testing of Products in accordance with specified standards.
- D. Ascertain compliance of materials and mixes with requirements of the City of Longview.
- E. Promptly notify the Engineer of Record and Contractor of observed irregularities or non-conformance of Work or Products.
- F. Perform additional tests required by Engineer.
- G. Attend preconstruction meetings and progress meetings.

1.7 AGENCY REPORTS

- A. After each test, promptly submit two copies of report to the Engineer of Record and the City of Longview and to Contractor.
- B. Include:
 - 1. Date Issued
 - 2. Project Title and Number

3. Name of Inspector
 4. Date and Time of Sampling or Inspection
 5. Identification of Product and Specifications Section
 6. Location in the Project
 7. Type of Inspection or Test
 8. Date of Test
 9. Results of Tests
 10. Conformance with Contract Documents
- C. When requested by the City of Longview, provide interpretation of test results.

1.8 LIMITS ON TESTING AUTHORITY

- A. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of City of Longview.
- B. Agency or laboratory may not approve or accept any portion of the Work.
- C. Agency or laboratory may not assume any duties of Contractor.
- D. Agency or laboratory has no authority to stop the Work.

1.9 CONTRACTOR RESPONSIBILITIES

- A. Deliver to agency or laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
- B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
- C. Provide incidental labor and facilities:
 1. To provide access to Work to be tested.
 2. To obtain and handle samples at the site or at source of Products to be tested.
 3. To facilitate tests.
 4. To provide storage and curing of test samples.
- D. Notify the Engineer of Record and laboratory 24 hours prior to expected time for operations requiring testing services.

1.10 SCHEDULE OF TESTS

20011 Gregg County Parking Garage and Office

A. Individual Specification Sections: Tests required and standards for testing.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

**SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Project identification sign.
- I. Field offices.

1.02 RELATED REQUIREMENTS

- A. Section 01 51 00 - Temporary Utilities.
- B. Section 01 52 13 - Field Offices and Sheds.
- C. Section 01 58 13 - Temporary Project Signage.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 51 00

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. New permanent facilities may be used.
- C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Internet Connections: Minimum of one; DSL modem or faster.

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.06 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.08 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.09 SECURITY - SEE SECTION 01 35 53

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.10 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.11 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on drawings.
- B. Erect on site at location indicated.
- C. No other signs are allowed without Owner permission except those required by law.

1.13 FIELD OFFICES - SEE SECTION 01 52 13

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate offices a minimum distance of 30 feet (10 m) from existing and new structures.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 51 00
TEMPORARY UTILITIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

- A. Section 01 50 00 - Temporary Facilities and Controls:
 - 1. Temporary telecommunications services for administrative purposes.
 - 2. Temporary sanitary facilities required by law.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction Current Edition.

1.04 TEMPORARY ELECTRICITY

- A. Cost: By Contractor.
- B. Provide power service required from utility source.
- C. Provide temporary electric feeder from existing building electrical service at location as directed.
- D. Power Service Characteristics: [] volt, [] ampere, three phase, four wire.
- E. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
- F. Provide main service disconnect and over-current protection at convenient location and meter.
- G. Permanent convenience receptacles may be utilized during construction.
- H. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.05 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.
- B. Provide and maintain 1 watt/sq ft (10.8 watt/sq m) lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- D. Maintain lighting and provide routine repairs.
- E. Permanent building lighting may be utilized during construction.

1.06 TEMPORARY HEATING

- A. Cost of Energy: By Contractor.
- B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- C. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.
- D. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.07 TEMPORARY COOLING

- A. Cost of Energy: By Contractor.
- B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

- C. Maintain maximum ambient temperature of 80 degrees F (26 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.
- D. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.08 TEMPORARY VENTILATION

1.09 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Contractor.
- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 01 52 13
FIELD OFFICES AND SHEDS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary field offices for use of Contractor.
- B. Maintenance and removal.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: use of premises and responsibility for providing field offices.
- B. Section 01 50 00 - Temporary Facilities and Controls:
- C. Section 01 50 00: Parking and access to field offices.

1.03 USE OF PERMANENT FACILITIES

- A. When permanent facilities are enclosed with operable utilities, relocate offices into building, with written agreement of Owner, and remove temporary buildings.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

- A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.02 CONSTRUCTION

- A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.

2.03 CONTRACTOR OFFICE AND FACILITIES

- A. Size: For Contractor's needs and to provide space for project meetings.
- B. Furnishings in Meeting Area: Conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.
- C. Other Furnishings: Contractor's option.
- D. Equipment: Six adjustable band protective helmets for visitors, one 10 inch (250 mm) outdoor weather thermometer and [_____].

2.04 OWNER AND ARCHITECT/ENGINEER OFFICE

PART 3 EXECUTION

3.01 PREPARATION

- A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.02 INSTALLATION

- A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.

3.03 MAINTENANCE AND CLEANING

- A. Maintain approach walks free of mud, water, and snow.

3.04 REMOVAL

- A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION

**SECTION 01 55 00
VEHICULAR ACCESS AND PARKING**

PART 1 GENERAL

1.01 SECTION INCLUDES

PART 3 EXECUTION

END OF SECTION

SECTION 01 55 26 - BARRICADES, SIGNS, AND TRAFFIC HANDLING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This item shall consist of providing, installing, moving, replacing, maintaining, cleaning, and removing upon completion of work all barricades, signs, barriers, cones, lights, signals, and such type devices and of handling traffic as indicated in the City of Longview approved traffic control plan or as directed by the City of Longview.

1.2 REFERENCES

- A. Texas Manual on Uniform Traffic Control Devices (TMUTCD). RELATED SECTIONS
- B. Section 01300 - Submittals: Traffic Control Plan, phasing, devices.

1.3 QUALITY ASSURANCE

- A. All barricades, signs, and other types of devices listed above shall conform to details shown in the plans or those indicated in the TMUTCD.
- B. Prior to beginning work, the Contractor shall designate a competent person responsible and available on the project site or in the immediate area to insure compliance with traffic control requirements.
- C. The Engineer will designate a qualified person to observe implementation, and who will have authority to assure compliance with TMUTCD.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Barricades, signs, and traffic handling devices shall be installed and maintained in accordance with the approved traffic control plan. These devices shall be maintained throughout the duration of the project unless otherwise approved by the Engineer.
- B. Contractor shall be responsible for coordination any traffic flow modification with City and/or State officials, including but not limited to the Police Department, Fire Department, and the 9-1-1 Network Emergency Communications.

END OF SECTION

**SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Performance bond.
- E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 REFERENCE STANDARDS

- A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus 2021.
- B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity. 1999a (Reapproved 2014).
- C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles 2015.
- D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles 2015a.
- E. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile 2021a.
- F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples 2017 (Reapproved 2021).

1.03 PERFORMANCE REQUIREMENTS

- A. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- B. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- C. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.
- D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- F. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 - 1. Control movement of sediment and soil from temporary stockpiles of soil.
 - 2. Prevent development of ruts due to equipment and vehicular traffic.
 - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- G. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 - 1. Prevent windblown soil from leaving the project site.
 - 2. Prevent tracking of mud onto public roads outside site.
 - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.

4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- H. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- I. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- J. Open Water: Prevent standing water that could become stagnant.
- K. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Erosion and Sedimentation Control Plan:
 1. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
 - e. Other information required by law.
 - f. Format required by law is acceptable, provided any additional information specified is also included.
 2. Obtain the approval of the Plan by authorities having jurisdiction.
 3. Obtain the approval of the Plan by Owner.
- C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 1. Average Opening Size: 30 U.S. Std. Sieve (0.600 mm), maximum, when tested in accordance with ASTM D4751.
 2. Permittivity: 0.05 sec⁻¹, minimum, when tested in accordance with ASTM D4491.
 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 4. Tensile Strength: 100 pounds-force (450 N), minimum, in cross-machine direction; 124 pounds-force (550 N), minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.

6. Tear Strength: 55 pounds-force (245 N), minimum, when tested in accordance with ASTM D4533/D4533M.
 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
- B. Silt Fence Posts: One of the following, minimum 5 feet (1500 mm) long:

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 INSTALLATION

- A. Silt Fences:
1. Store and handle fabric in accordance with ASTM D4873/D4873M.
 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch (405 mm) high barriers with minimum 36 inch (905 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 4 inches (100 mm) in ground.
 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch (710 mm) high barriers, minimum 48 inch (1220 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet (6 m), use nominal 32 inch (810 mm) high barriers with woven wire reinforcement and steel posts spaced at 4 feet (1220 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
 5. Install with top of fabric at nominal height and embedment as specified.
 6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches (460 mm), with extra post.
 7. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches (300 mm) high with post spacing not more than 4 feet (1220 mm).

3.04 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
 2. Remove silt deposits that exceed one-third of the height of the fence.
 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Clean out temporary sediment control structures weekly and relocate soil on site.
- E. Place sediment in appropriate locations on site; do not remove from site.

3.05 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 01 57 23 - STORM WATER POLLUTION PREVENTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. The Work to be performed under this Section shall consist of furnishing all permits, notice of intent, notice of termination, labor, equipment, materials, and pay all permit fees as necessary to meet the requirements of the Texas Pollution Discharge Elimination System (TPDES) associated with construction activities under TPDES Construction General Permit TXR150000 for storm water pollution prevention as required by current Federal, State, and Local rules and regulations.

1.2 SUBMITTALS FOR INFORMATION

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. The following items shall be submitted for record purposes:
 - 1. Storm water pollution prevention plan,
 - 2. Notice of Intent (NOI),
 - 3. Photocopies of permit application fee payment(s), and
 - 4. Notice of Termination (NOT).

1.3 GENERAL PERMIT, APPLICATION, AND FEES

- A. The Contractor shall bear sole responsibility for the storm water pollution prevention provisions of this Contact. As well as bear sole responsibility for implementation, and maintenance of the storm water pollution prevention plan, the best management practices, and the facilities utilized to meet the TPDES General Permit requirements. The storm water pollution prevention plan and Notice of Intent shall be completed prior to beginning any work or stockpiling of materials.
- B. Prior to filing the Notice of Intent, the Contractor shall develop and submit a Project specific storm water pollution prevention plan based on best management practices that includes all aspects as required by current Texas Commission on Environmental Quality (TCEQ) and US Environmental Protection Agency (USEPA) rules.
- C. After submittal of a Project specific storm water pollution prevention plan as required by TXR150000, the Contractor shall file the Notice of Intent (NOI). A copy of the NOI shall be submitted to the City of Longview for record purposes.
- D. The Contractor shall pay all fees associated the TPDES permit application as well as any renewal fees if applicable. A photocopy of the payment shall be submitted to the City of Longview.

- E. The Contractor shall pay all costs associated with the development of the storm water pollution prevention plan as well as the implementation, maintenance, monitoring, and inspection of the storm water pollution prevention plan facilities during the construction period.
- F. Upon closeout of the Project, the Contractor shall submit at Notice of Termination (NOT) to the TCEQ using the proper form and provide a copy to the City of Longview or record purposes.

1.4 PROJECT REGULATORY REQUIREMENTS

- A. Construction General Permit (CGP TPDES No. TXR150000) requirements are based on the area disturbed by the construction activities as follows:
 - 1. Projects disturbing five (5) or more acres.
 - 2. Projects disturbing one (1) to less than five (5) acres.
 - 3. Projects disturbing less than one (1) acre (Smaller Sites).
- B. Projects with Five (5) or More Acres Disturbed.
 - 1. Obtain a copy of the TCEQ Construction General Permit (TPDES Permit No. TXR150000) and incorporate the permit provisions into the construction activities. Refer to the Appendix.
 - 2. Develop and implement a storm water pollution prevention plan (SWP3). Refer to Appendix.
 - 3. Complete and submit an NOI to the TCEQ (using the TCEQ form) to the address listed on the form prior to the commencement of the construction. Refer to appendix.
 - 4. Submit a Notice of Termination (NOT) to the TCEQ (using the TCEQ form) once the site has reached final stabilization. Refer to Appendix.
- C. Projects with One (1) to Less than Five (5) Acres Disturbed.
 - 1. Obtain a copy of the TCEQ Construction General Permit (TPDES Permit No. TXR150000) and incorporate the permit requirements into the construction activities. Refer to Appendix.
 - 2. Develop and implement a storm water pollution prevention plan (SWP3). Refer to Appendix.
 - 3. Complete and post site notice (site notice is included in TXR150000). Refer to Appendix.
 - 4. Before construction begins:

- a. If site qualifies, complete and submit to the TCEQ a Low Rainfall Erosivity Waiver Form (East Texas sites typically do not qualify).
 - b. Complete and post a site notice (Site Notice form is included at the end of the TPDES Permit No. TXR150000).
5. For construction projects that will disturb one (1) or more acres, but less than five (5) acres, and are part of a larger common plan of development that will disturb five (5) or more acres, refer to Section 1.4.B "Projects with Five (5) or More Acres Disturbed".
- D. Smaller Sites (Less than One Acre Disturbed)
1. For construction projects that disturb less than one acre and are not part of a larger common plan of development, coverage under the Construction General Permit is not required.
 2. If the construction activity develops into a larger project, then permit coverage shall be required at the time based on the total number of acres disturbed.

1.5 STORM WATER POLLUTION PREVENTION PLAN

- A. The requirements of the storm water pollution prevention plan include the following minimum provisions:
1. A detailed Project description, a map indicating the site location(s), a site map depicting construction site details, and information on the receiving waters must be included.
 2. A description of the structural and the non-structural controls (best management practices, or BMPs) that will be used to minimize pollution in runoff during construction, as well as stabilization practices during and after the completion of the activity must be included.
 3. A description of how BMPs will be maintained and how controls may be revised upon finding the control measures are either not working properly or adequately must be included.
 4. A description of how site inspections will be conducted must be included. Inspections are required at a minimum frequency of at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater during active construction activities. Where sites have been temporarily stabilized, inspections must be conducted at least once every month. Special provisions allowing for representative inspections are provided for long, linear projects where access along the site is limited and travel along the site may damage stabilized areas or cause greater potential for erosion.
 5. Identification and description of the implementation of appropriate pollution prevention measures for all eligible non-storm water components of the discharge.

1.6 ADDITIONAL REQUIREMENTS

- A. The Contractor shall be solely responsible for insuring that erosion of the Project site(s) is kept to a minimum.
- B. In areas of cut and fill as well as along ditch lines, the Contractor shall perform temporary grading as necessary to insure that water is not concentrated in one area in a manner which could cause significant erosion.
- C. If necessary in the opinion of the City of Longview, the Contractor will be required to install erosion control berms, place hay bales, or construct siltation fences to prevent the loss of soil from the site and siltation of the pipes and channels downstream from the project due to construction.
- D. In addition to the above-mentioned items, the Contractor shall also comply with any and all applicable State and Federal regulations relating to water quality and storm water runoff including but not limited to the EPA NPDES, and TCEQ TPDES Storm Water Regulations.
- E. Any and all permits required for the Project under the above referenced regulations shall be obtained by the Contractor and all responsibilities related thereto shall be placed upon the Contractor and paid for as a part of this Contract as listed in the Bid Proposal.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

**SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project identification sign.
- B. Project informational signs.

1.02 QUALITY ASSURANCE

- A. Design sign and structure to withstand 50 miles/hr (80 km/hr) wind velocity.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: New, wood, structurally adequate.
- B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch (19 mm) thick, standard large sizes to minimize joints.
- C. Rough Hardware: Galvanized.
- D. Lettering: Exterior quality paint, contrasting colors.

2.02 PROJECT IDENTIFICATION SIGN

- A. One sign, [4' x 8' for a total of 32] sq ft ([] sq m) area, bottom 3 feet ([] m) above ground.
- B. Content:
 - 1. Project number, title, logo and name of Owner as indicated on Contract Documents.
 - 2. Names and titles of Architect and Consultants.
 - 3. Name of Prime Contractor.

2.03 PROJECT INFORMATIONAL SIGNS

- A. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot (30 m) distance.
- B. Provide at each field office, storage shed, and directional signs to direct traffic into and within site. Relocate as Work progress requires.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.
- B. Erect at location of high public visibility adjacent to main entrance to site.
- C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
- D. Install sign surface plumb and level, with butt joints. Anchor securely.

3.02 MAINTENANCE

- A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

**SECTION 01 60 00
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Procedures for Owner-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Lists of products to be removed from existing building.
- B. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- D. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
 - 1. See Section 01 10 00 for list of items required to be salvaged for reuse and relocation.
 - 2. If reuse of other existing materials or equipment is desired, submit substitution request.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.

- B. Use of products having any of the following characteristics is not permitted:
 - 1. Containing lead, cadmium, or asbestos.
- C. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 61 16.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
 - 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - 4. Have longer documented life span under normal use.
 - 5. Result in less construction waste. See Section 01 74 19
 - 6. Are made of recycled materials.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
 - 1. Review Owner reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install and finish products.
 - 4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- F. For exterior storage of fabricated products, place on sloped supports above ground.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.
- I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- J. Prevent contact with material that may cause corrosion, discoloration, or staining.
- K. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- L. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

**SECTION 01 61 16
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 40 00 - Quality Requirements: Procedures for testing and certifications.
- C. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- D. Section 07 92 00 - Joint Sealants: Emissions-compliant sealants.

1.03 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Flooring.
 - 4. Composite wood.
 - 5. Products making up wall and ceiling assemblies.
 - 6. Thermal and acoustical insulation.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
 - 1. Concrete.
 - 2. Clay brick.
 - 3. Metals that are plated, anodized, or powder-coated.
 - 4. Glass.
 - 5. Ceramics.
 - 6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings 2005 (Reapproved 2018).
- C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board 2007.
- D. SCAQMD 1113 - Architectural Coatings 1977 (Amended 2016).
- E. SCAQMD 1168 - Adhesive and Sealant Applications 1989 (Amended 2017).

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

- A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. VOC-Content-Restricted Products: VOC content not greater than required by the following:
 - 1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
 - 2. Joint Sealants: SCAQMD 1168 Rule.
 - 3. Paints and Coatings: Each color; most stringent of the following:
 - a. 40 CFR 59, Subpart D.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

**SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- B. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- C. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.
- D. Section 01 51 00 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.
- E. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- F. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2019.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.
- D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
- E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
 - 1. Minimum of 5 years of documented experience.
- B. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Perform dewatering activities, as required, for the duration of the project.
- E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- I. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- J. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- K. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having

interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- G. Utilize recognized engineering survey practices.
- H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and [_____].
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations, and [_____].
- I. Periodically verify layouts by same means.
- J. Maintain a complete and accurate log of control and survey work as it progresses.
- K. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes:
 - a. Replacing defective parts
 - b. Refinishing damaged surfaces
 - c. Touching up with matching materials
 - d. properly adjusting operating equipment.
- B. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- C. Whenever possible, execute the work by methods that avoid cutting or patching.
- D. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- E. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore

to original condition.

- F. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- G. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- H. Restore work with new products in accordance with requirements of Contract Documents.
- I. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- J. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.
- K. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

- A. Dispose of materials lawfully.
 - 1. Containerize hazardous and sanitary waste materials separately from other waste.
 - 2. Mark containers appropriately and dispose of legally, according to regulations.
- B. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- C. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- D. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- E. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.
- F. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.
- G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- H. Prohibit traffic from landscaped areas.
- I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 79 00 - Demonstration and Training.

3.11 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

3.12 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
 - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Clean filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and [_____].
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), identify the value of items on the list, and reasons why the Work is not complete. Include an expected date of completion.
 - 2. list, and reasons why the Work is not complete. Include an expected date of completion.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records, if any.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Owner will occupy all of the building as specified in Section 01 10 00.
- F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- I. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

**SECTION 01 78 00
CLOSEOUT SUBMITTALS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.

2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 1. Product data, with catalog number, size, composition, and color and texture designations.
 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 1. Description of unit or system, and component parts.
 2. Identify function, normal operating characteristics, and limiting conditions.
 3. Include performance curves, with engineering data and tests.
 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- E. Provide servicing and lubrication schedule, and list of lubricants required.
- F. Include manufacturer's printed operation and maintenance instructions.

- G. Include sequence of operation by controls manufacturer.
- H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- I. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

**SECTION 01 79 00
DEMONSTRATION AND TRAINING**

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Landscape irrigation.
 - 6. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Finishes, including flooring, wall finishes, ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.
- B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
 - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Commissioning Authority for review and inclusion in overall training plan.
 - 2. Submit not less than four weeks prior to start of training.
 - 3. Revise and resubmit until acceptable.
 - 4. Provide an overall schedule showing all training sessions.
 - 5. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.

- D. Training Reports:
 - 1. Identification of each training session, date, time, and duration.
 - 2. Sign-in sheet showing names and job titles of attendees.
 - 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
 - 4. Include Commissioning Authority's formal acceptance of training session.
- E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
 - 1. Format: DVD Disc.
 - 2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Owner will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- E. Provide training in minimum two hour segments.
- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.

3. Typical uses of the O&M manuals.
- I. Product- and System-Specific Training:
 1. Review the applicable O&M manuals.
 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 6. Discuss common troubleshooting problems and solutions.
 7. Discuss any peculiarities of equipment installation or operation.
 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 10. Review spare parts and tools required to be furnished by Contractor.
 11. Review spare parts suppliers and sources and procurement procedures.
- J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 01 91 13

GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
 - 1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
 - 2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
 - 3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
 - 4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.
- B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.
- C. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.
- D. The Commissioning Authority is employed by Owner.

1.02 SCOPE OF COMMISSIONING

- A. The following are to be commissioned:
- B. Building envelope:
 - 1. Air tightness.
- C. Plumbing Systems:
 - 1. Water heaters.
 - 2. Recirculation pumps.
- E. HVAC System, including:
 - 1. Major and minor equipment items.

2. Piping systems and equipment.
3. Ductwork and accessories.
4. Control system.
5. Variable frequency drives.

F. Special Ventilation:

1. Vehicle exhaust systems.
2. Specialty fans.

G. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.03 RELATED REQUIREMENTS

- A. Section 01 7800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.
- B. Section 01 9114 - Commissioning Authority Responsibilities.
- C. Section 23 0800 - Commissioning of HVAC: HVAC control system testing; other requirements.

1.04 REFERENCE STANDARDS

- A. CSI/CSC MF - Masterformat; 2016.
- B. PEI (Samples) - Sample Forms for Prefunctional Checklists and Functional Performance Tests; Current Edition.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
 1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
 2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.

3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

- C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

- C. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
 1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

- A. Commissioning Authority has prepared the Commissioning Plan.
 1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
 2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

- B. Contractor is responsible for compliance with the Commissioning Plan.

- C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.
 1. Commissioning will be phased (by floors, for example) to minimize the total construction time.

- D. Basis of Design Documentation (BOD): Detailed documentation of the functional requirements of the project; descriptions of the systems, components, and methods chosen to meet the design intent; assumptions underlying the design intent.
 1. Basis of Design Documentation is to be prepared by Architect.
 2. Basis of Design Documentation is to be prepared by Design-Builder.

- E. Commissioning Schedule:
 1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
 2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.

3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 DOCUMENTATION IDENTIFICATION SYSTEM

- A. Give each submitted form or report a unique identification; use the following scheme.
- B. Type of Document: Use the following prefixes:
 1. Startup Plan: SP-.
 2. Startup Report: SR-.
 3. Prefunctional Checklist: PC-.
 4. Functional Test Procedure: FTP-.
 5. Functional Test Report: FTR-.
- C. System Type: Use the first 4 digits from CSI/CSC MF (Master Format), that are applicable to the system; for example:
 1. 2300: HVAC system as a whole.
 2. 2320: HVAC Piping and Pumps.
 3. 2330: HVAC Air Distribution.
- D. Component Number: Assign numbers sequentially, using 1, 2, or 3 digits as required to accommodate the number of units in the system.
- E. Test, Revision, or Submittal Number: Number each successive iteration sequentially, starting with 1.
- F. Example: PC-2320-001.2 would be the Prefunctional Checklist for equipment item 1 in the HVAC piping system, probably a pump; this is the second, revised submittal of this checklist.

3.03 STARTUP PLANS AND REPORTS

- A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.
- B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.
- C. Submit directly to the Commissioning Authority.

3.04 PREFUNCTIONAL CHECKLISTS

- A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
 - 1. No sampling of identical or near-identical items is allowed.
 - 2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
 - 3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
 - a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
 - b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
 - c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
 - d. Serial number of installed unit.
 - e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer's start-up checklist items and minor testing.
 - f. Sensor and actuator calibration information.
 - 4. All preliminary Prefunctional Checklists are included in Contract Documents; the Commissioning Authority has the authority to modify these and will furnish final versions as applicable.
 - 5. A preliminary list of Prefunctional Checklists is attached, to indicate anticipated scope.
 - 6. PECl (Samples) found at <http://www.peci.org/library/mcpgs.htm> indicate anticipated level of detail for Prefunctional Checklists.
- B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
 - 1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
 - 2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
 - 3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
 - 4. If any Checklist line item is not relevant, record reasons on the form.
 - 5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.

6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
 7. Submit completed Checklists to Commissioning Authority within two days of completion.
- C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
 2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
 3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
 4. When asked to review the proposed Checklists, do so in a timely manner.
- D. Commissioning Authority Witnessing: Required for:
1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
 2. A sampling of non-primary equipment, as allowed by the commissioning plan.
- E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.05 FUNCTIONAL TESTS

- A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.
- B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.
- C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.
- D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
 2. Use the standard form provided with copies submitted to Owner and Contractor.

3. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
4. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
5. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.
6. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:

1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
2. Examples of Functional Testing:
 - a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
 - b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
 - c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
 - d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.
3. Some preliminary Functional Test procedures are included in Contract Documents; the Commissioning Authority has the authority to modify these and will furnish final versions as applicable.
4. A preliminary list of Functional Tests is attached, to indicate anticipated scope.
5. PECL (Samples) found at <http://www.peci.org/library/mcpgs.htm> indicated anticipated level of detail for Functional Tests.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

G. Factory Tests: Commissioning Authority and Contractor are responsible for coordinating testing of equipment at the factory by factory personnel, to ensure compliance with commissioning requirements.

- H. Field Tests By Others: Where Functional Tests are indicated as to be performed by others not subject to Contract Documents, those tests are not subject to these commissioning requirements.

3.06 SENSOR AND ACTUATOR CALIBRATION

- A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
- B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.
- C. All Sensors:
1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
 2. Verify that sensors with shielded cable are grounded only at one end.
 3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
 4. Tolerances for critical applications may be tighter.
- D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
 2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
 3. If not, install offset, calibrate or replace sensor.
- E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.
 2. Connect a signal generator in place of sensor.
 3. Connect ammeter in series between transmitter and building automation system control panel.
 4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
 5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
 6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
 7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
 8. Reconnect sensor.
 9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.

10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
 11. If not, replace sensor and repeat.
 12. For pressure sensors, perform a similar process with a suitable signal generator.
- F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
 2. Pressure, Air, Water, Gas: 3 percent of design.
 3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
 4. Relative Humidity: 4 percent of design.
 5. Barometric Pressure: 0.1 inch of Hg.
 6. Flow Rate, Air: 10 percent of design.
 7. Flow Rate, Water: 4 percent of design.
 8. Flow Rate, Steam: 3 percent of design.
 9. AHU Wet Bulb and Dew Point: 2.0 degrees F.
 10. Hot Water Coil and Boiler Water Temperature: 1.5 degrees F.
 11. Cooling Coil, Chilled and Condenser Water Temperatures: 0.4 degrees F.
 12. Combustion Flue Temperature: 5.0 degrees F.
 13. Oxygen and CO₂ Monitors: 0.1 percentage points.
 14. CO Monitor: 0.01 percentage points.
 15. Natural Gas and Oil Flow Rate: 1 percent of design.
- G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.
- H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
 2. Set pump/fan to normal operating mode.
 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 4. Command valve/damper to open; verify position is full open and adjust output signal as required.
 5. Command valve/damper to a few intermediate positions.
 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
 2. Use an ultra-sonic flow meter to detect flow or leakage.

3.07 TEST PROCEDURES – GENERAL

- A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
- B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.
- C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
 - 1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
 - 2. Sampling is not allowed for:
 - a. Major equipment.
 - b. Life-safety-critical equipment.
 - c. Prefunctional Checklist execution.
 - 3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
 - 4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
 - 5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
 - 6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
 - 7. If YY percent of the units in the second sample fail, test all remaining identical units.
 - 8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.
- D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
- E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.
- F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.
- G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

- H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.
- I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
 - 1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
 - 2. Other points will be monitored by the Commissioning Authority using dataloggers.
 - 3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
 - 4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
 - 5. Graphical output is desirable and is required for all output if the system can produce it.
 - 6. Monitoring may be used to augment manual testing.

3.08 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01 7800 - Closeout Submittals for additional requirements.
- B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

END OF SECTION

SECTION 01 91 14

COMMISSIONING AUTHORITY RESPONSIBILITIES

PART 1 GENERAL

1.01 SUMMARY

- A. Commissioning is intended to achieve the following specific objectives; this section covers the Commissioning Authority's responsibilities for commissioning:
 - 1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists are utilized to achieve this.
 - 2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests performed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
 - 3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed O&M data submittals are specified.
 - 4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is specified.
- B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.
- C. Coordinate and direct all the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
- D. The Commissioning Authority is employed by Construction Manager on behalf of Owner.
- E. The scope of commissioning activities is defined in Section 01 9113 - General Commissioning Requirements.
- F. Contractor's responsibilities are defined in Section 01 9113 - General Commissioning Requirements.

1.02 SCOPE OF COMMISSIONING

- A. The following are to be commissioned:
- B. Building envelope.
 - 1. Air tightness.
- C. Plumbing Systems:
 - 1. Water heaters.
 - 2. Recirculation pumps.
- D. HVAC Systems:
 - 1. Major and minor equipment items.

2. Piping systems and equipment.
 3. Ductwork systems and accessories.
 4. Control system.
- E. Special Ventilation Systems:
1. Vehicle exhaust systems.
 2. Specialty fans.
- F. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.03 DEFINITIONS

- A. Basis of Design: A document that records the concepts, calculations, decisions, and product selections used to meet Owner's project requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

1.04 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1 - The HVAC Commissioning Process; 2012.
- B. CSI/CSC MF - Masterformat; 2016.

1.05 SUBMITTALS

- A. Commissioning Plan:
1. Submit preliminary draft for review by Owner and Architect within 30 days after commencement of Commissioning Authority contract.
 2. Submit revised draft to be included in the construction Contract Documents, not less than 4 weeks prior to bid date.
 3. Submit final plan not more than 90 days after commencement of construction, for issuance to all parties.
- B. List of Prefunctional Checklists to be developed:
1. Submit preliminary list at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
 2. Submit revised list not less than 6 weeks prior to bid date, for inclusion in the construction Contract Documents.
 3. Submit final list not more than 60 days after start of construction.
- C. Prefunctional Checklists:
1. Submit preliminary draft at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
 2. Submit revised draft for review by Owner and Architect not less than 6 weeks prior to bid date, for inclusion in the construction Contract Documents.
 3. Submit final draft to Contractor not less than 4 weeks prior to startup of particular items to be commissioned.
- D. List of Functional Test procedures to be developed:

1. Submit preliminary list at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
2. Submit revised list not less than 6 weeks prior to bid date, for inclusion in Contract Documents; this is intended to be a list of titles, not full description of the tests.
3. Submit final list not more than 60 days after start of construction.

E. Functional Test Procedures:

1. Submit preliminary draft at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
2. Submit revised draft for review by Owner and Architect not less than 6 weeks prior to bid date, for inclusion in the construction Contract Documents.
3. Submit final draft to Contractor not less than 4 weeks prior to startup of particular items to be commissioned.

F. Training Plan.

G. Recommissioning Manual: Submit within 60 days after receipt of Owner's instructions to proceed with preparation.

H. Commissioning Process Record: Submit to Contractor for inclusion with O&M manuals. Include, at a minimum the following:

I. Final Commissioning Report: Submit to Owner. Include the following:

1.06 QUALITY ASSURANCE

- A. Commissioning Firm Qualifications: Firm experienced in commissioning assemblies and systems specified to be included in scope of work of this Section, and certified by one or more of the following organizations.
- B. Commissioning Plan: Prepare a plan that provides direction for commissioning tasks during construction phase of the project. Include, at a minimum, the following content at the level of detail appropriate to project scope and complexity:

PART 2 PRODUCTS

2.01 DOCUMENTATION IDENTIFICATION SYSTEM

- A. Give each submitted form or report a unique identification; use the following scheme.
- B. Type of Document: Use the following prefixes:
 1. Commissioning Plan: CP-
 2. Prefunctional Checklist: PC-
 3. Functional Test Procedure: FTP-
 4. Functional Test Report: FTR-
 5. Commissioning Report: CR-
- C. System Type: Use the first 4 digits from CSI/CSC MF (Master Format), that are applicable to the system; for example:

1. 2300: HVAC system as a whole.
 2. 2320: HVAC Piping and Pumps.
 3. 2330: HVAC Air Distribution.
- D. Component Number: Assign numbers sequentially, using 1, 2, or 3 digits as required to accommodate the number of units in the system.
- E. Test, Revision, or Submittal Number: Number each successive iteration sequentially, starting with 1.
- F. Example: PC-2320-001.2 would be the Prefunctional Checklist for equipment item 1 in the HVAC piping system, probably a pump; this is the second, revised submittal of this checklist.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

- A. Prepare and implement the Commissioning Plan, covering commissioning schedule, Prefunctional Checklist and Functional Test procedures, coordination requirements, and forms to be used, for all parties in the commissioning process.
1. Call and chair meetings of the Commissioning team when appropriate.
 2. Give Contractor sufficient notice for scheduling commissioning activities.
 3. Develop a comprehensive start-up and initial systems checkout plan with cooperation of Contractor and subcontractors.
 4. Commissioning will be phased (by floors, for example) to minimize the total construction time.
 5. ASHRAE Guideline 1.1 may be used as a guide for the Commissioning Plan.
 6. Avoid replication of information included in the construction Contract Documents to the greatest extent possible.
- B. Basis of Design Documentation: As defined above.
1. Prepared By: Architect.
 2. Copy to be furnished to Commissioning Authority for use in preparation of the commissioning plan.
- C. Review the construction Contract Documents for Contractor submittals of draft checklists, draft test procedures, manufacturer startup procedures, and other information intended for the use of the Commissioning Authority in preparing the Commissioning Plan.
- D. Commissioning Schedule:
1. Coordinate with Contractor anticipated dates of startup of each item of equipment and system.
 2. Contractor's scheduling responsibilities are specified in the construction Contract Documents.
 3. Revise and re-issue schedule monthly.
 4. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
 5. Deliver relevant Prefunctional Checklists and Functional Test Procedures to Contractor in time to avoid delay.
- E. Commissioning Team: Project manager or other designated person of:

1. Owner's building or plant operation staff.
2. Commissioning Authority.
3. Construction Manager.
4. Design professional's design team.
5. General Contractor.
6. HVAC subcontractor.
7. HVAC control system subcontractor.
8. HVAC testing, adjusting, and balancing (TAB) subcontractor.
9. Electrical subcontractor.
10. Communications subcontractor.
11. Other subcontractors who will be required to perform commissioning activities.

3.02 CONSTRUCTION CONTRACT DOCUMENTS

- A. General Commissioning Specifications: Architect has prepared general commissioning specifications for inclusion in the construction Contract Documents; review and submit comments to Owner.
 1. These specifications include:
 - a. Procedures applicable to all types of items to be commissioned.
 - b. General commissioning procedures for HVAC.
 - c. General commissioning procedures for electrical.
 - d. General commissioning procedures for communications.
 2. Prepare specifications for any of the following that would be recommended, for incorporation into the construction Contract Documents by Architect:
 - a. Additional Contractor submittals needed for purposes of commissioning, such as startup procedures, draft test procedures, draft training plans, etc.
 - b. Additional Owner personnel training.
 - c. Additional operation or maintenance data that should be submitted.
- B. General Commissioning Specifications: Prepare general commissioning specifications coordinated with and integrated into Contract Documents prepared by Architect.
 1. Include general procedures applicable to all types of items to be commissioned and specific procedures for each type of work.
 2. Identify Contractor submittals needed for purposes of commissioning, that are not otherwise required to be submitted.
 3. PECl (MCGS) may be used as a guide.
 4. Use SpecLink Section 01 9113 - General Commissioning Requirements.
- C. Prefunctional Checklists: Develop detailed Checklists for each item to be commissioned.
 1. List of Checklists to be Developed: Prepare and maintain a detailed list of titles, not full text.
 2. The Checklist forms are intended to be part of the Contractor's Contract Documents.
- D. Functional Testing: Develop detailed procedures for each item to be commissioned; submit for review by Owner and Architect.
 1. List of Test Procedures to be Developed: Prepare and maintain a detailed list of titles, not full text.

2. The forms the Commissioning Authority will use to report Functional Test results are not intended to be part of Contractor's Contract Documents, but the Functional Test Procedures that must be executed by the Contractor must be made part of the Contract Documents, by modification if necessary.
 3. Architect is required to prepare outlines of Functional Testing for major equipment and systems.
- E. Develop any other reporting forms Contractor will be required to use; if they are likely to require a substantially different amount of work than the Contractor can reasonably anticipate, they must be included in the construction Contract Documents.
- F. If any part of the documents described above have not been developed by the bid date, coordinate with Architect the issuance of modifications to the construction Contract Documents

3.03 PREFUNCTIONAL CHECKLISTS

- A. Prefunctional Checklists - Content: Prepare forms for Contractor's use, in sufficient detail to document that the work has been installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup.
1. Prepare separate Checklists for each type of equipment, system, or other assembly, customized to the item.
 2. Identify each Checklist by using Contract Documents identification number or name, if any; if none, create unique identifiers for each Checklist; do not rely on Contractor to number checklists.
 3. Multiple identical or near-identical items may appear on a single Checklist provided there is space to record all required data for each separately; label each set of data uniquely.
 4. Include space to record manufacturer name, model number, serial number, capacity and other relevant characteristics, and accessories and other features as applicable; include space to record "as specified", "as submitted", and "as installed" data.
 5. Include space to record whether or not the required submittals have been received; list each separate type of submittal.
 6. Include line items for each physical inspection to be performed.
 7. Include line items for each operational inspection to be performed, such as checking switch operation, fan rotation, valve and damper stroke, and measuring actual electrical loads.
 8. Include separate section for sensors and actuators, with space for documenting actual physical location and calibration measurements; provide a separate generic calibration checklist identified wherever referenced.
 9. Include spaces to record that related Checklists for related work upon which this work depends have been completed.
- B. Prefunctional Checklists - Format:
1. Provide a cover sheet showing name of equipment item or system, documentation identification number (see Documentation Identification Scheme), names of accessory components involved, and identification of related checklists.
 2. Include on cover sheet space for Contractor's use in attesting to completeness; provide spaces for the signatures of the general contractor and each subcontractor or other entity responsible, customized to the project and the type of item.
 3. Include on the cover sheet, above the signature block, the following statement: "The work referenced in this Checklist and other work integral to or dependent on this work is complete and ready for functional testing. The checklist items are complete and have

been checked off only by parties having direct knowledge of the event." Include two checkboxes:

- a. "This Checklist is submitted for approval with no exceptions."
 - b. "This Checklist is submitted for approval, subject to the attached list of outstanding items, none of which preclude the performance of safe and reliable functional tests. A statement of completion will be submitted upon completion of the outstanding items."
4. Use a consistent, tabular format for all Checklists, with one line per checklist activity.
 5. For each line item, provide space for initials and date, and identification of the subcontractor or other entity responsible.

3.04 FUNCTIONAL TEST PROCEDURES

- A. Develop test procedures in sufficient detail to demonstrate that functional performance is in accordance with Contract Documents, including proper operation through specified modes of operation where there is a different system response, including seasonal, unoccupied, warm-up, cool-down, part- and full-load regimes.
 1. Obtain assistance and review by installing subcontractors.
 2. Itemize each test sequence in step-by-step order, with acceptance criteria for each step and for the test as a whole.
 3. Include test setup instructions, description of tools and apparatus, special cautions, and.
 4. Avoid procedures that would void or otherwise limit warranties; review with Contractor prior to execution.
 5. For HVAC systems, procedures may include energy management control system trending, stand-alone datalogger monitoring, or manual functional testing.
 6. Submit to Construction Manager for review, and for approval if required.
 7. Obtain explicit approval of Contractor in regard to feasibility and safety prior to execution.
- B. Functional Test Forms: Prepare and distribute forms in advance of testing. Use a consistent format to the greatest degree practicable. For each form, include the following:
 1. Signature Block: Signature of the designated commissioning lead and the system and equipment installer attesting that the recorded test results are accurate.

3.05 CONSTRUCTION PHASE

- A. Coordinate the commissioning work with Contractor and Construction Manager; ensure that commissioning activities are being incorporated into the master schedule.
- B. Perform site visits, as necessary, to observe component and system installations. Attend planning and job-site meetings to obtain information on construction progress. Review Contractor's meeting minutes for issues relating to the commissioning process. Assist in resolving discrepancies.
- C. Commissioning Kick-Off Meeting: Plan and conduct a meeting early in the construction phase to review proposed commissioning schedule, activities, and responsibilities with parties involved. Require attendance by every member of the Commissioning Team.
- D. Conduct periodic meetings as necessary to coordinate, resolve planning issues, and aid in resolution of deficiencies, minimizing the time spent by Contractor and Owner personnel; hold meetings at least monthly.

- E. Submit periodic progress reports to Owner and Contractor.
- F. Review Contractor shop drawing submittals applicable to systems being commissioned for compliance with commissioning needs; verify that Owner's responsibilities are clearly defined in warranties.
- G. Review and approve submittals directly related to commissioning.
- H. Deliver Prefunctional Checklists and Functional Test procedures to Contractor.
- I. Verify satisfactory completion of Prefunctional Checklists by Contractor by reviewing checklists and by site observation and spot checking; provide formal approval when satisfactory.
- J. Verify startup of all systems by reviewing start-up reports and by site observation; provide formal approval when satisfactory.
- K. Coordinate, witness and approve Functional Tests performed by Contractor. Coordinate retesting until satisfactory performance is achieved.
- L. HVAC Commissioning:
 - 1. Gather and review the control sequences and interlocks and work with Contractor and design engineers until sufficient clarity has been obtained, in writing, to be able to prepare detailed Functional Test procedures.
 - 2. Witness all or part of HVAC piping test and flushing procedures, sufficient to be confident that proper procedures were followed; document testing and include documentation in O&M manuals.
 - 3. Witness all or part of duct testing and cleaning procedures, sufficient to be confident that proper procedures were followed; document testing and include documentation in O&M manuals.
 - 4. Review TAB Plan prepared by Contractor.
 - 5. Before TAB is executed, witness sufficient Functional Testing of the control system to approve it to be used for TAB.
 - 6. Verify air and water systems balancing by spot testing, by reviewing completed reports, and by site observation; provide formal approval when satisfactory.
 - 7. Analyze trend logs and monitoring data to verify performance.
 - 8. Prepare a standard trend logging package of primary parameters that will provide Owner's operations staff clear indications of system function in order to identify proper system operation and trouble shoot problems; provide any additional information needed to interpret the trend logs.
- M. Witness and document testing of systems and components over which the Commissioning Authority does not have direct control, such as smoke control systems, tests contracted directly by Owner, and tests by manufacturer's personnel; include documentation in O&M manuals.
- N. When Functional Testing for specific systems or equipment is specified to be performed by the Commissioning Authority rather than the Contractor, perform such testing without assistance of Contractor.
- O. Maintain a master deficiency and resolution log and a separate testing record. Provide written progress and test reports with recommended actions.
- P. Operation and Maintenance Data: Review submitted operation and maintenance data for completeness; provide formal approval if satisfactory.

- Q. Notify Contractor and Owner of deficiencies in procedures or results; suggest solutions.

3.06 TRAINING

- A. Training Plan: Prepare a comprehensive Training Plan, incorporating draft training plans submitted by Contractor.
 - 1. Include a 2 hour session by the HVAC design engineer covering the overall HVAC system and equipment design concepts, with one-line schematic drawings.
 - 2. Include a 2 hour session by the Commissioning Authority on the use of the blank Prefunctional Checklists and Functional Test forms for re-commissioning purposes.
 - 3. Establish criteria for determining satisfactory completion of training.
- B. Verify that training was satisfactorily completed; provide formal approval if satisfactory.
- C. Contractor will perform video recording of training sessions.

3.07 CLOSEOUT

- A. Commissioning Record: Use the same format and organization as specified for the O&M manuals.
 - 1. Include the Final Commissioning Plan and Final Report.
 - 2. For each product or system and equipment item, include the following organized as indicated, with separator tabs:
 - a. Design intent documentation, furnished by Architect or others.
 - b. Detailed operational sequences.
 - c. Startup plan and approved startup reports.
 - d. Filled out Prefunctional Checklists.
 - e. Filled out Functional Test reports; trend logs and monitoring reports and analysis; other verification documentation.
 - f. Training plan and training records.
 - g. Recommissioning recommendations, including time schedule and procedures; include blank copies of all Prefunctional Checklists and Functional Test report forms.
- B. Final Commissioning Report: Include:
 - 1. Executive summary.
 - 2. List of participants and roles.
 - 3. Brief facility description.
 - 4. Overview of commissioning scope and general description of testing and verification methods.
 - 5. For each item commissioned, an evaluation of adequacy of:
 - a. The product itself; i.e. compliance with Contract Documents.
 - b. Installation.
 - c. Functional performance; include a brief description of the verification method used and observations and conclusions from the testing.
 - d. O&M documentation, including design intent.
 - e. Operator training.
 - 6. List of all outstanding non-compliance items, referenced to the specific functional test, inspection, trend log, etc., where the deficiency is documented.

7. List of unresolved issues, seasonal or deferred testing, and other concerns that could affect facility operation.
 8. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. (about four to six pages).
 9. Attach appendices containing all commissioning documentation, including logs, minutes, reports, deficiency lists, communications, findings, etc., except that specified to be part of the Commissioning Record.
- C. Recommissioning Manual: Revise the Commissioning Plan documents, checklists, and Functional Test forms as necessary based on accepted recommendations of the final Commissioning Report. Provide step-by-step instructions for recommissioning, blank forms, and cross-references to O&M data needed during recommissioning.

3.08 POST-OCCUPANCY PHASE

- A. Assist in the development of a preventative maintenance plan, a detailed operating plan or an energy and resource management plan or as-built documentation.
- B. Coordinate deferred and seasonal Functional Tests; verify correction of deficiencies.
- C. On-Site Review: 10 months after Substantial Completion conduct on-site review with Owner's staff.
 1. Review the current facility operation and condition of outstanding issues related to the original and seasonal commissioning.
 2. Interview staff to identify problems or concerns they have operating the facility as originally intended.
 3. Make suggestions for improvements and for recording these changes in the O&M manuals.
 4. Identify areas of concern that are still under warranty or are the responsibility of the original construction contractor.
 5. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

END OF SECTION

**SECTION 02 41 00
DEMOLITION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of built site elements.
- B. Selective demolition of building elements for alteration purposes.
- C. Abandonment and removal of existing utilities and utility structures.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2019.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Contractor must file demolition notification with Texas Commission of Environmental Quality (TCEQ) prior to beginning demolition work.
 - 3. Comply with applicable requirements of NFPA 241.
 - 4. Use of explosives is not permitted.
 - 5. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 6. Provide, erect, and maintain temporary barriers and security devices.
 - 7. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 8. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 9. Do not close or obstruct roadways or sidewalks without permit.
 - 10. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 11. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
- E. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
- H. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Dismantle existing construction and separate materials.
 - 2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.02 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.03 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and []): Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. Verify that abandoned services serve only abandoned facilities before removal.
 - 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- D. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch as specified for patching new work.

3.04 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 02 41 00.01 - PREPARING RIGHT-OF-WAY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Removal of surface debris.
- B. Removal of trees, shrubs, and other plant life as noted on plans only.
- C. Preparing Right-of-Way shall be performed meeting the requirements of TxDOT Item 100 unless otherwise specified within this section.
- D. Removing Concrete and Brick Pavement shall be performed meeting the requirements of TxDOT Item 104 unless otherwise specified within this section.
- E. Removing Stabilized Base and/or Asphaltic Pavement shall be performed meeting the requirements of TxDOT Item 105 unless otherwise specified within this section
- F. Sawcutting of existing pavement and curbs and gutters will be required at the limits of construction.

1.2 REFERENCES

- A. Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2014 Edition.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with TxDOT Item 100 – Preparing Right of Way. See Section 01200 for Measurement and Payment.
- B. Perform Work in accordance with TxDOT Item 104 – Removing Concrete and Brick Pavement. Measurement and Payment for this item will be considered subsidiary to the Preparing Right of Way bid item regardless of the subgrade.
- C. Perform Work in accordance with TxDOT Item 105 – Removing Stabilized Base and/or Asphaltic Pavement. Measurement and Payment for this item will be considered subsidiary to the Preparing Right of Way bid item.

1.4 REGULATORY REQUIREMENTS

- A. Conform to applicable code for environmental requirements, disposal of debris, burning debris on site, and use of herbicides.
- B. Coordinate clearing Work with utility companies.
- C. Meet all requirements of TxDOT Items
- D. Existing concrete pavement, curb, asphalt pavement, brick, or curb and gutter to be removed, whether in streets or drives, shall be sawed along neat lines where portions are

to be left in place. Cost of sawing shall be considered subsidiary to various bid items, unless otherwise shown.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 GENERAL

- A. The Contractor shall make every effort to protect all lawns, trees, plants, and shrubs encountered during construction outside of the construction easement.
 - 1. In all cases where questions arise, the Contractor shall request clarification from the City of Longview.
 - 2. Any trees or shrubs which are in close proximity to the work or which are removed and replaced by the Contractor and die within a two (2) year period, beginning at the date of final payment, shall be removed and replaced at the Contractor's expense.
- B. All sign posts and similar private or public obstructions which interfere with the construction of this project will be removed and replaced by the Contractor at his own expense.
 - 1. Power poles and guys, which interfere with construction, shall be braced and, if necessary, relocated by the utility company.
 - 2. The Contractor shall be responsible for coordinating this work with the utility company but shall not be responsible for the cost of the franchise utility's work. All of the Contractor's Work associated with coordination, relocation, removal, renovation of utilities shall be included in the bid items in proposal not in any allowances.
- C. The Contractor shall protect all property lines, monuments, and stakes encountered in his work. All monuments and stakes for later use that are disturbed or destroyed by the Contractor shall be replaced at his expense.
- D. In case it is necessary to change or move the property of any owner of a public utility, such property shall not be moved or interfered with until ordered to do so by the City of Longview.
 - 1. The right is reserved to the owner of public utilities to enter upon the limits of the project for the purpose of making such changes or repairs to their property that may be made necessary by performance of this Contract.
 - 2. Any time the Contractor intends to expose, cross, or otherwise work in the area of existing utilities, the Contractor shall notify the utility Owner five (5) days in advance.

- E. The locations of existing utilities indicated on the Plans have been determined from field surveys and available public records.
 - 1. Probes for determination of location and elevation have been made only at locations specifically described on the Plans.
 - 2. Exact locations and elevation of all utilities are not guaranteed and shall be determined in the field by the Contractor prior to construction.
 - 3. It shall be the duty of the Contractor to ascertain whether any additional utilities other than those shown on the Plans may exist and to locate the same prior to construction.
 - 4. The Contractor shall also become familiar with any proposed adjustments to be made by the utility owners and extend full cooperation.
 - 5. Any cost resulting from the Contractor's damages to existing utilities shall be the sole responsibility of the Contractor.

- F. The Contractor shall be responsible for the protection of all existing utilities or service lines crossed or exposed by his construction operations.
 - 1. Where existing utilities or service lines are cut, broken or damaged, the Contractor shall replace or repair the utilities or service lines with the same type of original material and construction, or better, at his own cost and expense.
 - 2. The Contractor shall notify all owners of existing utilities a minimum of five (5) days prior to the start of construction.

- G. It is expected that utility relocations by SWEPCO, AT&T, Longview Kilgore Cable TV, and Network Communications will be ongoing during this Project. The City has no direct control over these operations and will be held harmless in the event that delays to the Contractor due to the utility relocations, if any, are incurred.

- H. Abandoned water lines or other pipe lines that have been cut during construction shall be plugged before backfill operations are complete. Cost of plugging existing lines shall be considered subsidiary to various bid items.

- I. The Contractor may encounter unanticipated cultural or archeological deposits during construction.
 - 1. If archeological sites or historic structures are discovered after construction operations are begun, the Contractor shall immediately cease operations in that particular area and notify the Owner.
 - 2. The Contractor shall take reasonable steps to protect and preserve the discoveries until they have been inspected by the Owner's Representative.

3. The Owner will promptly coordinate with the Texas Historical Commission and any other appropriate agencies to obtain any necessary approvals or permits to enable the work to continue.
4. The Contractor shall not resume work in the area of the discovery until authorized to do so by the Owner.

3.2 PREPARATION

- A. Verify that existing plant life designated to remain is tagged or identified.
- B. Identify an area for placing removed materials.

3.3 SAWCUT EXISTING PAVEMENT

- A. Equipment:
 1. There shall be few limitations on joint sawing equipment provided the equipment is approved by the City of Longview and is in proper working order.
 2. Both wet sawing, with diamond impregnated blades, and dry sawing, with silicon carbide or Carborundum blades may be used.
 3. In general, silicon carbide or Carborundum blades are suitable for producing a clean cut edge through the existing hot mix asphaltic concrete.
- B. Construction Methods:
 1. Contractor shall sawcut existing hot mix asphaltic concrete or reinforced concrete pavement as required on the Plans.
 2. Minimum depth of cut shall be three (3) inches.
 3. Pavement removal adjacent to the sawcut shall leave a clean and sharply defined pavement edge, thereby creating a smooth and straight paving joint at the existing pavement and the proposed pavement interface.

3.4 PROTECTION

- A. Locate, identify, and protect utilities that remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Protect benchmarks, survey control points, and existing structures from damage or displacement.

3.5 CLEARING

- A. Clear areas required for access to site and execution of Work.

- B. Remove trees and shrubs within marked areas. Remove stumps, main root ball, root system to a depth of 36 inches below proposed grade and/or below subgrade in paved areas prior to fill placement.
- C. Clear undergrowth and deadwood.

3.6 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Partially remove paving, and curbs as indicated. Neatly saw cut edges at right angle to surface.

3.7 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion.
- D. Remove excess topsoil not intended for reuse, from site.

3.8 DISPOSAL

- A. Legally dispose of all material at a licensed site or with written and notarized permission from the property owner for a private disposal site.
- B. All trees, stumps, brush or other debris removed from the job site as a preliminary to the construction of the Work or its appurtenances shall be removed from the property and properly disposed of in a satisfactory manner.
- C. All excavated earth in excess of that required for backfilling shall be removed from the job site and disposed of in a satisfactory manner.
- D. The Contractor shall review proposed waste sites for material to be wasted from this project.
 - 1. Contractor shall determine if any waste sites are located in a "Base Floodplain" or "Floodway" as defined by the Federal Emergency Management Agency (FEMA).
 - 2. If waste material from this project is placed in a "Base Floodplain" or "Floodway" as defined by FEMA, the Contractor shall be responsible for obtaining a permit from the City of Longview.
 - 3. The Contractor shall obtain a Development Permit from the City of Longview Engineering Department for any waste sites located within the city limits.

4. The Contractor shall furnish the City of Longview a copy of the signed agreement with the property owner for each disposal site, which the Contractor intends to use for "waste" materials.
 5. Conditions and restrictions, if any, will be clearly stated.
 6. Compliance will be required and a release from the property owner must be obtained upon completion of the Project.
- E. All costs associated with waste material removal and disposal shall be paid for by the Contractor.
 - F. Burning of debris shall not be permitted.
 - G. The Contractor shall be responsible for acquiring written approval and permits.

END OF SECTION

**SECTION 03 15 21
TERMITE BARRIER - STEGO**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Termite-resistant vapor barrier sheet.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Vapor barrier placement under concrete slab-on-grade.

1.03 REFERENCE STANDARDS

- A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.
- B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.
- C. Test Reports: Submit manufacturer's summary of independent laboratory and field testing for effectiveness in subterranean termite exclusion.
- D. Manufacturer's Installation Instructions.
- E. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.
- F. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing this type of work and:
 - 1. Having minimum of 2 years documented experience.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer's limited warranty.

PART 2 PRODUCTS

2.01 TERMITE BARRIER SHEET

- A. Termite-Resistant Vapor Barrier Sheet: Plastic sheet complying with ASTM E1745, Class C; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs, and for exclusion of subterranean termites.
- B. Water Vapor Permeance: Not more than 0.010 perms (0.6 ng/(s m² Pa)), maximum.
- C. Thickness: 15 mils (0.4 mm).
- D. Accessory Products: Barrier sheet manufacturer's recommended tape, adhesive, etc., for sealing seams and penetrations in termite barrier.
- E. Manufacturer: Stego Technology LLC; Pango Wrap with Pango Tape: www.stegoindustries.com/#sle.
- F. Provide penetration sleeve as directed per manufacturer instructions.
- G. Do not pour unless system is in place with integrity maintained per manufacturer instructions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that soil surfaces are unfrozen.
- B. Verify final grading is complete.

3.02 INSTALLATION - BARRIER SHEET

- A. Comply with ASTM E1643.
- B. Unroll Pango Wrap over the area where the slab is to be placed. Pango Wrap should completely cover the concrete placement area.
- C. Lap joints 6 inches (150 mm), minimum and taped using Pango Tape. Seal joints, seams, penetrations, and edges at adjacent materials with manufacturer's recommended products and follow manufacturer's written instructions.
 - 1. The area of adhesion should be free from dust, dirt, moisture, and frost to allow maximum adhesion of the pressure-sensitive tape. Ensure that all seams are taped with applied pressure to allow for maximum and continuous adhesion of the pressure-sensitive Pango Tape.
- D. ASTM E1643 requires sealing the perimeter of the slab. Extend vapor retarder over footings and seal to foundation wall, grade beam, or slab at an elevation consistent with the top of the slab or terminate at impediments such as waterstops or dowels. Consult the structural engineer of record before proceeding.
- E. In the event that Pango Wrap is damaged during or after installation, repairs must be made. Cut a piece of Pango Wrap to a size and shape that covers any damage by a minimum overlap of six inches in all directions. Clean all adhesion areas of dust, dirt, moisture, and frost. Tape down all edges using Pango Tape per manufacturer instructions.
- F. All penetrations must be sealed. All pipe, ducting, rebar, wire penetrations and block outs should be sealed using Pango Wrap and Pango Tape per manufacturer instructions.
- G. Installation should create a monolithic membrane between all interior intrusion pathways and vapor sources below the slab as well as at the slab perimeter. The underlying subbase should not be visible in any area where concrete will be placed.

3.03 PROTECTION

- A. Protect sheet materials from damage after completed installation.
- B. Repair damage to installed sheet materials with manufacturer's recommended products and according to the manufacturer's written instructions.

END OF SECTION

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

- A. Fabricators and erectors intending to bid Project shall attend Pre-Bid Conference. See Section "Invitation to Bid and Instructions to Bidders," heading "Pre-Bid Conference."
 - 1. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, finishes, and other miscellaneous items related to cast-in-place concrete.
- B. Cast-in-place concrete includes project requirements specified herein and on the drawings:
 - 1. Water/cementitious materials ratio: See General Notes on Drawings.
 - 2. Entrained air: See General Notes on Drawings.
 - 3. Water Reducing Admixture: See Part 2 Article "Admixtures."
 - 4. High strength: See General Notes on Drawings.
- C. Work in other Sections related to Cast-in-Place Concrete:
 - 1. Division 3 Section "Unbonded Post-Tensioned Concrete."
 - 2. Division 3 Section "Precast Structural Concrete."
 - 3. Division 3 Section "Precast Architectural Concrete."
 - 4. Division 7 Section "Traffic Coatings."
 - 5. Division 7 Section "Water Repellants."
 - 6. Division 7 Section "Expansion Joint Assemblies."
 - 7. Division 7 Section "Concrete Joint Sealants."
 - 8. Division 9 Section "Pavement Marking."

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.
- B. Self-Consolidating Concrete (SCC): Highly flowable, non-segregating concrete that can spread into place, fill the formwork, and encapsulate the reinforcement without any mechanical consolidation.

1.4 SUBMITTALS

- A. Submittals and Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including the cost of Engineer's services made necessary to review such additional resubmittals. Owner will in turn reimburse Engineer.

- B. Submit Product data for concrete component materials and other concrete related items, including, but not limited to:
 - 1. Material Certificates: Signed by Manufacturer that each of the following items complies with requirements:
 - a. Cementitious materials and aggregates
 - b. Admixtures
 - c. Form materials and form-release agents
 - d. Steel reinforcement and accessories
 - e. Epoxy coating
 - f. Waterstops
 - g. Curing materials
 - h. Bonding agents
 - i. Vapor barriers/reducer
 - j. Repair materials
 - 2. Submit certification that curing compound or evaporation reducer, if used, is compatible with sealer specified in Division 7 Section "Water Repellants", traffic topping specified in Division 7 section "Traffic Coatings", sealant specified in Division 7 Sections "Concrete Joint Sealants" and "Architectural Joint Sealants", and expansion joint assemblies specified in Division 7 Section "Expansion Joint Assemblies."
 - 3. Submit certification that curing compound or evaporation reducer is compatible with pavement markings specified in Division 9 Section "Painting."

- C. Submit evidence of licensure in Texas for professional engineer providing professional services as required for Contractor in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures.
 - 1. Contractor's responsibilities include formwork, shoring and re-shoring procedures, and other work described in Article "Contractors Professional Services-Performance and Design Criteria", Article "Formwork", and Article "Shores and Re-shores".
 - 2. Performance and design criteria are shown on the Drawings and in Article "Contractor's Professional Services- Performance and Design Criteria".
 - 3. Contractor's Professional Engineer shall furnish Owner a Certificate of Professional Liability Insurance in minimum amount of \$1,500,000 per claim.

- D. Submit concrete mixture proportions to Engineer for each concrete mixture. Submit alternate mixture proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Provide mixture proportions not less than four weeks before placing concrete and not less than one week before pre-installation conference (pre-concrete meeting).

2. Proportion mixtures as defined in ACI 301 Section 4 header "Proportioning," Mixtures shall be proportioned by party other than Testing Agency responsible for testing Project concrete.
 3. Proportion mixtures to minimize effects of thermal and drying shrinkage. See Part 2 heading "Concrete Mixtures" header "Shrinkage" for drying shrinkage limit.
 4. Use mixture proportions submission form at end of this Section for each concrete mixture, which identifies the following:
 - a. Mixture Proportions Identification and use.
 - b. Method used for documentation of required average compressive strength, (ACI 301 Section 4 – *Field test data* or *Trial mixtures*).
 - c. Gradation of fine and coarse aggregates.
 - d. Proportions of all ingredients including all admixtures added either at time of batching or at job site.
 - e. Water/cementitious materials ratio.
 - f. Slump, ASTM C143.
 - g. Certification of the chloride content of admixtures.
 - h. Air Content:
 - 1) Of freshly mixed concrete by pressure method, ASTM C231, or volumetric method, ASTM C173.
 - i. Density (Unit weight) of concrete, ASTM C138.
 - j. Strength at 7 and 28 days, ASTM C39. In addition, for post-tensioned concrete provide a strength gain curve with sufficient number of data points from 6 to 96 hours to accurately estimate when the minimum compressive strength for tensioning the concrete will be achieved. See Section "Unbonded Post-Tensioned Concrete."
 - k. Water soluble chloride ion content of concrete: ASTM C 1218.
 - l. Shrinkage (length change), ASTM C157 (modified) for cast-in-place post-tensioned concrete only. See Part 2 heading "Concrete Mixtures" header "Shrinkage" for modifications to ASTM C157.
 - m. Certificate of analysis of coal fly ash or processed ultra-fine fly ash: Comply with ASTM C618, Class C or F:
- E. Testing Agency: Promptly report all field concrete test results to Engineer, Contractor and Concrete Supplier. Include following information:
1. See Article "Quality Assurance."
 2. Density (unit weight) of concrete, ASTM C 138.
 3. Slump, ASTM C 143.
 4. Slump Flow, ASTM C 1611 (for SCC).
 5. Concrete temperature at placement time. ASTM C 1064.
 6. Air temperature at placement time.
 7. Strength determined in accordance with ASTM C 39.
 8. Shrinkage (length change) of superstructure concrete, ASTM C 157 (modified) for post-tensioned concrete and other concrete as noted on the drawings. Shrinkage shall be equal to or less than 0.04% at 28 days
 9. Calcium Nitrite presence in plastic concrete: See Part 3 heading, "Quality Control."
- F. Contractor: Submit grout temperature limitations with grout submittal.
- G. Submit current certification of welders.
- H. Submit shop drawings for steel reinforcement:

1. Prepare placing drawings that detail fabrication, bending, and placement of concrete reinforcement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Comply with ACI SP-66, "ACI Detailing Manual." Include special reinforcement required for openings through concrete structures, elevations of all walls and columns with locations of all splices and couplers.
 2. Prepare steel reinforcement placing drawings in coordination with the Work of Section "Unbonded Post-Tensioned Concrete". Review the Unbonded Post-Tensioned Concrete tendon shop drawings to determine placement details and clearances. Notify Engineer of potential interference or conflicts for placing reinforcement and post-tensioning tendons.
- I. Submit samples of materials as requested by Engineer, including names, sources, and descriptions as follows:
 1. Waterstops.
 2. Vapor retarder.
 - J. Submit laboratory test reports for concrete materials and mixtures.
 - K. Submit Minutes of concrete pre-installation conference.

1.5 CONTRACTOR'S PROFESSIONAL SERVICES - PERFORMANCE AND DESIGN CRITERIA

- A. Provide professional services for temporary conditions during construction and portions of the Work required to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Specific requirements and criteria include, but are not limited to the following:
 1. Design, erect, shore, brace, and maintain formwork, according to ACI 301 and ACI 347 to support vertical, lateral, static and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads. The contractor is responsible for layout and design, reviews, approvals, and inspections.
 2. Design formwork, shoring, bracing, and other conditions for structural requirements and stability during construction and until final structure is completed and accepted.
 - a. Comply with ACI 347.2 for design, installation, and removal of shoring and reshoring.
 - b. Superimposed loads to the concrete structure, slab-on-grade, and soil shall be less than the design loads as shown on Drawings.
 - c. Check early-age strength of concrete members against anticipated construction loads. Reduce the load on concrete members at the critical concrete age or change the concrete mixture for accelerated strength gain to avoid distress of concrete members.
 - d. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads such that no floor or member would be excessively loaded or would induce tensile stresses in concrete members.
 - e. Plan sequence of removal of shores and reshores to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excess stress or deflection.
 - f. Consider the effects of post-tensioning sequence for post-tensioned beams and girders. Review post-tensioning design criteria on the drawings and in specification Section "Unbonded Post-tensioned Concrete".

1.6 QUALITY ASSURANCE

20011 Gregg County Parking Garage and Office

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualification: An experienced supplier who is experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirement for production facilities and equipment. Manufacturer shall also be certified according to the National Ready Mixed Concrete Association's Certifications of Ready Mixed Concrete Production Facilities.
- C. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. ACI 301, "Specifications for Structural Concrete."
 - 2. ACI 318, "Building Code Requirements for Structural Concrete and Commentary."
 - 3. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials."
 - 4. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
- D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in Texas and who is experienced in providing professional engineering services of the kind indicated. See Article "Contractor's Professional Services Performance and Design Criteria".
- E. Materials and installed work may require retesting at any time during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.
- F. At least 35 days prior to scheduled start of concrete construction, contractor shall conduct meeting to review proposed mixture proportions and methods and procedures to achieve required concrete quality. Contractor shall send pre-concrete conference agenda to all attendees 20 days prior to scheduled date of conference indicating review requirements. Representatives of each entity directly concerned with cast-in-place concrete shall attend conference, including, but not limited to, the following:
 - 1. Contractor's superintendent.
 - 2. Agency (laboratory) responsible for concrete mixture proportions.
 - 3. Agency (laboratory) responsible for field quality control.
 - 4. Ready-mixed concrete producer.
 - 5. Concrete subcontractor.
 - 6. Primary admixture manufacturers.
 - 7. Engineer or Owner's representative.
 - 8. At the pre-concrete meeting the contractor shall provide a summary of concrete procedures to protect fresh concrete from rain.
 - a. The minutes shall include a statement by the Concrete Contractor indicating that the proposed mixture proportions and the placing/finishing/curing techniques can produce the concrete quality required by these specifications.
- G. Structural properties of permanent steel formwork shall be determined in accordance with AISI "Specifications for the Design of Cold-Formed Steel Structural Members."
- H. Welders and welding procedures for permanent steel formwork shall conform to requirements or AWS D1.1.
- I. Welders and welding procedures shall conform to requirements of AWS D1.4. Except where shown on Drawings, welding of reinforcing steel is prohibited unless accepted by Engineer in writing.

- J. Submit steel producer's certificates of mill analysis, tensile tests, and bend tests for reinforcing steel. Coordinate with welders and welding procedures.
- K. Inspection of steel reinforcement is required in accordance with **IBC Section 110**. Inspections shall be conducted by an inspection agency employed by Owner and approved by Engineer. Inspector shall provide report in approved format to Owner with copy to Engineer and Contractor. Inspection agency has authority to reject reinforcing not meeting Contract Documents. Inspections for all reinforcing steel for conformance to shop drawings and Contract Documents shall be completed prior to concrete placement.
- L. Submit following information on Inspection of Reinforcement unless modified in writing by Engineer.
 - 1. Project name and location.
 - 2. Contractor's name.
 - 3. Inspection Agency's name, address, and phone numbers (office and mobile).
 - 4. Date and time of inspection.
 - 5. Inspection Agency technician's name.
 - 6. Fabricator's name.
 - 7. Weather data:
 - a. Air Temperatures.
 - b. Weather.
 - c. Wind speed.
 - 8. Inspection location within structure.
 - 9. Reinforcement inspection data (including but not limited to):
 - a. Bar size, spacing, cover, and grade.
 - b. Splices, bends, anchorages, welding.
 - c. Support methods and construction sequencing.
 - 10. Diary of general progress of Work.
- M. Testing Agency Qualifications:
 - 1. Independent agency, acceptable to authorities having jurisdiction, and acceptable to engineer, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 2. Testing laboratory shall submit documented proof of ability to perform required tests.
 - 3. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1 according to ACI CP-1 or an equivalent certification program.
- N. Testing Agency is responsible for conducting, monitoring and reporting results of all tests required under this Section. Testing Agency shall immediately report test results showing properties that do not conform to Project Specification requirements to General Contractor's authorized on-site representative and to Owner's authorized on-site representative.
- O. Submit following Field Test information for Project Concrete unless modified in writing by Engineer:
 - 1. Project name and location.
 - 2. Contractor's name.
 - 3. Testing Agency's name, address, and phone number.
 - 4. Concrete supplier.
 - 5. Date of report.

6. Testing Agency technician's name (sampling and testing).
7. Placement location within structure.
8. Time of batching.
9. Time of testing.
10. Elapsed time from batching at plant to discharge from truck at site.
11. Concrete mixture data or identification code.

12. Weather data:
 - a. Air temperatures.
 - b. Weather.
 - c. Wind speed.

13. Field test data:
 - a. Date, time and place of test.
 - b. Slump.
 - c. Concrete Temperature.
 - d. Slump flow (for SCC).
 - e. Water content.
 - f. Air content.
 - g. Density (Unit weight).

14. Compressive test data:
 - a. Cylinder number.
 - b. Age of concrete when tested.
 - c. Date and time of cylinder test.
 - d. Curing time (field and lab).
 - e. Cross-sectional area of cylinder.
 - f. Compressive strength.
 - g. Type of failure (at break).

- P. All concrete flatwork finishers on Project shall hold current ACI Concrete Flatwork Finisher certification. Submit certification for each concrete flatwork finisher at Concrete Pre-construction Conference and obtain Engineer's written acceptance.

- Q. Mockups: Before casting concrete, build mockups to verify selections made under sample submittals and to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 1. Build two acceptable test panels approximately 600 sq. ft. for flatwork in parking drive areas slab-on-grade in the location indicated or, if not indicated, submit a request for acceptance of the proposed location at the project site. See additional requirements for test panels in specification article "Finishing Floors and Slabs."
 2. Stains, bug holes or other surface blemishes that deviate from the mockup will not be acceptable.
 3. Demonstrate curing, cleaning, and protecting of cast-in-place architectural concrete, finishes, and contraction joints, as applicable.
 4. Obtain Engineer's acceptance of mockups before casting concrete with specified finishes.
 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- R. Coal fly ash and processed ultra-fine fly ash supplier shall make available qualified individual, experienced in placement of fly ash concrete, to aid Contractor. Qualification of supplier's representative shall be acceptable to Owner. Representative shall attend pre-construction meeting, and shall be present for all trial placements, initial startup and then as required by Owner.
- S. At all times during high-evaporation conditions, maintain adequate supply of evaporation reducer at site. Do not use evaporation reducer as finishing aid. See Part 3.
- T. Testing Agency: Identify those trucks of concrete supplier's which meet requirements of NRMCA Quality Control Manual. Permit only those trucks to deliver concrete to Project.

1.7 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO, "Standard Specifications for Highway Bridges."
 - 2. AASHTO T 318, "Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying."
- B. American Concrete Institute (ACI):
 - 1. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials."
 - 2. ACI 214R, "Evaluation of Strength Test Results of Concrete."
 - 3. ACI 301, "Specifications for Structural Concrete."
 - 4. ACI 302.1R, "Guide for Concrete Floor and Slab Construction."
 - 5. ACI 305R, "Hot Weather Concreting."
 - 6. ACI 306.1, "Cold Weather Concreting."
 - 7. ACI 308R, "Guide to Curing Concrete."
 - 8. ACI 308.1, "Standard Specifications for Curing Concrete."
 - 9. ACI 318, "Building Code Requirements for Structural Concrete & Commentary."
 - 10. ACI 347, "Guide to Formwork for Concrete."
 - 11. ACI 347.2 "Guide to Shoring/Reshoring of Concrete Multistory Buildings."
 - 12. ACI 362.1, "Guide for the Design of Durable Parking Structures."
 - 13. ACI SP15, "Field Reference Manual."
- C. American Iron and Steel Institute (AISI):
 - 1. AISI, "Specification for the Design of Cold-Formed Steel Structural Members."
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 36, "Standard Specification for Carbon Structural Steel."
 - 2. ASTM A 185, "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete Reinforcement."
 - 3. ASTM A 497, "Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete Reinforcement."
 - 4. ASTM A 615, "Standard Specification for Deformed and Plain Carbon -Steel Bars for Concrete Reinforcement."
 - 5. ASTM A 706, "Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement."
 - 6. ASTM A 775, "Standard Specification for Epoxy-Coated Steel Reinforcing Bars."

7. ASTM A 884, "Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement for Reinforcement."
8. ASTM A 934/A 934M, "Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars."
9. ASTM B 633, "Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel."
10. ASTM C 31, "Standard Practice for Making and Curing Concrete Test Specimens in the Field."
11. ASTM C 33, "Standard Specification for Concrete Aggregates."
12. ASTM C 39, "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens."
13. ASTM C 94, "Standard Specification for Ready-Mixed Concrete."
14. ASTM C 109, "Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)."
15. ASTM C 138, "Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete."
16. ASTM C 143, "Standard Test Method for Slump of Hydraulic Cement Concrete."
17. ASTM C 150, "Standard Specification for Portland Cement."
18. ASTM C 157, "Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete."
19. ASTM C 171, "Standard Specification for Sheet Materials for Curing Concrete."
20. ASTM C 172, "Standard Practice for Sampling Freshly Mixed Concrete."
21. ASTM C 173, "Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method."
22. ASTM C 231, "Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method."
23. ASTM C 260, "Standard Specification for Air-Entraining Admixtures for Concrete."
24. ASTM C 309, "Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete."
25. ASTM C 311, "Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete."
26. ASTM C 330, "Standard Specification for Lightweight Aggregates for Structural Concrete."
27. ASTM C 457, "Standard Test Method for Microscopical Determination of Air-Void Content and Parameters of the Air-Void System in Hardened Concrete."
28. ASTM C 494, "Standard Specifications for Chemical Admixtures for Concrete."
29. ASTM C 567, "Standard Test Method for Determining the Density of Structural Lightweight Concrete."
30. ASTM C 595, "Standard Specification for Blended Hydraulic Cements."
31. ASTM C 618, "Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete."
32. ASTM C 666, "Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing."
33. ASTM C 672, "Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals."
34. ASTM C 989, "Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars."
35. ASTM C 1064/C 1064M "Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete."
36. ASTM C 1077, "Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation."
37. ASTM C 1116, "Standard Specification for Fiber-Reinforced Concrete and Shotcrete."
38. ASTM C 1202, "Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration."
39. ASTM C 1218, "Standard Test Method for Water Soluble Chloride Ion in Mortar and Concrete."
40. ASTM C 1240, "Standard Specification for Silica Fume Used in Cementitious Mixtures."

41. ASTM C 1260, "Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar Bar Method)."
 42. ASTM C 1293, "Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction."
 43. ASTM C 1315, "Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete."
 44. ASTM C 1567, "Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerate Mortar Bar Method)."
 45. ASTM C 1602/C 1602M, "Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete."
 46. ASTM C 1610/C 1610M, "Standard Test Method for Static Segregation of Self-Consolidating Concrete Using Column Technique."
 47. ASTM C 1611/C 1611M, "Standard Test Method for Slump Flow of Self-Consolidating Concrete."
 48. ASTM C 1621/C 1621M, "Standard Test Method for Passing Ability of Self-Consolidating Concrete by J-Ring."
 49. ASTM D 448, "Standard Classification for Sizes of Aggregate for Road and Bridge Construction."
 50. ASTM D 3963/D 3963M, "Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars."
 51. ASTM E 96/E 96M, "Standard Test Methods for Water Vapor Transmission of Materials."
 52. ASTM E 1643, "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs."
 53. ASTM E 1745 "Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs."
 54. ASTM F1637 02, "Standard Practice for Safe Walking Surfaces."
- E. American Welding Society (AWS):
1. AWS D1.1, "Structural Welding Code-Steel."
 2. AWS D1.4, "Structural Welding Code-Reinforcing Steel."
- F. Concrete Reinforcing Steel Institute (CRSI):
1. CRSI MSP, "Manual of Standard Practice."
- G. US Army Corps of Engineers (CE):
1. CE CRD-C 513 "Specifications for Rubber Waterstops."
 2. CE CRD-C 572 "Specifications for Polyvinyl Chloride Waterstops."
 3. CE CRD-C 662 "Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar Bar Method)."
- H. Prestressed Concrete Institute (PCI):
1. PCI MNL 116, "Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products."
 2. PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
 3. PCI MNL 120, "Design Handbook Precast Prestressed Concrete."
 4. PCI MNL 122, "Architectural Precast Design Handbook."
 5. PCI MNL 129, "Parking Structures-Recommended Practice for Design and Construction."
 6. PCI MNL 135, "Tolerances for Precast and Prestressed Concrete Construction."
 7. PCI "Code of Standard Practice for Precast Concrete."

- I. Contractor shall have following ACI publications at Project construction site:
 - 1. ACI SP-15, "Field Reference Manual: Standard Specifications for Structural Concrete ACI 301 with selected ACI References."
 - 2. ACI 302.1R, "Guide for Concrete Floor and Slab Construction."
 - 3. ACI 305R, "Hot Weather Concreting."
 - 4. ACI 306.1, "Cold Weather Concreting."

- J. Accessibility Requirements:
 - 1. "Americans with Disabilities - Act Accessibility Guidelines for Buildings and Facilities", as published by U.S. Architectural & Transportation Barriers Compliance Board, 1331 F Street, N.W., Suite 1000, Washington, DC 20004-1111, 1-800-872-2253, <http://www.access-board.gov/adaag/ADAAG.pdf>
 - 2. TAS – Texas Accessibility Standards.

- K. International Code Council (ICC):
 - 1. IBC, "International Building Code 2015."
 - 2. IPMC, "International Property Maintenance Code."
 - 3. IFC, "International Fire Code."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store all formwork and formwork materials clear of ground, protected, to preclude damage.
- B. Deliver reinforcement to Project site bundled, tagged and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.
- C. Store concrete reinforcement materials at site to prevent damage and accumulation of dirt or excessive rust.
- D. Concrete transported by truck mixer or agitator shall be completely discharged within one and one half-hours (one hour for hot weather concreting) after water has been added to cement or cement has been added to aggregates. Schedule deliveries to allow for delays due to weather, traffic, etc.

1.9 WARRANTY

- A. Period of this warranty shall be in accordance with the General Conditions or a minimum of one year after substantial completion of the work. Should any defect [other than hairline cracks: defined as not more than 0.006 in. wide] be discovered after acceptance and occupancy of Project, which can be directly attributed to defect in material or workmanship not evident at time of initial occupancy, then contractor shall, upon written notice, correct defects without expense to Owner or Engineer/Architect. The Contractor's warranty excludes remedy for damage or defect caused from abuse, improper or insufficient maintenance, or normal wear and tear.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Structural 1, B-B or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
 - 1. Corrugated concrete form material providing temporary support of concrete walls or beams and slabs above expansive soils.
 - 2. Products include all corrugated cardboard void forms that temporarily support concrete walls, grade beams, structural concrete slabs and top portion of concrete piers; includes filling the circular section where required.
 - a. Related accessory products include seam caps, end caps and protective cover boards or any other product to maintain above general products.
 - b. Submit all product data and manufacturer's installation instructions under provisions of this Section, based on the design loads specified in contract documents and depth and width indicated.
- D. Form Coatings: Provide commercial formulation form-coating compounds with a maximum VOC of 350 grams/liter that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces, including but not limited to water-curing, curing compound, stains or paints.
- E. Form Ties: Factory - fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will leave no metal closer than 1.5 in. to exposed surface.
 - 1. Provide ties that, when removed, will leave holes not larger than 1 in. diameter in concrete surface.
- F. Chamfer strips: Wood, metal, PVC, or rubber strips. 0.75 in. by 0.75 in. min. unless noted otherwise.
- G. Nails for P-T Anchors: Stainless steel ring shank nails.
 - 1. Clendenin Brothers, Baltimore, MD.
 - 2. Or Equal.

2.2 STEEL REINFORCEMENT

- A. Reinforcement Bars: ASTM A 615, deformed, yield strength: as noted on Drawings.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
- C. Post-tensioned Reinforcement: See Section "Unbonded Post-Tensioned Concrete".

- D. Steel Bar Mats: ASTM A 184, assembled with clips.
 - 1. Steel Reinforcement: ASTM A 615, Grade 60, deformed bars.
 - 2. Steel Reinforcement: ASTM A 706, deformed bars.
- E. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
 - 1. Welded wire reinforcement: provide in mats only. Roll stock prohibited.
- F. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.3 REINFORCEMENT ACCESSORIES

- A. Bar supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from all plastic of greater compressive strength than concrete, and as follows:
 - 1. In manner acceptable to Engineer solely, bar and welded wire reinforcement supports shall be color-coded to visually differentiate supports by height and shall be fabricated to resist overturning during construction operations.
 - 2. For slabs on ground, use all-plastic supports with sand plates or horizontal runners where base materials will not support chair legs. All supports shall have sufficient surface area in contact with ground so that they shall not allow clearance loss when reinforcement installed or concrete placed.
 - 3. For concrete surfaces exposed to view where bar supports contact forms, supports shall have minimal contact, shall not cause voids and shall not cause damage to surrounding concrete. Use all-plastic supports conforming to CRSI Class 1 protection requirements.
 - 4. Chairs shall be sized and spaced to prevent cover loss during construction operations.
 - 5. Acceptable manufacturers:
 - a. Dayton Superior Corp.
 - b. General Technologies, Inc.
 - c. Accepted equivalent.
 - 6. For welded wire reinforcement, provide continuous bar supports spaced at 2 feet o.c., maximum."
- B. For mechanical tension splices of reinforcement:
 - 1. All splices to develop 125 percent of specified yield strength of bars, or of smaller bar in transition splices. Acceptable products:
 - a. Bar-Lock Rebar Coupler, by Dayton Superior.
 - b. Bar-Grip or Grip-Twist, by Barsplice Products, Inc.
 - c. Extender HRC 500 Series Coupler, by Headed Reinforcement Corp.
 - d. Splice Sleeve, by NMB.
 - e. LENTON Splices, by Erico.
- C. Compression splices: Mechanically coupled splices in accordance with ACI 318, Chapter 12.

2.4 CONCRETE MATERIALS

- A. Ready Mixed Concrete: Obtain concrete from plant with current certification from:
 - 1. Concrete Materials Engineering Council.
 - 2. Texas Department of Transportation.
 - 3. National Ready Mixed Concrete Association.
 - 4. Prestressed Concrete Institute.

- B. Portland Cement (ACI 301, Section 4 header "Cementitious Materials"):
 - 1. Portland cement, Type I, ASTM C 150. Use one cement supplier throughout project. No change in brand or supplier without prior written acceptance from Engineer.

- C. Coal Fly Ash:
 - 1. Permitted in all parts of structure.
 - 2. ASTM C 618, Class C or F.
 - 3. Testing: ASTM C311.
 - 4. Percentage of fly ash in Mixture Proportion shall be by weight, not by volume. Water/cement ratio will be calculated as water/cementitious (total cement and fly ash) ratio.
 - 5. If project contains post-tensioned members, see Section "Unbonded Post-Tensioned Concrete," for high early strength requirements for concrete to be post-tensioned.
 - 6. If strength varies from value specified by more than specified tolerances, Engineer or designated representative shall reject that concrete.
 - 7. Submit all fly ash concrete Mixture Proportions per ACI 301.

- D. Slag – (Ground Granulated Blast-Furnace Slag – GG-BFS):
 - 1. ASTM C 989, Grade 100 or higher.
 - 2. Percentage of GGBF slag in Mixture Proportion shall be by weight, not by volume. Water-cement ratio shall be calculated as water-cementitious (total Portland cement + GGBF slag) ratio.
 - 3. If strength varies from value specified by more than specified tolerances, Engineer or designated representative shall reject that concrete.
 - 4. Submit all GGBF slag concrete mixture proportions per ACI 301.

- E. Normal Weight Aggregates (ACI 301, Section 4 header "Aggregates"):
 - 1. Normal weight concrete aggregates:
 - a. Coarse aggregate: Crushed and graded limestone or approved equivalent conforming to ASTM C33 except as noted here, minimum class designations as listed below:
 - 1) Below grade construction: Class 1M.
 - 2) Walls not exposed to public view: Class 3M.
 - 3) Walls exposed to public view: Class 5M.
 - 4) Slabs on ground: Class 4M.
 - 5) All other concrete: Class 5M.
 - b. No deleterious materials such as, but not limited to, chert or opaline.
 - c. Fine aggregate: Natural sand conforming to ASTM C 33 and having preferred grading shown for normal weight aggregate in ACI 302.1R, Table 8.5.1.
 - d. Coarse Aggregate shall not contain crushed hydraulic-cement concrete.

2. Combined Aggregate Gradation: Well graded from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50 sieve, and less than 8 percent may be retained on sieves finer than No. 50.
 3. Coarse aggregate: Nominal maximum sizes indicated below, conforming to ASTM C 33, Table 2:
 - a. Footings/Foundations: Size number 57 or 357.
 - b. Less than 3 in. thick: Size number 7 or 67.
 - c. Slab on grade: Size number 57.
 - d. All other members: Size number 67.
 4. Chloride Ion Level: ASTM C 1218. Chloride ion content of cement, aggregates and all other ingredients: tested by laboratory making trial mixes.
- F. Water: Comply with ASTM C 1602.
- G. Storage of Materials (ACI 301, Section 4 header "Materials Storage and Handling").

2.5 ADMIXTURES

- A. Use water-reducing admixture, mid-range water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete as required for placement and workability.
- B. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg. F as required for schedule.
- C. Use high-range water-reducing admixture (HRWR) in pumped concrete, and for concrete with water/cementitious ratio of less than or equal to 0.45. Use high-range or mid-range water-reducing admixtures in pumped concrete and normal or mid-range water reducing admixtures for concrete with water/cementitious ratios greater than 0.45.
- D. Self-consolidating concrete (SCC) may be used where placement due to either dense reinforcement or form design requires both a high level of workability (horizontal slump flow greater than 24 in. diameter) and the water/cementitious ratio is less than or equal to 0.45.
- E. Use air-entraining admixture for workability at the dosage indicated on drawing General Notes.
- F. Only admixture manufacturers listed acceptable. Do not submit alternate manufacturers.
- G. Concrete supplier and manufacturer shall verify via trial mixes and certify compatibility (no adverse effect on workability, strength, durability, entrained air content, etc.) of all ingredients in each Mixture. Use admixtures in strict accordance with manufacturer's recommendations.
- H. Prohibited Admixtures: Calcium chloride or admixtures containing intentionally added chlorides shall not be used.
- I. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
 1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Air-Mix," "Eucon Air-Series" or "AEA-92," Euclid Chemical Co.

20011 Gregg County Parking Garage and Office

- b. "Daravair Series" or "Darex Series," GCP Applied Technologies.
 - c. "Micro-Air," or "MB-VR," or "MBAE-90," BASF Construction Chemicals.
 - d. "Sika AEA Series," or "Sika AIR Series," Sika Corporation.
 - e. "ConAir Series," Premiere Concrete Admixtures.
 - f. Polychem "VR" or "VRC" or "Polychem AE," General Resource Technology.
 - g. "RSA-10," Russ Tech Admixtures, Inc.
- J. Normal Water-Reducing Admixture: ASTM C 494, Type A.
- 1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Eucon Series," Euclid Chemical Co.
 - b. "WRDA Series," GCP Applied Technologies.
 - c. "Pozzolith Series," or "PolyHeed Series," BASF Construction Chemicals.
 - d. "Plastocrete Series", Sika Corporation.
 - e. "OptiFlo Series" or "EcoFlo Series," Premiere Concrete Admixtures.
 - f. "Polychem Series" or "KB Series," General Resource Technology.
 - g. "LC-400 Series" or "LC-500 Series," Russ Tech Admixtures, Inc.
- K. Mid Range Water-Reducing Admixture: ASTM C 494, Type A.
- 1. Subject to compliance with requirements, provide one of following:
 - a. "Eucon MR" or "Eucon X-15 and X-20," Euclid Chemical Co.
 - b. "Daracem Series" or "MIRA Series," GCP Applied Technologies.
 - c. "PolyHeed Series," BASF Construction Chemicals.
 - d. "Sikaplast Series" or "Plastocrete Series", Sika Corporation.
 - e. "Polychem 1000" or "KB Series," General Resource Technology.
 - f. "Finishease-NC," Russ Tech Admixtures, Inc.
 - g. "OptiFlo Series" or "EcoFlo Series," Premiere Concrete Admixtures.
- L. High Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F.
- 1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Eucon 37" or "Plastol Series," Euclid Chemical Co.
 - b. "Daracem Series" or "ADVA Series," GCP Applied Technologies.
 - c. "Rheobuild 1000", "PS 1466" or "Glenium Series," BASF Construction Chemicals.
 - d. "Sikament Series" or "Sika ViscoCrete Series," Sika Corporation.
 - e. "Melchem Series," General Resource Technology.
 - f. "Superflo 443" or "Superflo 2000 Series," Russ Tech Admixtures, Inc.
 - g. "EcoFlo Series" or "UltraFlo Series," Premiere Concrete Admixtures.
- M. High-Range Water-Reducing Admixture (Superplasticizer) for Self-Consolidating Concrete, ASTM C 494 Type F.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Plastol Series" or "Eucon SPJ," Euclid Chemical Co.
 - b. "ADVA Series," GCP Applied Technologies.
 - c. "Glenium Series" or "PS1466," BASF Construction Chemicals.
 - d. "Sika ViscoCrete Series" or "Sikament Series", Sika Corporation.
 - e. "Superflo 2000 Series," Russ Tech Admixtures, Inc.
 - f. "UltraFlo Series," Premiere Concrete Admixtures.

- N. Viscosity Modifying Admixture for Self-consolidating Concrete:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Visctrol" or "Eucon ABS," Euclid Chemical Co.
 - b. "Rheomac VMA Series," BASF Construction Chemicals.
 - c. "Sika Stabilizer Series," Sika Corporation.
 - d. "AWA-C61," Russ Tech Admixtures, Inc.
 - e. "V-MAR," GCP Applied Technologies.
 - f. "UltraFinish A1" or "PCA-AWA," Premiere Concrete Admixtures.
- O. High Range water reducing retarding (superplasticizer), ASTM C 494 Type G:
1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Eucon 537 or RD2," Euclid Chemical Co.
 - b. "Daracem 100," GCP Applied Technologies.
 - c. "Sikament Series," Sika Corporation
 - d. "Melchem," General Resource Technology.
- P. Non-Chloride, Non-Corrosive Water-Reducing, Accelerating Admixture: ASTM C 494, Type C or E.
1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Eucon AcN-Series," "Accelguard 80," "Accelguard NCA," or "Accelguard 90," Euclid Chemical Co.
 - b. "DCI," "PolaraSet," "Lubricon NCA," "Daraset," or "Gilco," GCP Applied Technologies.
 - c. "Pozzutec 20+" or "Pozzolith NC 534," BASF Construction Chemicals.
 - d. "Sika Set NC," "Plastocrete 161FL", or "Sika Rapid-1," Sika Corporation.
 - e. "Polychem NCA" or "Polychem Super Set," General Resource Technology.
 - f. "LCNC-166," Russ Tech Admixtures, Inc.
 - g. "NitroCast Series," Premiere Concrete Admixtures.
- Q. Water-Reducing or retarding Admixture: ASTM C 494, Type D or B.
1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Eucon Retarder-75", "Eucon DS" or "Eucon W.O." Euclid Chemical Co.
 - b. "Daratard-17" or "Recover," GCP Applied Technologies.
 - c. "Pozzolith Series" or "Delvo Series," BASF Construction Chemicals.
 - d. "Sikatard Series," or "Plastiment Series" or "Plastocrete Series," Sika Corporation.
 - e. "Polychem R," General Resource Technology.
 - f. "LC-400 Series" or "LC-500 Series," Russ Tech Admixtures, Inc.
 - g. "OptiFlo Series," Premiere Concrete Admixtures.
- R. Corrosion Inhibiting Admixture capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Calcium Nitrite based Corrosion Inhibitor shall have a concentration of 30 percent, plus or minus 2 percent of solids content. Dosage rate shall be 3 gal/cu. yd. of concrete which will inhibit corrosion to 9.9 lbs of chloride per cu. yd. of concrete.

- 1) "Eucon CIA" or "Eucon BCN," Euclid Chemical Company.
 - 2) "DCI" or "DCI-S," GCP Applied Technologies.
 - 3) "Rheocrete CNI," BASF Construction Chemicals.
 - 4) "Sika CNI," Sika Corporation.
 - 5) "Polychem CI," General Resource Technology.
 - 6) "Russ Tech RCI," Russ Tech Admixtures, Inc.
 - 7) "Impede CNI," Premiere Concrete Admixtures.
- b. Amine Carboxylate based corrosion inhibitor (concentrated liquid or powder formulation).
- 1) "MCI-2005," Cortec Corporation, dosage rate 1.0 pt/cu. yd.
 - 2) "MCI-2005 NS," Cortec Corporation, dosage rate 1.5 pt/cu. yd.
 - 3) "MCI-2006 NS," Cortec Corporation, dosage rate 1 lb/cu. yd.
2. Show Corrosion Inhibitor as an Add Alternate on Bid Form.
- S. High Reactivity Metakaolin ASTM C 618, Class N:
1. Products: Subject to compliance with requirements, provide one of following:
 - a. Grace HRMK 100," GCP Applied Technologies.
 - b. "MetaMax," BASF Construction Chemicals.
- T. Alkali-Silica Reaction Inhibiting Admixture.
1. Products:
 - a. "ASRx 30LN," BASF Construction Chemicals.
 - b. "Eucon Integral ARC," Euclid Chemical Co.
 - c. "Sika Control ASR", Sika Corporation.
 - d. "Rasir," GCP Applied Technologies.
 - e. "Impede LN," Premiere Concrete Admixtures.
 2. Include water content in admixture when calculating water-to-cement ratio.
 3. Provide satisfactory CE CRD-C667 results with lithium admixture as defined in "Alkali-Aggregate Reactivity Resistance" paragraph below.
- U. Shrinkage Reducing Admixture:
1. Design requires using materials with combined drying shrinkage characteristic of 0.04 percent maximum at 28 days. Proposed concrete Mixture(s), using actual aggregates, admixtures and cement of the proposed mix for Project as detailed herein and in Drawings, shall meet criteria. Submit ASTM C 157 (may be modified by curing period duration) results for at least 3 specimens. Test takes 28 days minimum. Begin tests as soon as possible so final test results available for submittal to Engineer.
 2. Products: Subject to compliance with requirements, provide one of following:
 - a. If calcium nitrite is present in the original concrete mixture:
 - 1) "Eclipse 4500," GCP Applied Technologies.
 - 2) "Eucon SRA +" or "Conex," Euclid Chemical Company.
 - 3) "Sika Control 40", Sika Corporation.

- b. If calcium nitrite is not present in the original concrete mixture:
 - 1) "Eucon SRA," "Eucon SRA+," or "Conex" Euclid Chemical Company.
 - 2) "Eclipse 4500," GCP Applied Technologies.
 - 3) "TetraGuard AS 20," BASF Construction Chemicals.
 - 4) "Sika Control 40," Sika Corporation.
 - 5) "SRA-157," Russ Tech Admixtures, Inc.
 - 6) "PCA-SRA," Premiere Concrete Admixtures.

2.6 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Superstop; Tremco Inc.
 - b. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
 - c. Mirastop; Miradri, Div. Of Royal Ten Cate (USA), Inc.
 - d. Superstop; Progress Unlimited Inc.
 - e. Hydrotite or SikaSwell Profile; Sika Corporation.

2.7 VAPOR BARRIERS

- A. Vapor Barrier: Provide vapor barrier which conforms to ASTM E 1745, Class A. The membrane shall have a water-vapor transmission rate less than or equal to 0.008 gr. /ft²/hr. when tested, in accordance with ASTM E96. Vapor barrier shall be no less than 15 mils thick. The vapor barrier shall be placed over prepared base material where indicated below slabs on ground.
 - 1. New ISO certified virgin resins, polyolefin based maximum.
 - 2. Available Product: Subject to compliance with requirements, a product that may be incorporated into the Work includes, but is not limited to "Griffolyn Vaporguard" by Reef Industries, Inc., Stego Wrap (15-Mil) Vapor Barrier by Stego Industries LLC, or Perminator (15 Mil) Underground Vapor Barrier by W.R. Meadows,.

2.8 CURING MATERIALS

- A. Evaporation Reducer: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Evaporation Retarder:
 - a. Eucobar; Euclid Chemical Co.
 - b. E-Con; L&M Construction Chemicals, Inc.
 - c. MasterKure ER 50; BASF Construction Chemicals.
 - d. SikaFilm; Sika Corporation.
 - e. AquaFilm Concentrate J74; Dayton Superior Corporation.
 - f. "EVRT", Russ Tech Admixtures, Inc.
 - g. "Barrier," Premiere Concrete Solutions.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Curing Compound (VOC Compliant, less than 350 g/l): Comply with ASTM C 309, Type 1, Class A or B. Moisture loss shall be not more than 0.55 kg/m² when applied at 200 sq. ft. /gal. Manufacturer's certification is required. Silicate based compounds prohibited.
 - 1. Subject to project requirements provide one of the following products:
 - a. "Kurez DR VOX" or "Kurez RC," Euclid Chemical Company.
 - b. "Clear Resin Cure J11W," Dayton Superior.
 - c. "MasterKure CC 200 WB" or "MasterKure CC 160 WB" BASF Construction Chemicals.
 - 2. Additional requirements:
 - a. With product submittal provide plan and procedures for removal of residual curing compound prior to application of sealers, coatings, stains, pavement markings and other finishes.
 - b. Provide a summary of testing to show adequate surface preparation for successful application of sealers, coatings, stains, pavement markings, and other finishes.

2.9 RELATED MATERIALS

- A. Bonding Additive: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- B. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
 - 2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
 - 3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- C. Post Installed mechanical and adhesive anchors shall be manufactured by Hilti Fastening Systems, Tulsa Oklahoma, ITW Ramset/Red Head, Wood Dale, IL, Simpson Anchor Systems, Columbus, OH, Powers Fasteners, Brewster, NY, or accepted equivalent. Anchor bolt composition shall be from one or more of carbon steel and stainless steel, lead, Zamac alloy, nylon, plastic, polypropylene, and jute fiber.
 - 1. Strength of anchors shall comply with ACI 318-11 Appendix D, and ACI 355.2 and ICC-ES-AC193 for mechanical anchors and ACI 355.4 and ICC-ES-AC308 for adhesive anchors.
 - 2. Carbon steel anchors shall be either zinc plated in accordance with ASTM B 633, or hot-dipped galvanized in accordance with ASTM A-153-78. Provide mill test reports and manufacturer's quality control certification upon Engineer's request.
 - 3. Stainless steel anchors shall be manufactured from ASTM A304, or A663 stainless steel. Provide mill test reports and manufacturer's quality control certification upon Engineer's request.
 - 4. Plastic, lead, or Zamac alloy anchors shall not be used for overhead applications. Adhesive anchors shall not be used to resist pullout forces in overhead and wall

installations unless proper consideration is given to fire conditions. For adhesive anchors, consult with manufacturer's engineer.

5. Safety Factors: Static loads 4:1 minimum. Static load safety factors shall be per manufacturer's published data. Critical load (vibratory, overhead, etc. or more) safety factors shall be 10:1 minimum. Adhesive anchors are not permitted for critical loads and where resistance to direct sustained tension is required.
 - a. If necessary for purposes of determining tensile and/or shear capacity in questionable base material, testing shall be done prior to actual anchor installation. A maximum of five tension and/or shear tests shall be performed by manufacturer's engineer. Anchors shall be proof loaded in tension and/or shear to assure that working load capacity is within specified allowable load limit as published by manufacturer.
6. Anchor spacing and edge distance per manufacturer's limits. Loading and cluster spacing shall be as established by minimum industry standards for anchors, except as follows: Anchor loading, cluster spacing and edge distances shall be as published in manufacturer's literature. Consult with manufacturer's engineer for specific requirements.
7. Anchor installation shall be as required by manufacturers printed installation instructions.

D. Inserts and Coil Rods:

1. Yield strength: 65,000 psi minimum.
2. Galvanizing: Where indicated, electrodeposited zinc coating, ASTM B 633, Service condition 1, Type III.
3. Epoxy coating: Where indicated.
4. Acceptable manufacturers:
 - a. Dayton Superior Corp., Miamisburg, OH.
5. Details shown on drawings are based on Dayton/Richmond Concrete Accessories, Inc. products and their respective capacities. Other products may be used only if contractor submits calculations, sealed by professional engineer or structural engineer licensed in Texas, substantiating strength of connection with other product. Calculations are subject to Engineer's acceptance before fabrication is to proceed.

E. Joint Filler:

1. Joint filler in slabs and curbs: Asphalt impregnated fiber board; as shown on Drawings. Acceptable products:
 - a. "Flexcell," Knight-Celotex Corp.
 - b. "Fibre Expansion Joint," W.R. Meadows, Inc.
2. Joint filler used vertically to isolate walls from columns or other walls: White molded polystyrene beadboard type.
3. Joint cover used to bridge gap between columns and grade walls, retaining walls, or basement walls: Minimum width: Gap width plus 4 in. For gaps over 3 in. wide, protect cover with protection board sized to span gap satisfactorily. Acceptable products:
 - a. "Sealtight Premoulded Membrane Vapor Seal," W.R. Meadows, Inc., Elgin, Illinois.
 - b. "Sealtight Melgard," W.R. Meadows, Inc., Elgin, Illinois and shall be applied according to manufacturer's instructions.

F. Slide Bearing System at Expansion Joints:

1. Provide slide bearing system as shown and detailed on Drawings:
 - a. Slab and plank bearings shall be ultrahigh molecular weight, high-density polyethylene resin: Acceptable material:
 - 1) "Korolath PE," Korolath Corporation, Hudson, Mass.
 - 2) "Tivar-1000," Poly-Hi/Menasha Corporation, Fort Wayne, Indiana.
 - 3) "UHMW Econ-o-Shim," Deslausiers, Inc., Bellwood IL.

2.10 CONCRETE MIXTURES

- A. Proportion mixtures determined by either laboratory trial mix or field test data bases, as follows:
 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
 2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.
 3. Provide different mixtures as the season warrants, as well as each type and strength of concrete or for different placing methods.
- B. Use a qualified independent testing agency for preparing and reporting proposed Mixture Proportions for the laboratory trial mix basis.
- C. Requirements for normal-weight concrete mix are shown on Drawings:
 1. Compressive strength
 2. Slump
 3. Water-cementitious materials ratio
 4. Air content
- D. Supplementary cementitious materials: Maximum weight of fly ash, natural pozzolans, or slag included in concrete shall not exceed percentages of total weight of cementitious materials as follows:
 1. Fly Ash or other pozzolans conforming to ASTM C 618: 25 percent.
 2. Slag conforming to ASTM C 989: 50 percent.
 3. Total of fly ash or other pozzolans and slag: 50 percent. Within the total, Fly ash or pozzolans not exceeding 25 percent.
- E. Air Entrainment:
 1. See General Notes on Drawings for total average air content (percent by volume).
- F. Chloride Ion Content of Mixture:
 1. Water soluble chloride ion content of concrete shall not exceed 0.06 percent by weight of cement for pre-stressed concrete and 0.15 percent for reinforced concrete. (ACI 318 Chapter 4 Table 4.4.1 "Maximum Chloride Ion Content for Corrosion Protection of Reinforcement") Test to determine chloride ion content shall conform to ASTM C 1218.
 2. Concrete chloride ion content shall be determined by Testing Agency prior to placement. Cast samples from current production of concrete mix proposed for superstructure.
 3. Concrete not meeting the requirements of paragraph "Water soluble chloride ion content of concrete..." above, shall contain appropriate amount of calcium nitrite. Concrete supplier shall provide laboratory test results showing the amount of excess chloride ion content in the concrete mixture contributed by the aggregates. For each pound of chloride ion in excess of the amount allowed, mix shall contain calcium nitrite (30 percent, plus or

minus 2 percent, solids content) on one-to-one basis (one gallon of calcium nitrite for one lb. of excess chloride ion). Calcium nitrite used to offset chloride ions is in addition to calcium nitrite used as a corrosion inhibitor. Maximum of 1.5 lb. of chloride ion per cubic yard may be offset in this manner.

- G. Resistance to Alkali-Silica Reaction – Unless otherwise specified, or unless members are assigned to Exposure class C0, use one of the three options below for qualifying concrete mixtures to reduce the potential of alkali-silica reaction:
1. For each aggregate used in concrete, the expansion result determined in accordance with ASTM C1293 shall not exceed 0.04 percent at 1 year.
 2. For each aggregate used in concrete, the expansion result of the aggregate and cementitious materials combination determined in accordance with ASTM C1567 shall not exceed 0.10 percent at an age of 16 days.
 3. Alkali content in concrete (LBA) shall not exceed 4 lb/yd³ for moderately reactive aggregate or 3 lb/yd³ for highly reactive aggregate. Reactivity shall be determined by testing in accordance with ASTM C1293 and categorized in accordance with the ASTM C1778. Alkali content shall be calculated as follows:
 - a. $LBA = (\text{cement content lb/yd}^3) \times (\text{equivalent alkali content of portland cement in percent} / 100 \text{ percent})$.
- H. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Consider using water-reducing admixture or high-range water-reducing admixture (Superplasticizers), OR admixtures that achieve self-consolidating concrete, as required, for placement, workability, finishing and when required, increased flowability.
 2. Consider using water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use high range water-reducing admixture in pumped concrete, concrete for parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio of 0.45 or less. Use normal or mid-range water reducing admixture for concrete with water-cementitious materials ratio greater than 0.45.
- I. When concrete mixture contains calcium nitrite admixture, (or other ionic salts that affect the chloride permeability test), perform rapid chloride permeability test for submitted mixture and for control sample. Control sample shall have the same mixture and water-cementitious materials ratio as submitted mixture, except calcium nitrite admixture shall not be used.
- J. Slump (ACI 301, Part 4 header "Slump"):
1. Maximum slump for concrete is indicated on Drawings. Where field conditions require slump to exceed that shown, increased slump shall be obtained by use of high range water reducers (superplasticizers) only, and Contractor shall obtain written acceptance from Engineer who may require an adjustment to mix.
 2. All concrete containing high-range water-reducing admixture (superplasticizer) shall have a verified initial slump of 2– 3 in. Final slump after the addition of the superplasticizer shall be 6–9 in. as required by the contractor to properly place the concrete. Before permission for plant addition of superplasticizer to be granted by Engineer, fulfill following requirements:
 - a. Submit letter from testing laboratory which developed original mixture proportions, for each superplasticized mixture, certifying volume of mix water which will produce specified slump and water/cement ratio, taking into account aggregate moisture content.

- b. Submit plant computer printout of mixture ingredients for each truckload of superplasticized concrete with delivery of that truckload. Mix water volume greater than that certified shall be cause for concrete rejection.
- c. Over-retarding or crusting of flatwork surface: cause for concrete rejection.
- d. Segregation or rapid slump loss (superplasticizer life) due to incompatibility or under-dosing: cause for concrete rejection.

K. Shrinkage (Length Change):

- 1. Determine length change of hardened concrete test specimens in accordance with ASTM C 157, except as noted in paragraph below. Existing test data from previous project with same materials may be acceptable.
- 2. Test specimens shall be moist cured, including period in molds for 7 days. Then store specimens in air for period of 28 days.
- 3. Utilize concrete materials and mix proportions submitted, for use in floor slab beam, in accordance with Part 1 Article "Submittals".
- 4. Report length change of specimens after periods of air drying after curing of 4, 7, 14, 21, and 28 days.
- 5. Average length change after 28 days shall be limited to 0.04%, unless otherwise accepted by Engineer. Values exceeding 0.04% shall be rejected.

L. Self-Consolidating Concrete:

- 1. Minimum flow of 24 in. to 28 in. or as required by the successful test placement. All self-consolidating concrete shall contain the specified high-range water-reducing admixture and viscosity-modifying admixture as required.
- 2. Measure slump flow using slump cone upright or inverted in accordance with ASTM C1611. Measured flow shall be greater than 24 inches and consistent with submitted mixture test parameters plus or minus 2 in.
- 3. Measure passing ability in accordance with ASTM C 1621/C 1621M. Use the slump cone in the same way as in the slump flow test. Difference in average slump flow between slump flow and passing ability tests shall not exceed 2 in.
- 4. Determine the static segregation (stability) in accordance with ASTM C 1610/C 1610M. Segregation factor of the mixture shall not be more than 15 percent.

M. Engineer's acceptance of mixture proportions shall not relieve Contractor from responsibility for any variation from requirements of Contract Documents unless Contractor has in writing called Engineer's attention to each such variation at time of submission and Engineer has given written approval of each such variation.

N. Adjustment to Concrete Mixtures: Adjustments to mixture proportions may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mixture and strength results shall be submitted to and accepted by Engineer before using in work.

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information. Truck mixing prohibited. Mix at plant.

- 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

- B. Provide plant-printed batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mixture identification number, date, time of batching, mixing time, quantity and details of materials, amount of water introduced and water permitted by plant to be added, if any.

2.12 TOOLS

A. Slab Jointing

- 1. Concrete groovers: For tooled joints in concrete:
 - a. For concrete not exceeding 4 in. thickness, use groover with 1 in. deep v-cut bit, 0.5 in. surface width and 3/16 in. to 1/4 in. edge radius.
 - b. For concrete exceeding 4 in. thickness, use groover with 1.5 in. deep v-cut bit, 0.5 in. surface width and 3/16 in. to 1/4 in. edge radius.
- 2. Saw Cut Joints:
 - a. Acceptable tool: "Soff-Cut Saw Model 310" or "Model G2000," Soff-Cut International, Corona, CA.
 - 1) Cut joint as soon as concrete will support weight of operator and saw without deforming.
 - 2) Joint shall be 1 in. deep for concrete thickness of 4 in. or less. Joint shall be 1.5 in. deep for concrete exceeding 4 in. thickness. Do not cut reinforcement.
 - 3) Extend joint to adjacent vertical surface within 30 minutes of cutting.
 - 4) Retool or grind saw cut joint before installing sealant to provide equivalent dimensions, shape and volume as joint obtained by tooled joint. Surface width shall be 0.5 in. with 3/16 to 1/4 in. edge radius.
 - 5) All joints subject to acceptance by sealant installer. Rework rejected joints until acceptable to sealant installer.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads and in accordance with Article 1.5 "Contractor's Professional Services – Performance and Design Criteria".
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117, except as modified below:
 - 1. Drilled Pier Caps:
 - a. Variation of center from specified plan location: 0.5 in.
 - b. Variation of bearing surface from specified location: Plus or minus 0.5 in.
 - c. Variation from specified dimensions in plan: Plus 2 in. minus 0 in.
 - d. Variation decrease from specified thickness: 0.5 in.

2. Footings:
 - a. Footings other than those to receive masonry construction: Variation of bearing surface from specified elevation: Plus or minus 0.5 in.
 - b. Footings to Receive Masonry Construction:
 - 1) Variation of center from specified location in plan: Plus or minus 0.25 in. in any 10 ft. but not to exceed plus or minus 0.5 in.
 - 2) Variation of bearing surfaces for specified elevation: Plus or minus 0.25 in. in any 10 ft. but not to exceed plus or minus 0.5 in.
 3. Piers, Columns, Walls, Beams, and Slabs:
 - a. Variation in cross-sectional dimensions of piers, beams and columns and in thickness of walls and slabs: 12 in. or less: Plus 0.375 in., minus 0.25 in. Greater than 12 in.: Plus 0.5 in., minus 0.375 in.
 - b. Variation in elevation from specified elevation for piers, columns and walls: Plus or minus 0.5 in.
- C. Void Forms:
1. Prepare ground surface on level plane.
 2. Protect all forms from moisture prior to concrete placement.
 3. Install all forms and accessories in accordance with manufacturer's recommendations.
 4. Protect all forms from puncture and moisture during concrete placement including accessories such as taped joints, seam pads and end caps.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, Reglets, recesses, and the like, for easy removal.
 2. Kerf wood inserts for easy removal.
 3. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sink ages, keyways, Reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 - 1. At least 70 percent of 28-day design compressive strength.
 - 2. For post-tensioned concrete, formwork shall remain in place until post-tensioning has been completed. Do not place additional loads on structure until concrete has been properly reshored.
 - 3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 347.2, ACI 318 and ACI 301, for design, installation, and removal of shoring and reshoring and in accordance with Article 1.5 "Contractor's Professional Services – Performance and Design Criteria".
 - 1. Do not remove shoring until measurement of slab tolerances is completed.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR BARRIER

- A. Vapor Barrier: Place, protect, and repair vapor-barrier or vapor sheets according to ASTM E 1643 and manufacturer's written instructions.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain specified concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on continuous bar supports spaced at 2 ft. o.c., maximum. Lap edges and ends of adjoining sheets per ACI 318 and as follows:
 - 1. Length of overlap measured between outermost cross wires of each sheet shall not be less than one spacing of cross wires plus two inches nor less than one and one-half times the development length nor 6 in. minimum where development length is calculated per section 12.8 of ACI 318.
 - 2. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
- F. Splices:
 - 1. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements of ACI 318 for minimum lap of spliced bars.
 - 2. For mechanical tension splices of reinforcement:
 - a. Column bar lengths shall not exceed 30 ft. between splices. In any bar, no splices shall occur at any floor level.
 - b. Exercise care to assure that no reduction of cross-sectional area of reinforcement occurs.
 - c. For all mechanical splices, perform splicing in strict accordance with manufacturer's requirements and instructions.
 - d. Stagger splices in adjacent bars.
 - e. Except where shown on Drawings, welding of reinforcement prohibited without prior written authorization by Engineer.
 - 3. Compression splices: Mechanically coupled splices in accordance with ACI 318, Chapter 12.
 - 4. Welded wire reinforcement shall not extend through contraction joints.

3.7 JOINTS

- A. Joints in Concrete (ACI 301, Section 5):

1. Construction, control and isolation joints are located and detailed on Drawings:
 - a. Tool joints at time of finishing. Tool: Part 2 Article "Tools."
 - b. Saw Cut Joints:
 - 1) Cut joint as soon as concrete will support weight of operator and saw without deforming.
 - 2) Joint shall be 1 in. deep for concrete thickness of 4 in. or less. Joint shall be 1.5 in. deep for concrete exceeding 4 in. thickness. Do not cut reinforcement.
 - 3) Extend joint to adjacent vertical surface within 30 minutes of cutting.
 - 4) Retool or grind saw cut joint before installing sealant to provide equivalent dimensions, shape, and volume as joint obtained by tooled joint. Surface width shall be 0.5 in. with 3/16 in. to 1/4 in. edge radius.
 - 5) All joints subject to acceptance by sealant installer. Rework rejected joints until acceptable to sealant installer.
 - c. Isolation joints: Interrupt structural continuity resulting from bond, reinforcement or keyway.
 - d. Construction and control joints in walls: Space joints at 20 ft. on center unless smaller spacing is shown on Drawings.
 - e. Construction or control joints in floor slabs on ground: Maximum slab area controlled by jointing 400 sq. ft. Space joints at 20 ft. on center maximum unless different spacing is shown on Drawings.
 - f. Coordinate configuration of tooled joints with control joint sealants.
- B. Provide keyways at least 1-1/2 in. deep in construction joints in walls and slabs. Accepted bulkheads designed for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated. Do not continue reinforcement through sides of strip placements.
- D. Use bonding grout, containing the specified bonding admixture, on existing concrete surfaces that will be joined with fresh concrete.
- E. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.
 1. Joint filler and sealant materials are specified in Division 7 Sections of these Specifications.
- F. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown.
 1. Tool contraction joints.
 2. If joint pattern not shown, provide joints not exceeding 20 ft. in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
- G. Joint sealant material is specified in Division 7 Sections.

3.8 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
 - 1. Consolidate placed concrete with mechanical vibrating equipment. Use plastic or rubber-tipped vibrators when concrete reinforcement is epoxy-coated.
 - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically (in thin slabs vibrator may be inserted at angle or horizontally to keep vibrator head completely immersed) inserted at uniformly spaced locations no farther than 1.5 times action radius so area visibly affected by vibrator overlaps adjacent previously vibrated area by 3-4 inches. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration (usually 5 to 15 seconds) of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge or motor driven vibrating screed and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using highway bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Use only the specified non-corrosive accelerator. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mixture proportions.
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

- A. As-Cast Finishes: As-cast concrete texture imparted by form-facing material in accordance with ACI 301 and as specified below in accordance with Class of Finish:
1. Rough Form Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding limits for class of surface specified.
 - a. Provide class C finish as described in ACI 347, for surfaces permanently concealed from public view, unless otherwise noted in the Contract Documents. Class C permits gradual or abrupt irregularities of 1/2 inch.
 2. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding limits for class of surface specified.
 - a. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 - b. Provide class B finish as described in ACI 347. Class B permits gradual or abrupt irregularities of 1/4 inch.
- B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.
- C. Mock-Up: Provide a full scale mock-up for all finishes exposed to view as described in article "Quality Assurance".

3.11 FINISHING FLOORS AND SLABS

- A. Flatwork in Parking and Drive Areas (BROOM Finish, ACI 301, Section 5 header “Broom or Belt Finish”:
1. Bullfloat immediately after screeding. Complete before any excess moisture or bleed water is present on surface (ACI 302.1R, Article 8.3.3). The use of power trowels is discouraged; however, if they are used the following applies:
 - a. Use minimal passes so as to not overwork the concrete.
 2. After excess moisture or bleed water has disappeared and concrete has stiffened sufficiently to allow operation, give slab surfaces coarse transverse scored texture by drawing broom across surface. Texture shall be as accepted by Engineer from sample panels.
 3. Finish tolerance: ACI 301, Paragraph 5.3.4.2 and ACI 117, paragraph 4.8.6: The gap at any point between the straightedge and the floor (and between the high spots) shall not exceed 0.5 in. In addition, floor surface shall not vary more than plus or minus 0.75 in. from elevation noted on Drawings anywhere on floor surface.
 4. Before installation of flatwork and after submittal, review, and approval of concrete mixture proportions, Contractor shall fabricate two acceptable test panels simulating finishing techniques and final appearance to be expected and used on Project. Test panels shall be minimum of 20 ft. by 30 ft. in area and shall be reinforced and cast to thickness of typical parking and drive area wearing surface in Project. (Maximum thickness of test panels need not exceed 6 in.) Test panels shall be cast from concrete supplied by similar concrete batch, both immediately after addition of superplasticizer or water-reducing admixture, and at maximum allowed time for use of admixture-treated concrete in accordance with Specifications. Intent of test panels is to simulate both high and low workability mixes, with approximate slump at time of casting of test panels to be 6 in. and 3 in., respectively. Contractor shall finish panels following requirements of paragraphs above, and shall adjust finishing techniques to duplicate appearance of concrete surface of each panel. Finished panels (one or both) may be rejected by Engineer, in which case Contractor shall repeat procedure on rejected panel(s) until Engineer acceptance is obtained. Accepted test panels shall be cured in accordance with Specifications and may be incorporated into Project. Accepted test panels shall serve as basis for acceptance/rejection of final finished surfaces of all flatwork.
 5. Finish all concrete slabs to proper elevations to ensure that all surface moisture will drain freely to floor drains, and that no puddle areas exist. Contractor shall bear cost of any corrections to provide for positive drainage.
- B. Flatwork in Stairtowers and Parking Garage floor subject to pedestrian traffic:
1. Concrete surfaces at all walking areas subject to pedestrian traffic shall provide a smooth, slip resistant walking surface for pedestrians with these minimum requirements:
 - a. Shall provide walking surfaces in accordance with ASTM – F 1637 Standard Practice for Safe Walking Surfaces and “Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)” and TAS (Texas Accessibility Standards).
 - b. Adjoining walkway surfaces shall be flush and meet the following minimum requirements:
 - 1) Changes in level of less than $\frac{1}{4}$ inch in height may be without edge treatment as shown in ADA Figure 303.2 and on the Drawings.

- 2) Changes in Level between $\frac{1}{4}$ inch and $\frac{1}{2}$ inch in height shall be beveled with a slope no greater than 1:2 as shown in ADA Figure 303.3 and on the Drawings.
 - 3) Changes in level greater than $\frac{1}{2}$ inch in height are not permitted unless they can be transitioned by means of a ramp with minimum requirements shown on the Drawings.
 - 4) Openings in floor or ground surfaces shall not allow passage of a sphere more than $\frac{1}{2}$ inch diameter except as allowed for elevators and platform lifts as shown in ADA Figure 302.3 and on the Drawings.
- c. Walkway surfaces shall provide a slip resistant surface.
- 1) Concrete surfaces shall be troweled and finished to provide a slip resistant finish.
 - 2) Contractor shall provide sample area with slip resistant surface finish.
 - 3) Static coefficient of friction for walking surfaces shall be measured on a dry surface by the NBS – Brungraber machine using a silastic sensor shoe and shall be 0.6 or larger for a level surface and 0.8 or larger for ramps.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still workable and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.13 CONCRETE PROTECTION AND CURING

- A. General: Comply with ACI 308.1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Reducer: Apply evaporation reducer to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb. /sq. ft. /h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing. Do not finish immediately after evaporation reducer applied. Wait until after colored tint disappears.
- C. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

- a. Tepid (within 20 deg F of concrete temperature) water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing Compound: After Moisture or Moisture-Retaining-Cover Curing, apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Apply two separate coats with first allowed to become tacky before applying second. Direction of second application shall be at right angles to direction of first.
 - b. Curing compound prohibited when concrete has specified water-cementitious materials ratio less than or equal to 0.40 or air temperature above 80 deg F. Use moist cure instead.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Tepid (within 20 deg F of concrete temperature) water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - b. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
 3. Curing Compound: Where permitted, apply uniformly in continuous operation by power spray or roller immediately after final finishing and the absence of surface moisture, according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Apply two separate coats with first allowed to become tacky before applying second. Direction of second application shall be at right angles to direction of first.
 - b. Curing compound prohibited when concrete has specified water-cementitious ratio less than or equal to 0.40 or air temperature above 80 deg F. Use moist cure instead.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer/Architect. Remove and replace concrete that cannot be repaired and patched to Engineer/Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing. Use this repair procedure only with Engineer/Architect approval.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than ½ inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with specified bonding agent. Fill and compact with specified patching mortar before specified bonding agent has dried. Fill form-tie voids with specified patching mortar or cone plugs secured in place with specified bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area on mockup, or if none, at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer/Architect.
 - 4. Repair isolated random cracks that have little movement and single holes not over 1 in. in diameter in accordance with procedures and materials specified in Division 7 Sections "Water Repellants" and "Concrete Joint Sealants." Receive Engineer's written acceptance of methods and materials selected prior to application.
 - a. Repair isolated random horizontal cracks less than 0.01 in. wide, using silane sealer product specified in Division 7 "Water Repellants"
 - b. Repair isolated random horizontal cracks 0.01 in. to less than 0.03 in. wide, using crack sealer product specified in Division 7 "Water Repellants."
 - c. Repair isolated random horizontal cracks 0.03 in. to 0.06 in. wide: route and seal with specified sealant product in Division 7 "Concrete Joint Sealants."
 - d. Repair isolated random vertical cracks more than 0.01 in. wide, using epoxy injection product approved.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, pop-outs, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 4. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of ¼ inch to match adjacent floor

- elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete or latex modified concrete as approved by the Engineer. Remove defective areas with clean, square cuts and expose steel reinforcement with at least ¾ inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 6. Repair single holes 1 inch or less in diameter with patching mortar. Cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
 7. Repair isolated random cracks that have little movement and single holes not over 1 in. in diameter in accordance with procedures and materials specified in Division 7 Section "Concrete Joint Sealants." Receive Engineer's written acceptance of methods and materials selected prior to application.
 - a. Repair isolated random horizontal cracks less than 0.01 in. wide, using silane sealer product specified in Division 7 "Water Repellants"
 - b. Repair isolated random horizontal cracks 0.01 in. to less than 0.03 in. wide, using crack sealer product specified in Division 7 "Water Repellants."
 - c. Repair isolated random horizontal cracks 0.03 in. to 0.06 in. wide: route and seal with specified sealant product in Division 7 "Concrete Joint Sealants."
 - d. Repair isolated random vertical cracks more than 0.01 in. wide, using epoxy injection product approved.
- E. Perform structural repairs of concrete, subject to Engineer/Architect's approval, using epoxy adhesive and patching mortar, latex modified concrete or other materials as approved by the Engineer.
- F. Repair materials and installation not specified above may be used, subject to Engineer/Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Owner will employ a testing laboratory to perform tests and to submit test reports.
- B. Sample concrete in accordance with ASTM C 172.
- C. Temperature:
 1. Test temperature of concrete in accordance with ASTM C 1064/C 1064M and ACI 301 each time cylinders are taken or as directed by the Engineer.
- D. Slump Test:
 1. Conduct one slump test in accordance with ASTM C 143/C 143M per truck load of ready-mixed concrete delivered to Project at truck for superstructure concrete.
 2. Conduct slump test in accordance with ASTM C143/C 143M and ACI 301 for foundation concrete.

3. When high-range water-reducing admixture (superplasticizer) is used, initial slump must be verified by Testing Agency.
- E. Slump Flow Test (SCC):
1. Conduct one slump flow test in accordance with ASTM C 1611/C 1611M per truck load of ready mixed concrete delivered to Project at truck for superstructure concrete.
 2. Conduct slump flow test in accordance with ASTM C1611/C 1611M and ACI 301 for foundation concrete.
- F. Water Content:
1. Water content and water-cementitious materials ratio shall be verified by use of the Microwave Test in accordance with AASHTO T 318.
 2. Conduct test each time test cylinders are taken and as directed by Engineer.
- G. Concrete Compressive Strength:
1. Make test cylinders in accordance with ASTM C 31 and test in accordance with ASTM C 39 as follows:
 - a. Take minimum of three sets of cylinders (four sets for post-tensioned cast-in-place concrete) for each 100 cu yds. or fraction thereof, of each Mixture of concrete placed in any one day.
 - b. A set of cylinders shall be comprised of two 6 inch by 12 inch cylinders or three 4 inch by 8 inch cylinders.
 - c. Additional cylinders shall be taken under conditions of cold weather concreting per Part 3 Heading "Concrete Curing and Protection."
 - d. At Contractor's option and cost, cylinders may be taken to verify concrete strength prior to form removal.
 - e. Testing Agency: Provide and maintain site cure box for cylinders.
 2. Sample plastic concrete for testing at point of final placement, in accordance with ASTM C 172. Engineer will select sampling locations which may include points where plastic concrete has already been screeded and floated. Sample concrete for test cylinders to be used to verify concrete compressive strength for post-tensioning as near as possible to actual tendon anchorages.
 3. Cover specimens properly, immediately after finishing. Protect outside surfaces of cardboard molds, if used, from contact with sources of water for first 24 hours after molding.
 4. Cure test cylinders per ASTM C 31 as follows:
 - a. To verify compressive strength prior to post-tensioning or form removal or for additional test cylinders required due to cold weather concreting conditions:
 - 1) Store test specimens on structure as near to point of sampling as possible and protect from elements in same manner as that given to portion of structure as specimen represents.
 - 2) Transport to test laboratory no more than 4 hours before testing. Remove molds from specimens immediately before testing.
 - b. To verify 28-day compressive strength:
 - 1) During first 24 hours after molding, store test specimens under conditions that maintain temperature immediately adjacent to specimens in range of 60 to 80 degrees F. and prevent loss of moisture from specimens.

- 2) Remove test specimens from molds at end of 20 +/- 4 hours and store in moist condition at 73.4 +/- 3 degrees F. until moment of test. Laboratory moist rooms shall meet requirements of ASTM C 511.
5. Compression test for non-prestressed concrete:
 - a. Test one set of cylinders at 7 days.
 - b. Test one set of cylinders at 28 days.
 - c. Hold one set of cylinders in reserve for use as Engineer/Architect directs.
6. Compression tests for post-tensioned concrete:
 - a. Test one set of cylinders immediately before tensioning slabs and beams. Cylinders must be field cured in accordance with paragraph "Cure test cylinders per ASTM C 31...."
 - b. Test one set of cylinders at 28 days.
 - c. Hold one set of cylinders in reserve for use as Engineer directs.
7. Unless notified by Engineer, reserve cylinders may be discarded without being tested after 56 days.
- H. Testing for the presence of the Calcium Nitrite admixture in the concrete shall conform to APPENDIX at end of this section for plastic concrete testing.
- I. Report all nonconforming test results to Engineer and others on distribution lists via fax or email. Follow up with colored paper copies to flag the non-conformances.
- J. Monthly, submit a graph showing distribution of compressive strength test results and air content test results. Include microwave test results for concretes with a water cementitious ratio less than or equal to 0.40 concrete.

3.16 EVALUATION AND ACCEPTANCE OF CONCRETE

- A. Concrete Compression test will be evaluated by Engineer in accordance with ACI 301. If number of tests conducted is inadequate for evaluation of concrete or test results for any type of concrete fail to meet specified strength requirements, core tests may be required as directed by Engineer. Air content and parameters of air-void system shall meet requirements of this Section.
- B. Core tests, when required, in accordance with ASTM C42 and ACI 301.
- C. Should tested hardened concrete meet Specifications, Owner will pay for coring and testing of hardened concrete. Should tested hardened concrete not meet Specifications or should concrete have to be tested because Contractor did not conform to Project specifications, Contractor shall pay for coring and testing of hardened concrete and for any corrective action required for unaccepted concrete.

3.17 ACCEPTANCE OF STRUCTURE

- A. Acceptance of completed concrete Work will be according to provisions of ACI 301.
- B. "RAPIDLOAD" testing is acceptable, by Structural Preservation Systems, Baltimore, MD.

END OF SECTION 033000

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers Inc.

APPENDIX: Test method for Calcium Nitrite presence in plastic concrete.

A. Scope

This Method of Test is used to determine the presence of calcium nitrite in the plastic concrete state. A freshly mixed concrete sample shall be tested. Quantofix test strips, for high range nitrite, manufactured by Macherey-Nagel Inc. of Bethlehem, PA or equivalent, shall be used.

For each day's operation, unless directed otherwise, a minimum of one test shall be performed.

B. Apparatus

Quantofix Test Strips for high range nitrite #91322
Macherey-Nagel Inc. (888) 321-6224

10cc disposable syringes with Leur-Lok tip #309604
Becton-Dickinson & Co (201) 847-6800

Disposable Filters 25mm/.45 micron # SLHA02510
Millipore (800) 645-5476

Wide-mouth Container

Clean Measuring Cup

C. Procedure

1. Determine the amount of concrete to be tested based on the design amount of Calcium Nitrite and the table below. Add concrete to pre-measured 0.5 gallons of water in a wide mouth container. Use the water in the container to rinse out the measuring cup.
2. Shake the container for 2 to 5 minutes until contents are well mixed.
3. Using the syringe, uptake approximately 10 milliliters of extraction water from the container. Attach a disposable filter to the end of the syringe.
4. Filter the extraction water into a clean cup.
5. Dip the test strip into the clear, filtered extraction water and compare the color to the chart on the side of the test strip container.
6. Using the table below determine if the reading on the test strips corresponds with the expected reading for the design amount of Calcium Nitrite.

| <u>Design Amount of Calcium Nitrite, gal/CY</u> | <u>Volume of Concrete to be Added, oz.</u> | <u>Expected Reading on Test Strip</u> |
|---|--|---------------------------------------|
| 2.0 | 8 | 0.3 |
| 2.5 | 6 | 0.3 |
| 3.0 | 5 | 0.3 |
| 3.5 | 4 | 0.3 |
| 4.0 | 8 | 0.6 |
| 4.5 | 7 | 0.6 |
| 5.0 | 6 | 0.6 |

Notes:

1. Column 1 indicates the amount of calcium nitrite, in gallons, that has been added to a cubic yard of concrete.
2. Column 2 indicates the amount of concrete that should remain in the container after shaking.
3. Column 3 is the test strip reading that will correspond to the indicated quantity of calcium nitrite.

D. Verification Requirements for Calcium Nitrite Dispensing Systems:

1. Independent Testing agency shall perform the following:
 - a. Prior to and after each pour take volume readings of corrosion inhibitor tank, correlate to size of pour, and report results to Engineer, corrosion inhibitor manufacturer/supplier, and concrete producer. Volume used should be within plus or minus 10 percent of specified amount.

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

| | |
|-------------------------------|-----------------|
| I. GENERAL INFORMATION: | |
| Project: | City: |
| General Contractor: | |
| Concrete Supplier: | |
| Mixture Identification No.: | Concrete Grade: |
| Use (Describe) ¹ : | |

¹ example: Footings, interior flatwork, floor slabs, topping, columns, etc.

| | | |
|---|---|---|
| II. MIXTURE PROPORTIONING DATA: | | |
| Proportioning Based on (Check only one): | | |
| Standard Deviation Analysis: _____ (see section VIII) or Trial Mix Test Data: _____ (see Section IX) | | |
| Mixture Characteristics: (see Mixtures in Drawings General Notes) | Density: _____ pcf; | Air: _____ % specified |
| | Slump _____ in. before superplasticizer | Slump _____ in. after superplasticizer Or for SCC: Spread _____ in. |
| | Strength: _____ psi (28 day); | |

_____ WALKER SUBMITTAL STAMP

_____ CONTRACTOR

_____ SUBMITTAL STAMP

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

| | | |
|---|-------------|--------------------------------------|
| III. MATERIALS: | | |
| Aggregates: (size; type; source; gradation report; specification) | | |
| Coarse: | | |
| Fine: | | |
| Other Materials: | <u>Type</u> | <u>Product-Manufacturer (Source)</u> |
| Cement: | | |
| Flyash, slag, or other pozzolan: | | |
| Silica Fume | | |
| Processed Ultra Fine Fly Ash | | |
| HRM | | |
| Air Entraining Agent: | | |
| Water Reducer | | |
| High Range Water Reducer (HRWR / superplasticizer) | | |
| Non-Corrosive Accelerator | | |
| Retarder | | |
| Fibers | | |
| Other(s): | | |

| | | |
|---|---|---|
| IV. MIX PROPORTIONS ⁽²⁾ | | |
| | WEIGHT (lbs.) (per yd³) | ABSOLUTE VOL. (cu. ft.) (per yd³) |
| Cement: | | |
| Fine Aggregate: ⁽³⁾ | | |
| Coarse Aggregate: ⁽³⁾ | | |
| Flyash, slag, or other pozzolan: | | |
| Silica Fume | | |
| Processes Ultra-Fine Fly Ash | | |
| HRM | | |
| Water: ⁽⁴⁾ (gals. & lbs.) | | |
| Entrained Air: (oz.) | | |
| Fibers: | | |
| (Other) _____: | | |

| | | |
|----------------|--|--|
| TOTALS: | | |
|----------------|--|--|

NOTES:
⁽²⁾ Mix proportions indicated shall be based on data used in section VII or IX.
⁽³⁾ Based on saturated surface dry weights of aggregates.
⁽⁴⁾ Includes ALL WATER, including added water and free water contained on aggregates.

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

| | | | |
|--|-----|-------------------------------|--|
| <u>V. RATIOS</u> | | <u>VI. SPECIFIC GRAVITIES</u> | |
| Water ⁽¹⁾ | lb. | Fine Aggregate: | |
| _____ = _____ = | | | |
| Cementitious Material ⁽²⁾ | lb. | Coarse Aggregate: | |
| _____ = _____ = | | | |
| Fine Agg. | lb. | | |
| _____ = _____ = | | | |
| Total Agg. | lb. | | |
| <p>NOTES: ⁽¹⁾Includes ALL water, including added water and free water contained on aggregates. ⁽²⁾Cementitious materials include cement, fly ash, slag, silica fume, HRM, Processed Ultra-Fine Fly Ash or other pozzolan.</p> | | | |

| | | | | |
|--------------------------------|----------|---------------------|---------|-----------------|
| <u>VII. ADMIXTURES</u> | | | | |
| Air Entraining Agent (A.E.A.): | ___ oz. | per yd ³ | ___ oz. | per 100# cement |
| Superplasticizer | ___ oz. | per yd ³ | ___ oz. | per 100# cement |
| Water Reducer | ___ oz. | per yd ³ | ___ oz. | per 100# cement |
| Non-corrosive Accelerator | ___ oz. | per yd ³ | ___ oz. | per 100# cement |
| Retarder | ___ oz. | per yd ³ | ___ oz. | per 100# cement |
| Other | ___ oz. | per yd ³ | ___ oz. | per 100# cement |
| Lithium Nitrate | ___ gal. | per yd ³ | | |

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

| | | |
|---|---|------------|
| VIII. STANDARD DEVIATION ANALYSIS: | <u>Yes</u> | <u>N/A</u> |
| <small>(Complete this section only if Mixture was developed using standard deviation analysis of previous project test results. If other method was used, check "N/A".)</small> | | |
| <u>Number of Tests Evaluated:</u> <small>(One test is average of two cylinder breaks)</small> | <u>Standard Deviation:</u> <small>(Single Group)</small> | |
| <u>Attach copy of test data considered:</u> | <u>Standard Deviation:</u> <small>(Two Groups)</small> | |
| Required average compressive strength: $f'_{cr} = f'_c + \underline{\hspace{2cm}}$ psi | | |
| <p>NOTE: Mixture shall be proportioned in accordance with ACI 301 section 4.2.3 to achieve average compressive strength f'_{cr} equal to or greater than the larger of one of the following equations:</p> <p>(4.-3) $f'_{cr} = f'_c + 1.34ks$ [s= calculated standard deviation] or (4-4) $f'_{cr} = f'_c + 2.33ks - 500$ or (4-5) $f'_{cr} = 0.9f'_c + 2.33ks$ (for $f'_c > 5,000$ psi)</p> <p><small>(Refer to ACI 301 for required average when data are not available to establish standard deviation. For post-tensioning projects, see also special requirements for strength required to apply initial post-tensioning.)</small></p> | | |
| MIXTURE CHARACTERISTICS (As shown on drawings) | | |
| Slump = <u> </u> in. | Air Content = <u> </u> % | |
| Unit Wet Wt. = <u> </u> pcf | Unit Dry Wt. = <u> </u> pcf | |
| MIXTURE CHARACTERISTICS (Based on proportioning data) | | |
| Initial Slump = <u> </u> in. | Final Slump <u> </u> in. | |
| Unit Wet Wt.= <u> </u> pcf. | Unit Dry Wt. = <u> </u> pcf. | |
| Air Content = <u> </u> % | | |

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

| | | | |
|--|-------------------------------|-------------------------------|-------------------------------|
| IX. TRIAL MIXTURE TEST DATA: | | Yes | N/A |
| (Complete this section only if Mixture Proportion is based on data from trial test mixture(s) batched by testing agency or Contractor. If other method was used, check "N/A".) | | | |
| <u>Age</u> (days) | <u>Mix #1</u> (comp. str.) | <u>Mix #2</u> (comp. str.) | <u>Mix #3</u> (comp. str.) |
| <u>7</u> | | | |
| <u>7</u> | | | |
| <u>28</u> | | | |
| <u>28</u> | | | |
| <u>28</u> | | | |
| <u>28</u> day average compressive strength, psi | | | |
| <p>NOTE: Mixture shall be proportioned in accordance with ACI 301 section 4.2.3 to achieve average compressive strength f'_{cr} equal to or greater than the larger of one of the following equations:</p> <p>(Less than 3000) $f'_{cr} = f'_c + 1000$ or (3000 to 5000) $f'_{cr} = f'_c + 1200$ or (Over 5000) $f'_{cr} = 1.1f'_c + 700$</p> <p>For post-tensioning projects, see also special requirements for strength required to apply initial post-tensioning.</p> | | | |
| MIXTURE CHARACTERISTICS (as shown on drawings) | | | |
| Slump = _____ in. | | Air Content = _____ % | |
| Unit Wet Wt. = _____ pcf | | Unit Dry Wt. = _____ pcf | |
| MIXTURE CHARACTERISTICS (Based on proportioning data) | | | |
| Initial Slump = _____ in. | | Final Slump _____ in. | |
| Unit Wet Wt. = _____ pcf. | | Unit Dry Wt. = _____ pcf. | |
| Air Content = _____ % | | | |

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

| | | |
|---|-----------------------------------|--|
| <u>X. OTHER REQUIRED TESTS</u> | | |
| Water Soluble Chloride Ion Content of mix: | _____ % (by weight of cement) | ASTM C 1218 |
| Hardened Air Content (per ASTM C457): | | |
| Air content: _____ % | Air void spacing Factor _____ in. | Specific surface: _____ in ² /in ³ |
| Chloride Ion Content of Concrete Mixture: ASTM C 1218 | | |
| Shrinkage (Length Change, Average) per ASTM C157: | | |
| _____ % @ 4 days | _____ % @ 7 days | _____ % @ 14 days |
| _____ % @ 21 days | _____ % @ 28 days | |

| |
|---------------------|
| <u>XI. Remarks:</u> |
| |
| |
| |

©2022, Walker Parking Consultants/Engineer, Inc.

| |
|---|
| Ready Mix Concrete Supplier Information |
| Name: |
| Address: |
| |
| Phone Number: |
| Date: |
| Main Plant Location: |
| Miles from Project Site: |
| Secondary or Backup Plant Location: |
| Miles from Project Site: |

My signature below certifies that I have read, understood, and will comply with the requirements of this Section.

Signature _____

Typed or Printed Name

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

| REQUIRED ATTACHMENTS | |
|----------------------|---|
| | Coarse aggregate grading report |
| | Fine aggregate grading report |
| | Concrete compressive strength data used for calculation of required average strength and for calculation of standard deviation |
| | Chloride ion data and related calculations |
| | Admixture compatibility certification letter |
| | Shrinkage information per ASTM C157 |
| | ASTM C 457 |
| | Alkali Content Data and Calculations OR ASTM C1293, ASTM C1260, ASTM C 1567 or CE CRD-C662 Test report for each aggregate |

**SECTION 03 35 11
CONCRETE FLOOR FINISHES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface treatments for concrete floors and slabs.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with concrete floor placement and concrete floor curing.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.
- C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

PART 2 PRODUCTS

2.01 COATINGS

- A. Low Gloss Clear Coating: Transparent, non-yellowing, water- or solvent-based coating.
 - 1. Composition: Acrylic polymer-based.
 - 2. Nonvolatile Content: 15 percent, minimum, when measured by volume.
 - 3. Products:
 - a. Clemons Concrete Coatings; Supreme Shield 600:
www.clemonsconcretecoatings.com/#sle.
 - b. Concrete Sealers USA; TS202: www.concretesealersusa.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that floor surfaces are acceptable to receive the work of this section.
- B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

- A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

- A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
- B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

END OF SECTION

SECTION 03 38 16
UNBONDED POST-TENSIONED CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. In accordance with Contract Documents, provide all materials, labor, equipment, and supervision to fabricate and install all post-tensioning Work. Non-prestressed reinforcement shall conform to Division 03 Section, "Cast-in-Place Concrete."
- B. Meet the requirements of ACI 301, ACI 318, ACI 423.7, CRSI MSP-2, and Contract Documents. In case of a conflict, meet the more stringent requirement.
- C. Related work in other Sections related to Post-Tensioned Concrete:
 - 1. Division 03 Section "Cast-in-Place Concrete."
 - 2. Division 03 Section "Precast Structural Concrete."
 - 3. Division 03 Section "Precast Architectural Concrete."

1.3 REFERENCES

- A. Field Reference: Keep a copy of the following reference in the Contractor's field office.
 - 1. PTI's "Field Procedures Manual for Unbonded Single Strand Tendons"
- B. American Concrete Institute (ACI):
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 318, "Building Code Requirements for Structural Concrete."
 - 3. ACI 347, "Recommended Practice for Concrete Formwork."
 - 4. ACI 362.1R-97, "Guide for the Design of Durable Parking Structures."
 - 5. ACI 423.3R, "Recommendations for Concrete Members Prestressed with Unbonded Tendons."
 - 6. ACI 423.7, "Specification for Unbonded Single-Strand Tendon Materials and Commentary."
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A416, "Specification for Uncoated Seven-Wire Strand for Prestressed Concrete."
 - 2. ASTM E328, "Recommended Practice for Stress-Relaxation Tests for Materials and Structures."
- D. Concrete Reinforcing Steel Institute (CRSI):
 - 1. CRSI MSP-2, "Manual of Standard Practice."

- E. Post-Tensioning Institute (PTI):
 - 1. PTI, "Guide Specifications for Post-Tensioning Materials."
 - 2. PTI, "Performance Specification for Corrosion Preventive Coating."
 - 3. PTI, "Specification for Unbonded Single Strand Tendons."
 - 4. PTI, "Field Procedures Manual for Unbonded Single Strand Tendons."

- F. International Code Conference (ICC):
 - 1. ICC, "International Building Code."
 - 2. ICC, "International Building Code Standards."

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the tendon and anchor locations with Work of other Sections, including "Cast-in-Place Concrete." Immediately inform Engineer/Architect of any potential interference.

- B. Sequencing:
 - 1. Deviations in the construction and stressing sequence shown on the Drawings are not permitted without written acceptance from Engineer/Architect.

- C. Submittals and Resubmittals:
 - 1. Engineer will review each submittal the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made.
 - 2. Circle resubmittal changes/revisions/corrections. Engineer will review only circled items and will not be responsible for non-circled changes, revisions, corrections or additions.
 - 3. Should additional resubmittals be required, reimburse Owner for all costs incurred, including the cost of Engineer's services made necessary to review such additional resubmittals. Owner will in turn reimburse Engineer.

1.5 ACTION SUBMITTALS

- A. Product Data: For each product as indicated.
 - 1. Corrosion Inhibiting Coating: Type and chemical analysis.
 - 2. Sheathing: Type, material, density and thickness.
 - 3. Anchorage Device: Type, material and size.
 - 4. Coupler Device: Type, material and size.
 - 5. Pocket Former: Type, material and size.
 - 6. Sheathing Repair Tape: Type, material and width.
 - 7. Encapsulation System: Type and materials.

- B. Shop Drawings: Include the following prepared by or under the supervision of a qualified professional engineer:
 - 1. Number, arrangement and designation of tendons.
 - 2. Tendon profile and method of tendon support. Show tendon profiles at sufficient scale to clearly indicate tendon high and low points.

3. Tendon anchorage details including bundled tendon flaring.
- C. Samples: For the following products:
1. Each anchorage assembly with a minimum of 24 inches of coated, sheathed strand.
 2. Each coupler assembly with a minimum of 24 inches of coated, sheathed strand.
 3. Encapsulation system.
- D. Delegated-Design: For post-tensioning system.
1. Signed and sealed calculations prepared by a qualified structural engineer indicating method of elongation and determination of number of tendons. Include values used for friction coefficients, anchorage seating loss, elastic shortening, creep, relaxation, wobble and shrinkage.
- E. Stressing Records: Same day as stressing operation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Supplier and Installer using the forms at the end of this section.
- B. Mill Test Reports: Certified mill test reports for each coil or pack of strand used on Project, indicating that strand is low relaxation and including the following information:
1. Heat number and identification.
 2. Minimum breaking strength.
 3. Yield strength at 1 percent extension under load.
 4. Elongation at failure.
 5. Modulus of elasticity.
 6. Diameter and net area of strand.
- C. Test and Evaluation Reports: Indicating compliance with the following requirements:
1. Tests required by ACI 301, Section "Post-Tensioned Concrete."
 2. Hydrostatic tests required by ACI 423.7 for "Anchorage and couplers in aggressive environments."
 3. Relaxation loss tests required by ACI 423.7 for low relaxation prestressing steel.
- D. Field Quality-Control Reports: Within 72 hours of inspection.
- E. Stressing Jack Calibration: Calibration certificates for jacks and gages to be used on Project. Calibrate each jack-and-gage set as a pair.
- F. Warranty: Proposed warranty prior to the start of construction.

1.7 QUALITY ASSURANCE

- A. Supplier Qualifications:
1. Use a fabricating plant certified by PTI.

2. Successfully provided all materials for at least 5 post-tensioning installations in parking structures in the United States with a structural system similar to Project within the previous 5 years. Provide all information requested on the form at the end of this section.

B. Installer Qualifications:

1. Certified by PTI.
2. Successfully performed at least 5 post-tensioning installations in parking structures in the United States with a structural system similar to Project within the previous 5 years. Provide all information requested on the form at the end of this section.
3. Use a full-time Project superintendent that has supervised at least 5 projects of similar magnitude.
4. Use PTI Certified Field Installers to install and stress post-tensioning system.

C. Comply with requirements in ACI 301, Section "Post-Tensioned Concrete."

D. Perform all post-tensioning Work under the supervision of a Project Superintendent who is present during all operations including installation, concrete placement, stressing and finishing.

1.8 DELIVERY, STORAGE AND HANDLING

A. Assign all tendons in same member the same heat number and identify accordingly.

B. Package each tendon bundle at source to prevent physical damage to tendon during transportation and storage, and to protect strand from moisture. Use heavy padding; cardboard is not permitted. Do not use wire binding or other materials that could cut the sheathing or tendon.

C. Deliver, store and handle post-tensioning materials according to ACI 423.7.

D. Immediately remove damaged components from Project site and replace at no cost to Owner.

E. Do not remove sheathing on stressing end until the day of stressing.

F. Materials Stored on Slabs:

1. Prior to final stressing of beams and slabs, do not store any materials on slab.
2. After final stressing of beams and slabs but before concrete has reached the specified 28 day strength, do not store materials on slab such that the weight exceeds 50 percent of the design live load.
3. After final stressing of beams and slabs and concrete has reached the specified 28 day strength, do not store materials on slab such that the weight exceeds the design live load.

1.9 WARRANTY

A. Provide a warranty from the Supplier that includes the following terms and provisions.

1. Warranty period of 5 years beginning with the date of Beneficial Occupancy.
2. Correct, at no expense to Owner, any defects that develop during the warranty period, which can be attributed to a defect in quality of product or workmanship.
3. All materials have been manufactured in accordance with the Project specifications.
4. Installation of materials, if under the control of the Supplier, has been according to the Project specifications.

5. Supplier is not responsible for damage or liability caused by the actions or omissions of others.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

- A. System described in this Section intended to satisfactorily perform in ACI 362.1R-97 zone environment as defined on S-Series Contract Drawings without long-term corrosion or other distress for 40 years.
- B. Engage a qualified professional engineer licensed in Texas to provide tendon quantity calculations and detail the tendon layout based on the following:
 1. Provide the final effective forces indicated on the drawings, which are the stressing forces minus both the short- and long-term losses.
 2. Do not exceed the maximum tensile stress in the tendon during the stressing operation. The maximum tensile stress is the smallest of the following:
 - a. 80 percent of the specified tensile strength of the tendon.
 - b. 94 percent of the specified yield strength of the tendon.
 - c. Maximum value recommended by the tendon manufacturer.
 3. Do not exceed 70 percent of the specified tensile strength after the anchors are seated.
 4. Use PTI recommended values for friction and wobble coefficients unless test data is submitted to substantiate lower values.
 5. Limit main slab tendon maximum spacing according to ACI 318, chapter "Prestressed Concrete," heading "Slab Systems."
 6. For multi-span tendons, do not base the effective tendon force on the average stress for all spans. Calculate losses for each span independently.

2.2 PRESTRESSING TENDONS

- A. Prestressing Strand: ASTM A416, Grade 270, uncoated, seven-wire, low-relaxation strand with minimum ultimate strength of 270 ksi.
 1. Manufactured by a single source.
 2. Strands manufactured outside United States subject to Engineer/Architect's approval based on evidence of satisfactory performance in the United States during the previous 5 years.
 3. Use of high stress bar system instead of strand system is not permitted unless accepted in writing by the Engineer.
 4. Conform to ACI 423.7 for relaxation loss requirements.
- B. Tendon Sheathing: Seamless and extruded high density polypropylene or seamless and extruded high density polyethylene with a specific gravity greater than 0.95 conforming to ACI 423.7.
 1. Sufficient strength to withstand damage during fabrication, transport, installation, concrete placement and stressing.
 2. Minimum thickness of 50 mils (-0 mils +15 mils)
 3. Minimum inside diameter 0.03 inches greater than maximum strand diameter.

4. Chemically stable without becoming brittle or softening over anticipated temperature range and service life of structure.
 5. Non-reactive with concrete, steel and corrosion inhibiting coating.
 6. Contrasting color of corrosion inhibiting coating to enhance visibility of damage. Black/dark colored sheathing is not acceptable.
 7. Annular space between sheathing and strand completely filled with corrosion inhibiting coating.
 8. Watertight including all connections and components over entire length.
- C. Tendon Anchor: Non-porous casting free of sand, blow holes, voids and other defects meeting the testing and material requirements of ACI 423.7.
1. Plastic coated bearing plates sized in accordance with ACI 423.7, unless certified test reports substantiate comparable or superior performance, for transfer at minimum stressing concrete strength.
 2. Capable of complying with PTI Guide Specification requirements for aggressive environments.
 3. Capable of developing at least 95% of the actual ultimate strength of tendon.
 4. Minimum wedge cavity opening of at least 0.19 inches larger than tendon diameter. Reaming of anchor wedge cavity is not permitted.
 5. Wedges capable of precluding failure of tendon due to notching or pinching effects during static and fatigue load tests stipulated in ACI 423.7.
 6. Provisions for a plastic cap which fits tightly and seals barrel end on stressing side of anchor.
 7. Provisions for a plastic sleeve which prevents moisture infiltration into anchor casting or tendon sheathing on bearing side of anchor.
- D. Coupler Assembly: Assembly of strands and wedges meeting the testing and material requirements of ACI 301.
1. Capable of complying with PTI Guide Specification requirements for aggressive environments.
 2. Capable of developing at least 95 percent of the ultimate strength of tendon.
 3. Wedges capable of precluding failure of tendon due to notching or pinching effects during static and fatigue load tests stipulated in ACI 423.7.
- E. Encapsulation System: Watertight encapsulation along the entire length of tendon, including anchorages and couplers, when subjected to hydrostatic testing required in ACI 423.7 for aggressive environments.
1. Sleeve: Translucent plastic with a positive mechanical connection to anchorages capable of resisting 100 lbs. pulling force. Minimum 10 inches long and 4 inches overlap with sheathing, completely filled with corrosion inhibiting coating.
 2. Anchor Cap: Translucent plastic with a positive mechanical connection to anchorages capable of resisting 100 lbs. pulling force. At intermediate anchorages, open to allow passage of strand.
 3. Subject to the requirements provide one of the following systems:
 - a. "Zero Void," General Technologies, Inc.
 - b. "Hayes Posi-Lock Plus," Hayes Industries, Ltd.
 - c. Accepted equivalent.

2.3 ACCESSORIES

- A. Pocket Formers: Capable of completely sealing wedge cavity from intrusion of concrete or cement slurry; sized to provide at least a 2 inch recess and allow access for cutting strand tail.
 - 1. If Zero Void encapsulation system in used, the "Zero Void Nail-Less Pocket Former" is required.
- B. Anchorage Fasteners: Stainless-steel ring nails. Subject to the requirements use one of the following:
 - 1. Clendenin Brothers, Baltimore, MD.
 - 2. Swan Secure Products, Baltimore, MD.
 - 3. R.J. Leahy Co., San Francisco, CA.
 - 4. Accepted equivalent.
- C. Sheathing Repair Tape: Elastic, self-adhesive, moisture-proof tape with a minimum width of 2 inches in contrasting color to tendon sheathing, and that is non-reactive with sheathing, corrosion inhibiting coating, or tendon. Subject to the requirements use one of the following:
 - 1. "3M Tape No. 226," 3M, St. Paul, MN.
 - 2. "Polyken 826," Berry Plastics Corp, Evansville, IN
 - 3. "Tyco Adhesives No. 398," Tyco Adhesives, Franklin, MA
- D. Sheathing Repair Material: For nicks and cuts less than 0.25 inches use one of the following:
 - 1. "Scotch-Weld DP-8005," by 3M.
- E. Corrosion inhibiting coating: Capable of meeting the requirements of ACI 423.7. Subject to the requirements use one of the following
 - 1. "Greasrex K-218," ExxonMobil Oil Corp., Irving, TX.
 - 2. "Red-i PT Coating Grease," Lubricating Specialties Co., Pico Rivera, CA
 - 3. "Renolit PTG," Fuch's Lubricant Co., Harvey, IL
 - 4. "Royal PT-1 and PT-2 Corrosion Inhibiting Grease," Troco Oil Co., Tulsa, OK
- F. Tendon supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening tendons in place. Use tendon supports capable of meeting the requirements in CRSI's "Manual of Standard Practice" and as follows:
 - 1. Clearly marked to differentiate by height.
 - 2. Capable of resisting overturning during construction operations.
 - 3. Minimal contact with forms where concrete is exposed to view.
 - 4. Do not cause voids or damage to surrounding concrete.
 - 5. All-plastic supports conforming to CRSI Class 1 protection requirements and with a compressive strength higher than concrete.
 - 6. Acceptable manufacturers:
 - a. Dayton Superior Corporation
 - b. General Technologies, Inc.
 - c. Accepted equivalent.

2.4 GROUT MATERIALS

- A. Premixed, nonmetallic, noncorrosive, non-staining grout product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with ASTM C 1107, Grade B, with fluid consistency and a 30-minute working time.
- B. Non-reactive with prestressing strand, anchorage materials, or concrete and without chlorides or other chemicals known to be deleterious to prestressing strand.
- C. Subject to compliance with requirements, provide one of the following:
 - 1. Sure Grip High Performance Grout, Dayton Superior.
 - 2. Euco N.S., Euclid Chemical Co.
 - 3. Masterflow 928, BASF.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Provide formwork for post-tensioned elements as specified in Division 03 Section, "Cast-in-Place Concrete." Design formwork to support load redistribution that may occur during stressing operation. Ensure that formwork does not restrain elastic shortening, camber or deflection resulting from application of prestressing force.
- B. Do not remove forms supporting post-tensioned elements until tendons have been fully stressed and elongations have been approved by Engineer/Architect.

3.2 TENDON INSTALLATION

- A. Tendon Supports:
 - 1. Support slab tendons independently of beam reinforcement.
 - 2. Position supports at high and low points and at intervals not exceeding 48 inches.
 - 3. Support tendons as required to provide the specified profile and prevent displacement during subsequent construction operations.
- B. Tendon Profile:
 - 1. Place tendons with a parabolic profile in a vertical plane conforming to control points shown on Drawings unless otherwise noted. Control points locate the center of gravity of tendons.
 - 2. Locate low point at mid-span unless otherwise noted.
 - 3. Maintain tendon profile with the maximum allowable deviation for corresponding member dimensions as follows:
 - a. 8 inches or less: ± 0.25 inches.
 - b. 8 to 24 inches: ± 0.375 inches.
 - c. 24 inches or more: ± 0.5 inches.
- C. Tendon Location:
 - 1. Obtain Engineer/Architect's approval before relocating tendons that interfere with one another.
 - 2. Slight deviations in horizontal spacing and location are permitted when required to avoid openings and inserts.

3. Maintain minimum radius of curvature of 21 feet for horizontal deviations.
4. Locate tendons parallel to grid lines unless otherwise noted.
5. Straighten strands to produce equal stress in all tendons that are to be stressed in a concrete placement and to ensure proper positioning of anchors.

D. Anchors:

1. Install anchors perpendicular to tendon axis.
2. Install tendons straight, without vertical or horizontal curvature, for a minimum of 12 inches behind stressing-end and intermediate anchors.
3. Attach stressing-end anchors securely to bulkhead forms to prevent loosening due to construction activity or during concrete placement.

E. Tendon Bundling:

1. Limit slab tendon bundles to two tendons.
2. Do not twist or entwine tendons within a bundle.
3. Maintain a minimum of 12 inches between centers of adjacent bundles.

F. Tendon Protection:

1. Protect tendons from moisture and corrosion prior to concrete placement.
2. Protect exposed tendons from moisture and corrosion at all times.
3. Bare tendons are not permitted at any time.
4. Do not cut or remove sheathing before concrete is placed.

G. Over occupied/finished areas permanently mark tendon locations on slab soffit.

H. Do not use splices or coupler assemblies within a concrete pour unless accepted in writing by the Engineer. When coupler assemblies are used, completely fill enclosure with corrosion inhibiting coating.

I. Welding is prohibited unless shown on the drawings or accepted in writing by the Engineer.

3.3 SHEATHING INSPECTION AND REPAIR

A. Inspect sheathing for damage after installing tendons and before placing concrete.

B. Remove and replace tendons that have damaged encapsulation systems including sheathing tears or cuts over 10 percent of the length (damage need not be continuous), sheathing withdrawn from connecting sleeves, or connecting sleeves withdrawn from fixed end anchorages.

C. Repair damaged areas by restoring corrosion inhibiting coating and repairing sheathing according to the following procedure to the satisfaction of the Engineer/Architect.

1. Coat with corrosion inhibiting coating outside of sheathing for the length of damaged area plus 2 inches beyond each end of damage. For example, if sheathing tear is 6 inches long then corrosion inhibiting coated area will be 10 inches long, centered on tear.
2. Install longitudinally slit sheathing around corrosion inhibiting coating area with the slit on the side opposite the tear. Extend slit sheathing 2 inches beyond corrosion inhibiting coating area at each end. For example, if corrosion inhibiting coating area is 10 inches long, then the slit sheathing will be 14 inches long, centered on tear.
3. After removing corrosion inhibiting coating from the area to be taped, spirally wrap tape around slit sheathing to provide at least 2 layers of tape. Extend tape 2 inches beyond slit

sheathing at each end. For example, if slit sheathing is 14 inches long, then taped area will be 18 inches long, centered on tear.

- D. Repair nick and cuts less than 0.25 inches long with sheathing repair material.

3.4 TENDON STRESSING

- A. Calibrate stressing jacks and gages at least every 6 months and keep copies of certificates on site and available for inspection.
- B. Use stressing jacks that are equipped with pressure gages to permit stress in the tendon to be computed at any time.
- C. Begin stressing operations as soon as concrete strength reaches 3,000 psi.
- D. Complete stressing within 96 hours after concrete placement begins unless concrete has not reached the required strength. If concrete strength has not reached minimum stressing strength within 96 hours (including weekends and holidays) apply 50 percent stress to each tendon and full stress as soon as compressive strength reaches the minimum stressing strength.
- E. If measured elongation deviates from calculated elongation by more than 7 percent, recalculate elongations based on actual modulus of elasticity of strand.
- F. If, after modulus check, measured and calculated elongations still deviate by more than 7 percent, cease stressing operations. Review section 7.3 from PTI's "Field Procedures Manual for Unbonded Single Strand Tendons" for causes for improper elongation. Proceed with stressing only after deviation cause has been determined and corrected to satisfaction of Engineer/Architect.
- G. Do not allow tendon movement greater than 0.25 inches during wedge seating.

3.5 TENDON FINISHING

- A. Do not cut tendons or cover anchorages until stressing records reviewed and accepted by Engineer/Architect.
- B. Clean tendons, anchorages and pockets of corrosion inhibiting prior to cutting tendons.
- C. Cut tendon end between 0.5 inches and 0.75 inches from wedges. Leave tendon end clean and free of burrs. Use of oxyacetylene flame to cut tendon is not permitted unless accepted in writing by Engineer before cutting begins. Use one of the following methods:
 - 1. Plasma cutting.
 - 2. Hydraulic shears.
- D. Make tendon ends accessible for inspection prior to and during cutting and grouting.
- E. Do not damage tendon, anchorage or concrete during the cutting and removal of the tendon.
- F. For encapsulated systems, cut tendon and install watertight cap with grease no more than 8 hours after acceptance of stressing records.

- G. Install a watertight assembly no more than 24 hours after stressing operations at the exposed stressing length of the intermediate anchorages.
- H. Coat pocket surface with bonding agent after sealing tendon end and wedges and before grouting tendon pocket.
- I. Grout tendon pockets no more than 24 hours after acceptance of stressing records. Finish grout flush with adjacent concrete.

3.6 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency approved by Engineer/Architect to perform tests and inspections. Testing agency has authority to reject work not conforming to the Contract Documents.
- B. Before concrete placement, testing agency will inspect the following for compliance with the Contract Documents and accepted Installation Drawings. Contractor shall complete their work and provide adequate time to complete the inspections in advance of the scheduled concrete placement.
 - 1. Location and number of tendons.
 - 2. Tendon size and grade.
 - 3. Tendon profile and cover.
 - 4. Sheathing type, thickness, damage and repair.
 - 5. Corrosion inhibiting coating.
 - 6. Anchorages, sleeves and accessories.
 - 7. Support methods.
 - 8. Encapsulation system.
 - 9. Requirements of ICC "International Building Code," Section 110 and 1704.
- C. During stressing operations testing agency will record the following and promptly submit to Engineer/Architect upon completion of stressing operations each day.
 - 1. Calculated tendon elongation based on actual modulus of elasticity and cross-sectional area of tendons used.
 - 2. Actual elongation measured for each tendon.
 - 3. Gage pressure required to achieve required stressing force (per calibration chart) for each tendon.
 - 4. Actual gage pressure for each tendon.
 - 5. Required concrete strength at time of stressing.
 - 6. Reported concrete strength at time of stressing.
 - 7. Range of allowable elongations for stressing force.
 - 8. Jack and gage identification numbers.
 - 9. Installer certification that stressing process and records have been reviewed and that forces specified have been provided.
- D. After stressing operations testing agency will inspect the following for compliance with the Contract Documents.
 - 1. Tendon cutting.
 - 2. Tendon end length.
 - 3. Anchor caps with grease.
 - 4. Cleaning and grouting of pockets.

- E. Testing agency will prepare test and inspections reports in an accepted format. In addition to test and inspection data, include the following.
 - 1. Project name and location.
 - 2. Date and time of inspection.
 - 3. Inspection location within the structure.
 - 4. Air temperatures, weather and wind speed.
 - 5. Testing agency's name, address and phone number.
 - 6. Testing agency's technician's name.
 - 7. Installer's name.

3.7 REPAIRS

- A. Submit repair procedures to Engineer/Architect for acceptance prior to starting repairs.
- B. Complete all required repairs at no cost to Owner.

END OF SECTION 033816

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

POST-TENSIONING SUPPLIER QUALIFICATION FORM

| | |
|----------------------|-------|
| GENERAL INFORMATION: | |
| Project: | City: |
| Supplier: | |
| General Contractor: | |

| | |
|--------------------|------------------------------|
| SAMPLE PROJECT #1 | Date Completed: |
| Project Name: | \$ Value of PT Sub-contract: |
| City and State: | Tonnage of PT tendons: |
| Engineer of Record | General Contractor |
| Name: | Project Manager: |
| Firm: | Firm: |
| Phone Number: | Phone Number: |
| Email: | Email: |

| | |
|--------------------|------------------------------|
| SAMPLE PROJECT #2 | Date Completed: |
| Project Name: | \$ Value of PT Sub-contract: |
| City and State: | Tonnage of PT tendons: |
| Engineer of Record | General Contractor |
| Name: | Project Manager: |
| Firm: | Firm: |
| Phone Number: | Phone Number: |
| Email: | Email: |

POST-TENSIONING SUPPLIER QUALIFICATION FORM

| | |
|--------------------|------------------------------|
| SAMPLE PROJECT #3 | Date Completed: |
| Project Name: | \$ Value of PT Sub-contract: |
| City and State: | Tonnage of PT tendons: |
| Engineer of Record | General Contractor |
| Name: | Project Manager: |
| Firm: | Firm: |
| Phone Number: | Phone Number: |
| Email: | Email: |

| | |
|--------------------|------------------------------|
| SAMPLE PROJECT #4 | Date Completed: |
| Project Name: | \$ Value of PT Sub-contract: |
| City and State: | Tonnage of PT tendons: |
| Engineer of Record | General Contractor |
| Name: | Project Manager: |
| Firm: | Firm: |
| Phone Number: | Phone Number: |
| Email: | Email: |

| | |
|--------------------|------------------------------|
| SAMPLE PROJECT #5 | Date Completed: |
| Project Name: | \$ Value of PT Sub-contract: |
| City and State: | Tonnage of PT tendons: |
| Engineer of Record | General Contractor |
| Name: | Project Manager: |
| Firm: | Firm: |
| Phone Number: | Phone Number: |
| Email: | Email: |

POST-TENSIONING SUPPLIER QUALIFICATION FORM

| REQUIRED ATTACHMENTS | |
|----------------------|--|
| | Quality plan for manufacture, delivery, and detailing of post-tensioning system. |
| | Verification letter stating that the post-tensioning system will be manufactured in a plant with a current PTI certification and that all materials conform with ACI 301, ACI 318, and are approved by the International Code Council (International Building Code.) |

POST-TENSIONING INSTALLER QUALIFICATION FORM

| | |
|----------------------|-------|
| GENERAL INFORMATION: | |
| Project: | City: |
| Installer: | |
| General Contractor: | |

| | |
|--------------------|------------------------------|
| SAMPLE PROJECT #1 | Date Completed: |
| Project Name: | \$ Value of PT Sub-contract: |
| City and State: | Tonnage of PT tendons: |
| Engineer of Record | General Contractor |
| Name: | Project Manager: |
| Firm: | Firm: |
| Phone Number: | Phone Number: |
| Email: | Email: |

| | |
|--------------------|------------------------------|
| SAMPLE PROJECT #2 | Date Completed: |
| Project Name: | \$ Value of PT Sub-contract: |
| City and State: | Tonnage of PT tendons: |
| Engineer of Record | General Contractor |
| Name: | Project Manager: |
| Firm: | Firm: |
| Phone Number: | Phone Number: |
| Email: | Email: |

POST-TENSIONING INSTALLER QUALIFICATION FORM

| | |
|--------------------|------------------------------|
| SAMPLE PROJECT #3 | Date Completed: |
| Project Name: | \$ Value of PT Sub-contract: |
| City and State: | Tonnage of PT tendons: |
| Engineer of Record | General Contractor |
| Name: | Project Manager: |
| Firm: | Firm: |
| Phone Number: | Phone Number: |
| Email: | Email: |

| | |
|--------------------|------------------------------|
| SAMPLE PROJECT #4 | Date Completed: |
| Project Name: | \$ Value of PT Sub-contract: |
| City and State: | Tonnage of PT tendons: |
| Engineer of Record | General Contractor |
| Name: | Project Manager: |
| Firm: | Firm: |
| Phone Number: | Phone Number: |
| Email: | Email: |

| | |
|--------------------|------------------------------|
| SAMPLE PROJECT #5 | Date Completed: |
| Project Name: | \$ Value of PT Sub-contract: |
| City and State: | Tonnage of PT tendons: |
| Engineer of Record | General Contractor |
| Name: | Project Manager: |
| Firm: | Firm: |
| Phone Number: | Phone Number: |
| Email: | Email: |

POST-TENSIONING INSTALLER QUALIFICATION FORM

| REQUIRED ATTACHMENTS | |
|----------------------|---|
| | Resume of Project Superintendent indicating required experience. |
| | Letter from post-tensioning Supplier accepting Installer. |
| | Verification letter stating that the Installer has a current PTI certification and that PTI Certified Field Installers will be used to install and stress post-tensioning system. |

SECTION 03 45 00

PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Architectural precast concrete cladding units.
- B. Related Sections include the following:
 - 1. Division 03 Section "Cast-In-Place Concrete" for installing connection anchors in concrete.
 - 2. Division 05 Section "Structural Steel Framing" for furnishing and installing connections attached to structural-steel framing.
 - 3. Division 05 Section "Metal Fabrications" for kickers and other miscellaneous steel shapes.
 - 4. Division 07 Section "Water Repellents" for water-repellent finish treatments.
 - 5. Division 08 Section "Aluminum Windows" for windows set into architectural precast concrete units.

1.3 DEFINITION

- A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
 - 1. Loads: As indicated.
 - 2. Dead Loads: See Structural General Notes
 - 3. Live Loads: See Structural General Notes
 - 4. Wind Loads: See Structural General Notes
 - 5. Seismic Loads: See Structural General Notes
 - 6. Project Specific Loads: as indicated on Structural sheets, where specified
 - 7. Design framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements as follows:

- a. Upward and downward movement of 1/2 inch.
8. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 100 deg.
9. Fire-Resistance Rating: Select material and minimum thicknesses to provide 2-hour fire rating.
10. Window Washing System: Design precast units supporting window washing system indicated to resist pull-out and horizontal shear forces transmitted from window washing equipment.
11. Vehicular Impact Loads: Design spandrel beams acting as vehicular barriers for passenger cars to resist a single 6000-lb service load and 10,000-lb ultimate load applied horizontally in any direction to the spandrel beam, with anchorages or attachments capable of transferring this load to the structure. Design spandrel beams assuming the load to act at a height of 18 inches and 27 inches (not concurrently) above the floor or ramp surface on an area not to exceed 1 sq. ft.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.
- C. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.
 1. Indicate separate face and backup mixture locations and thicknesses.
 2. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
 3. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
 4. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
 5. Include plans and elevations showing unit location and sequence of erection for special conditions.
 6. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
 7. Indicate relationship of architectural precast concrete units to adjacent materials.
 8. Indicate locations and details of brick units, including corner units and special shapes, and joint treatment.
 9. Indicate locations and details of stone facings, anchors, and joint widths.
 10. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
 11. Comprehensive engineering analysis signed and sealed by the qualified professional engineer licensed to perform work in the state of Texas and responsible for preparation of precast shop drawings. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

- D. Samples: For each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.
 - 1. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.
 - 2. Samples for each brick unit required, showing full range of color and texture expected. Include Sample showing color and texture of joint treatment.
 - a. Grout Samples for Initial Selection: Color charts consisting of actual sections of grout showing manufacturer's full range of colors.
 - b. Grout Samples for Verification: Showing color and texture of joint treatment.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator and testing agency.
- B. Welding certificates.
- C. Material Certificates: For the following items, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Reinforcing materials and prestressing tendons.
 - 3. Admixtures.
 - 4. Bearing pads.
 - 5. Structural-steel shapes and hollow structural sections.
 - 6. Brick units and accessories.
 - 7. Stone anchors.
- D. Material Test Reports: For aggregates.
- E. Source quality-control test reports.
- F. Field quality-control test reports.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A precast concrete erector shall be fully certified by PCI, prior to beginning any work at the job site to erect Category A (Architectural Systems) for non-load bearing members.
- B. Installer Qualifications: A precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project in same category as this Project before erection of precast concrete and who can produce an Erectors' Post-Audit Declaration.
- C. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 1. Participates in PCI's plant certification program at time of bidding and is designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units.

- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- E. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.
- F. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
- G. Welding: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."
- H. Calculated Fire-Test-Response Characteristics: Where indicated, provide architectural precast concrete units whose fire resistance has been calculated according to PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete" and is acceptable to authorities having jurisdiction.
- I. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of 2 sample panels approximately 16 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.
 - 1. Locate panels where indicated or, if not indicated, as directed by Architect.
 - 2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
 - 3. After acceptance of repair technique, maintain one sample panel at manufacturer's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
 - 4. Demolish and remove sample panels when directed.
- J. Mockups: After sample panel approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup as indicated on Drawings including sealants and architectural precast concrete complete with anchors, connections, flashings, and joint fillers.
 - 2. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Architect in writing.
- K. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management And Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground.
- B. Support units during shipment on nonstaining shock-absorbing material.

- C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
- D. Place stored units so identification marks are clearly visible, and units can be inspected.
- E. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses which would cause cracking or damage.
- F. Lift and support units only at designated points shown on Shop Drawings.

1.9 SEQUENCING

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.
 - 1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.
- B. Form Liners: Units of face design, texture, arrangement, and configuration. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.
- C. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
- C. Galvanized Reinforcing Bars: ASTM A 615, ASTM A 706, Grade 60 deformed bars, Class II zinc coated, hot-dip galvanized.
- D. Steel Bar Mats: ASTM A 184, fabricated from ASTM A 615 or ASTM A 706, Grade 60 deformed bars, assembled with clips.
- E. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

- F. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- G. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.3 PRESTRESSING TENDONS

- A. Prestressing Strand: ASTM A 416, Grade 270, uncoated, 7-wire, low-relaxation strand.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.
 - 1. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.
- B. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
 - 1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
 - a. Gradation: Gap graded.
 - 2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate, unless otherwise approved by Architect.
- C. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.
- D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.
- E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.
 - 1. Water-Reducing Admixtures: ASTM C 494, Type A.
 - 2. Retarding Admixture: ASTM C 494, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 - 4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
 - 5. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 - 6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 - 7. Plasticizing and Retarding Admixture: ASTM C 1017.

2.5 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36.
- B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields
- C. Malleable Iron Castings: ASTM A 47.
- D. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.
- E. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706.
- F. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563; and flat, unhardened steel washers, ASTM F 844.
- G. Anchor Rods: ASTM F 1554, Grade 36 or Grade 55
- H. Zinc-Coated Finish: For exterior steel items (all exposed steel connections at precast walls and spandrel beams) and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123, after fabrication and completion of connections, and ASTM A 153, as applicable.
- I. Shop-Primed Finish: Prepare surfaces of non-galvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply rust-inhibitive primer according to SSPC-PA 1.
- J. Welding Electrodes: Comply with AWS standards.

2.6 BEARING PADS

- A. Provide one of the following bearing pads for architectural precast concrete units as follows:
 - 1. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Type A durometer hardness of 70 to 90, ASTM D 2240; capable of supporting a compressive stress of 3000 psi with no cracking, splitting, or delaminating in the internal portions of pad.
 - 2. High-Density Plastic: Multimonomer, nonleaching, plastic strip.
- B. Joints between precast pieces: Non-load bearing vertical spacers only:
 - 1. Fiber impregnated elastomeric bearing pads.
 - 2. Durometer hardness 80 minimum.
 - 3. Acceptable materials:
 - a. "Vossco," Voss Engineering Co., Chicago, IL.
 - b. "Comcord," JVI, Inc., Skokie, IL.
- C. Shims for bearing pads:
 - 1. Galvanized ASTM A 36 steel. Do not stack steel shims more than 3 high. Tack weld multiple shims together on at least 2 faces or corners. Touch up galvanizing damaged by welding. See Section "Cast-in-Place Concrete" for materials.
 - 2. High-Density Plastic: A maximum of 1 plastic shim and a maximum of ½" in thickness may be used to adjust for field tolerances. Precaster shall submit certification of bearing capacity of plastic shim materials for approval prior to installation.

2.7 ACCESSORIES

- A. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.8 GROUT MATERIALS

- A. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

2.9 CONCRETE MIXTURES

- A. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.
- B. Normal-Weight Concrete Mixtures: Proportion face and backup mixtures or full-depth mixtures, at fabricator's option by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete.
- C. Requirements for concrete mixture proportions are shown on Drawings:
 - 1. Compressive strength
 - 2. Slump
 - 3. Water-cementitious materials ratio
 - 4. Air content
- D. Supplementary Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - 1. Fly Ash or other pozzolans conforming to ASTM C 618: 25 percent.
 - 2. Slag conforming to ASTM C 989: 50 percent.
 - 3. Total of fly ash or other pozzolans and slag: 50 percent. Within the total, fly ash or pozzolans not exceeding 25 percent.
- E. Air Entrainment:
 - 1. See General Notes on Drawings for total average air content (percent by volume).
- F. Chloride Ion Content of Mixture:
 - 1. Water soluble chloride ion content of mix (including all constituents) shall not exceed 0.06% chloride ions by weight of cement for prestressed concrete and 0.15% for reinforced concrete. Test to determine chloride ion content shall conform to ASTM C 1218.
- G. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture or high-range water-reducing admixture (super-plasticizer) in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use high range water-reducing admixture in pumped concrete, concrete for parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio of 0.45 or less. Use normal or mid-range ASTM Type A water reducing admixture for concrete with water-cementitious materials ratio greater than 0.45.

- H. Engineer's acceptance of mixture shall not relieve precast concrete fabricator from responsibility for any variation from requirements of Contract Documents unless precast concrete fabricator has in writing called Engineer's attention to each such variation at time of submission and Engineer has given written approval of each such variation.
- I. Adjustment to Concrete Mixtures: Mixture proportion adjustments may be requested by precast concrete fabricator when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Laboratory test data for revised mixture proportions and strength results must be submitted to and accepted by Engineer before using in work.

2.10 MOLD FABRICATION

- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.
 - 1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.
- B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
 - 1. Form joints are not permitted on faces exposed to view in the finished work.
 - 2. Edge and Corner Treatment: Uniformly chamfered.

2.11 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
 - 1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.
- D. Cast-in openings larger than 10 inches in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.
- E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
 2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
 3. Place reinforcing steel and prestressing strand to maintain at least 1-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
 4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
- F. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.
- G. Prestress tendons for architectural precast concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 117.
1. Delay detensioning or post-tensioning of precast, prestressed architectural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete.
 2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
 3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
 4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.
- H. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.
- J. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.
1. Place backup concrete mixture to ensure bond with face-mixture concrete.
- K. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.
1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."
- L. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

- M. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.
- N. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product. Limit concrete temperature to 140° F during accelerated curing unless test data is submitted that cement is not subject to delayed ettringite formation (DEF).
- O. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.12 FABRICATION TOLERANCES

- A. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

2.13 FINISHES

- A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved mockups and as follows:
 - 1. PCI's "Architectural Precast Concrete - Color and Texture Selection Guide," of plate numbers indicated.
 - 2. Formed surfaces: Fill air pockets and holes over 0.25 in. in diameter with sand-cement paste and grind smooth all form offsets or fins over 0.125 in.
 - 3. Unformed surfaces: face toward inside of parking structure.
 - 4. Spandrel beams:
 - a. Interior face: steel trowel finish, or textured finish per accepted sample.
 - b. Exterior face, ends, bottom and top; smooth dense surface standard finish.
 - 5. Wall panels:
 - a. Stair walls, interior faces: steel trowel finish.

2.14 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."
- B. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.
 - 1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing

agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

- C. Strength of precast concrete units will be considered deficient if units fail to comply with ACI 318 requirements for concrete strength.
- D. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.
 - 1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
 - 2. Cores will be tested in an air-dry condition.
 - 3. Strength of concrete for each series of 3 cores will be considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
 - 4. Test results will be made in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:
 - a. Project identification name and number.
 - b. Date when tests were performed.
 - c. Name of precast concrete fabricator.
 - d. Name of concrete testing agency.
 - e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install precast concrete units until supporting cast-in-place building structural framing has attained minimum allowable design compressive strength or supporting steel or other structure is complete.

3.2 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.
- B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
 - 1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
 - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
 - 4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch.
- C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
 - 1. Do not permit connections to disrupt continuity of roof flashing.
- D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
 - 1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
 - 2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
 - 3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.
 - 4. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
 - 5. Remove, reweld, or repair incomplete and defective welds.
- E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
 - 1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.
- F. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

3.3 ERECTION TOLERANCES

- A. Erect architectural precast concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. As pieces arrive at jobsite, General Contractor's Quality Control inspector shall check the production control tag for each piece to verify that the piece is complete and correct.
- C. Any defective Work that cannot be repaired to satisfaction of Engineer/Architect, whether found at site or at shop at any time before completion and acceptance of Project, will be rejected regardless of previous reviews and shall be remade or reconstructed to satisfaction of Engineer/Architect. However, finishes accepted at shop will not be rejected at site.
- D. Improperly located bearing pads or those of incorrect material will not be accepted by Engineer/Architect and shall be relocated or modified at expense of Contractor, no matter when rejected.
- E. Performance Requirements:
 - 1. Conduct inspections, perform testing, and make repairs or replace unsatisfactory precast pieces as required.
 - 2. Limitations as to amount of patching which will be permitted are subject to acceptance of Engineer/Architect.
 - 3. In-place precast pieces may be rejected for any 1 of the following:
 - a. Exceeding specified installation tolerances.
 - b. Damaged during construction operations.
 - c. Exposed-to-view surfaces which develop surface finish deficiencies.
 - d. Other defects as listed in PCI MNL-117.
- F. Welds and high-strength bolt connections are subject to inspection and testing by Testing Agency. As minimum, following testing shall be performed:
 - 1. Welds: Visually inspect all welds.
 - a. Test 25% of all field fillet welds and 5% of all shop welds
 - b. Testing: Penetrating dye or magnetic particle at Inspector discretion.
 - c. One spot test per partial penetration weld using magnetic or ultrasonic testing.
 - 2. Bolted Connections: Visual inspection of all connections. Check proper torque with calibrated torque wrench at minimum of 2 bolts of every connection.
- G. Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.
- H. Testing Agency has authority to reject materials, welds, and connections not meeting Specifications.
- I. Testing Agency will report test results promptly and in writing to Contractor and Engineer/Architect.

- J. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 REPAIRS

- A. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- B. Repair architectural precast concrete units if permitted by Architect. The Architect reserves the right to reject repaired units that do not comply with requirements.
- C. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.
- D. Field repairs of damaged architectural precast concrete units involve the following:
 - 1. Repair isolated random cracks that have little movement and single holes not over 1 in. in diameter in accordance with manufacturer's requirements. As a minimum, manufacturer requirements shall be submitted for record and address the procedures and materials specified in Division 07 Section "Waterproofing System." Receive Engineer's written acceptance of materials selected prior to application.
 - a. Repair isolated random vertical cracks more than 0.01 in. wide, using epoxy injection product specified in part 2 heading "Related Materials" of this section.
 - 2. Repairs and repaired pieces shall be subject to 5 yr warranty provided by precaster. See Part 1 heading "Repair Warranty."
- E. Repairs and repaired pieces shall have documented design.
- F. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.
- G. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- H. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.6 CLEANING

- A. Clean surfaces of precast concrete units exposed to view.
- B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.

2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034500

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

SECTION 04 22 00
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Miscellaneous masonry accessories.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include data on material properties.
 - b. For masonry units, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 3. Mortar admixtures.
 - 4. Grout mixes. Include description of type and proportions of ingredients.
 - 5. Reinforcing bars.
 - 6. Joint reinforcement.

- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver pre-blended, dry mortar mix in moisture-resistant containers. Store pre-blended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls, and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide bullnose units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C 90.
 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
 2. Density Classification: Normal weight.
 3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less-than-nominal dimensions.

2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cemex S.A.B. de C.V.
 - b. Essroc.
 - c. Holcim (US) Inc.
 - d. Lafarge North America Inc.
 - e. Lehigh Hanson; HeidelbergCement Group.
- E. Mortar Cement: ASTM C 1329/C 1329M.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Lafarge North America Inc.

- F. Aggregate for Mortar: ASTM C 144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- G. Cold-Weather Admixture: Non-chloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. BASF Corporation-Construction Systems.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. Grace Construction Products; W.R. Grace & Co. -- Conn.
- H. Water: Potable.

2.6 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Dur-O-Wal; a Hohmann & Barnard company.
 - b. Heckmann Building Products, Inc.
 - c. Hohmann & Barnard, Inc.
 - d. Wire-Bond.
- C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951/A 951M.
1. Exterior Walls: Hot-dip galvanized carbon steel.
 2. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
 3. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
 4. Spacing of Cross Rods: Not more than 16 inches (407 mm) o.c.
 5. Provide in maximum lengths with prefabricated corner and tee units.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.

- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.8 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 - 1. Use Type M or Type S.
- C. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
 - 3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

- 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
- 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
- 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm).

B. Lines and Levels:

- 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
- 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
- 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
- 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
- 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
- 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
- 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than **1/16 inch (1.5 mm)**.

C. Joints:

- 1. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
- 2. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- G. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 3. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

3.8 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.9 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- B. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- C. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- D. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
- E. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- F. Prism Test: For each type of construction provided, according to ASTM C 1314 at 28 days.

3.10 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.11 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 042200

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers Inc.

**SECTION 04 23 13
THIN BRICK**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Thin brick veneer

1.02 RELATED REQUIREMENTS

- A. Section 03 45 00 Precast Architectural Concrete.

1.03 REFERENCES

- A. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- B. ASTM C 1088 - Standard Specification for Thin Veneer Brick Units Made from Clay or Shale.
- C. For embedded applications, see Precast Concrete Institute (PCI) and Tilt-Up Concrete Association (TCA)

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. [Product Data]: Manufacturer's catalog data, detail sheets, and printed installation instructions.
- C. Selection Samples: For each product requiring color/texture selection, provide full size samples for final selection.
- D. Verification Samples: For each product, color, and texture selected, provide two full-size units representing actual color and texture of products to be installed.

1.05 MOCK-UP

- A. Construct sample panel at location indicated or directed, and as follows:
- B. Size: 4 feet by 4 feet (1.2 m by 1.2 m) embed into Pre-Cast Architectural Concrete Panels.
 - 1. Include all unit types and sizes to be used, and mortar joint treatment.
- C. Obtain architect's acceptance of sample panel before beginning construction activities of this section.
- D. Do not remove sample panel until construction activities of this section have been accepted by architect.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products of this section on pallets, with individual faces protected; keep dry.
- B. Store units in protected area or under cover on level ground; keep dry. Do not double stack pallets.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Distributed by: Blackson Brick Company. Justin Sterna. justin@blacksonbrick.com
- B. Substitutions: See Section 01 60 00-Product Requirements.

2.02 MATERIALS

- A. Thin Brick: ASTM C 1088, Type TBX or TBS, tested in accordance with ASTM C67, as manufactured by Endicott Thin Brick, LLC. And PCI/TCA specifications.
 - 1. Size: 3-5/8" (92.1 mm) high, 7-5/8" (193.7 mm) long, 1/2" (12.7 mm) thick
 - 2. Texture: Velour
 - 3. Approved Color: Summittville Decator Blend
 - 4. Trim Units: Matching thin brick.
 - a. Edge cap C – 3-5/8" bed (92.1 mm), 7-5/8" (193.7 mm) long, 3-5/8" face
 - 5. Corners: Matching thin brick
 - a. BC448: 3-5/8" (92.1mm) face, 7-5/8" (193.7mm) long, 1/2" (12.7mm) thick

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install thin brick in accordance with BIA Technote 28C or appropriate industry standards.
- B. Reference system manufacturer's printed instructions, approved submittals and in proper relationship with adjacent construction.

END OF SECTION

**SECTION 04 72 00
CAST STONE MASONRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Architectural cast stone.
- B. Units required are:
 - 1. Exterior wall units, including wall caps, coping, and sills.

1.02 RELATED REQUIREMENTS

- A. Section 03 45 00 - Precast Architectural Concrete.
- B. Section 04 05 11 - Mortar and Masonry Grout: Mortar for setting cast stone.
- C. Section 04 20 00 - Unit Masonry: Installation of cast stone in conjunction with masonry.
- D. Section 07 92 00 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.
- C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement 2016.
- D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement 2019, with Editorial Revision (2020).
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.
- F. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.
- G. ASTM C150/C150M - Standard Specification for Portland Cement 2020.
- H. ASTM C270 - Standard Specification for Mortar for Unit Masonry 2019a.
- I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete 2019.
- J. ASTM C1364 - Standard Specification for Architectural Cast Stone 2019.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Test results of cast stone components made previously by the manufacturer.
- C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
- D. Mortar Color Selection Samples.
- E. Verification Samples: Pieces of actual cast stone components not less than 6 inches (152 mm) square, illustrating range of color and texture to be anticipated in components furnished for the project.
- F. Full-Size Samples, For Review:
 - 1. Basic Shapes: One of each.
 - 2. Accent, Trim and Specialty Shapes: One of each.
- G. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications:

1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
2. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.06 MOCK-UP

- A. Provide full size cast stone components for installation in mock-up of exterior wall.
- B. See Section 01 40 00 - Quality Requirements for additional requirements.
- C. Remove mock-up not incorporated into the work and dispose of debris.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Number each piece individually to match shop drawings and schedule.
- C. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.
- E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- F. Store mortar materials where contamination can be avoided.
- G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Architectural Cast Stone:
 1. Advanced Cast Stone, Inc; www.advancedcaststone.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ARCHITECTURAL CAST STONE

- A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural stone, complying with ASTM C1364.
 1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
 2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
 3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet (6 meters).
 4. Color: Match precast concrete panels.
 5. Remove cement film from exposed surfaces before packaging for shipment.
- B. Shapes: Provide shapes indicated on drawings.
 1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch (3 mm) or length divided by 360, whichever is greater, but not more than 1/4 inch (6 mm).
 2. Unless otherwise indicated on drawings, provide:
 - a. Wash or slope of 1:12 on exterior horizontal surfaces.
 - b. Drips on projecting components, wherever possible.
 - c. Raised fillets at back of sills and at ends to be built in.
- C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.

2.03 MATERIALS

- A. Portland Cement: ASTM C150/C150M.
 - 1. For Mortar: Type I or II, except Type III may be used in cold weather.
- B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.
- C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.
- D. Admixtures: ASTM C494/C494M.
- E. Water: Potable.
- F. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.
 - 1. Galvanized in accordance with ASTM A767/A767M, Class I.
- G. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
- H. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
- I. Mortar: Portland cement-lime, as specified in Section 04 05 11 ; do not use masonry cement.
- J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.
- B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

- A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 20 00.
- B. Mechanically anchor cast stone units indicated; set remainder in mortar.
- C. Setting:
 - 1. Drench cast stone components with clear, running water immediately before installation.
 - 2. Set units in a full bed of mortar unless otherwise indicated.
 - 3. Fill vertical joints with mortar.
 - 4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 TOLERANCES

- A. Joints: Make all joints 3/8 inch (9.5 mm), except as otherwise detailed.
 - 1. Rake mortar joints 3/4 inch (19 mm) for pointing.
 - 2. Remove excess mortar from face of stone before pointing joints.
 - 3. Point joints with mortar in layers 3/8 inch (9.5 mm) thick and tool to a slight concave profile.
 - 4. Leave the following joints open for sealant:
 - a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
 - b. Joints in projecting units.
 - c. Joints between rigidly anchored units, including soffits, panels, and column covers.
 - d. Joints below lugged sills and stair treads.
 - e. Joints below ledge and relieving angles.
 - f. Joints labeled "expansion joint".
- B. Installation Tolerances:
 - 1. Variation from Plumb: Not more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m) or more.

2. Variation from Level: Not more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.
3. Variation in Joint Width: Not more than 1/8 inch in 36 inches (3 mm in 900 mm) or 1/4 of nominal joint width, whichever is less.
4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch (1.5 mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 REPAIR

- A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet (6 m).
- B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.
- C. Repair methods and results subject to Architect 's approval.

3.05 CLEANING

- A. Clean completed exposed cast stone after mortar is thoroughly set and cured.
 1. Wet surfaces with water before applying cleaner.
 2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
 3. Remove cleaner promptly by rinsing thoroughly with clear water.
 4. Do not use acidic cleaners.

3.06 PROTECTION

- A. Protect completed work from damage.
- B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel.
 - 2. Grout.
- B. Related Sections include the following:
 - 1. Division 05 Section "Steel Deck" for field installation of shear connectors.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using AISC's "Manual of Steel Construction, Allowable Stress Design," Part 4.
 - 2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.
- B. Construction: Type 2, simple framing.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 5. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For Installer and fabricator.
- E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
1. Structural steel including chemical and physical properties.
 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 3. Shop primers.
 4. Nonshrink grout.
- F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Erector must be able to show evidence of having erected a minimum of ten projects of similar size and scope in the last five years.
- B. Fabricator Qualifications: Fabricator must be able to show evidence of having fabricated a minimum of ten projects of similar size and scope in the last five years.
- C. Shop-Painting Applicators: Qualified according to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel."
- E. Comply with applicable provisions of the following specifications and documents:
1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 2. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design or Load and Resistance Factor Design Specification for Structural Steel Buildings."
 3. AISC's "Specification for the Design of Steel Hollow Structural Sections."
 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A.
- B. Channels and Angles,: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
 1. Weight Class: Standard.
 2. Finish: Galvanized.
- F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- B. Threaded Rods: ASTM A 36/A 36M or ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6).
 1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
 2. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
 3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer. Confirm compatibility with products supplied in division 9 prior to application.
- B. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 - 1. Camber structural-steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials.
 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards or to meet manufacturer's requirements of division 9 topcoat to be utilized, whichever is more stringent:
 1. SSPC-SP 2, "Hand Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.
 1. Fill vent holes and grind smooth after galvanizing.
 2. Galvanize lintels attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
1. Liquid Penetrant Inspection: ASTM E 165.
 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 3. Ultrasonic Inspection: ASTM E 164.
 4. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of base plate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with non-shrink grout.
 4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
 - 1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.

d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted bearing plates and structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION 0512 00

SECTION 05 12 13
ARCHITECTURALLY-EXPOSED STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Additional requirements for structural steel members designated as architecturally-exposed structural steel (AESS).

1.02 RELATED REQUIREMENTS

- A. Section 05 12 00 - Structural Steel Framing: General requirements for structural steel members, including AESS framing specified in this section.
- B. Section 09 91 13 - Exterior Painting: Finish coat requirements and coordination with primer and surface preparation specified in this section.
- C. Section 09 91 23 - Interior Painting: Finish coat requirements and coordination with primer and surface preparation specified in this section.
- D. Section 09 96 00 - High-Performance Coatings: Finish coat requirements and coordination with primer and surface preparation specified in this section.

1.03 REFERENCE STANDARDS

- A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges 2016.
- B. AISC 360 - Specification for Structural Steel Buildings 2016 (Revised 2021).
- C. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling 2019.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.
- E. ASTM A1085/A1085M - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS) 2015.
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2020.
- G. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
- H. SSPC-SP 6 - Commercial Blast Cleaning 2007.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Detailing for fabrication of AESS components.
 - 1. Provide erection documents clearly indicating which members are AESS members and the AESS category of each part.
 - 2. Include details that clearly identify AESS requirements found in this specification. Provide connections for AESS consistent with concepts shown on drawings.
 - 3. Indicate welds by AWS A2.4 symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined by the designated AESS category.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Handle finished pieces in accordance with Section 10 of AISC 303, using nylon-type slings, or chains with softeners, or wire ropes with softeners such that they are not damaged.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Comply with Section 05 12 00, except as amended in this section for aesthetic purposes.

2.02 FABRICATION

- A. Fabricate and assemble AESS in shop to greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by Architect. Detail AESS

assemblies to minimize field handling and expedite erection.

- B. Permissible tolerances for member depth, width, out of square, and camber and sweep to be as specified in ASTM A6/A6M, ASTM A500/A500M, and ASTM A1085/A1085M.
- C. Use special care in handling and shipping of AESS both before and after shop painting to minimize damage to any shop finish. Use nylon-type slings or softeners when using chains or wire rope slings.
- D. Surface Preparation:
 - 1. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
 - 2. Remove backing and run out tabs.
- E. Fabricate AESS in accordance with categories defined in AISC 303, as follows:

2.03 PAINT SYSTEM

- A. Compatibility: All components/procedures of AESS paint system to comply with coating system specified, submitted, and approved per Sections 09 91 13, 09 91 23, and 09 96 00. As a minimum, identify required surface preparation, primer, intermediate coat (if applicable), and finish coat. Primer, intermediate coating, and finish coating to be from a single manufacturer combined in a system documented by manufacturer with adequate guidance for fabricator to procure and execute.
- B. Finish Coating: Field apply intermediate and top coats per Sections 09 91 13, 09 91 23, and 09 96 00.

2.04 SHOP PRIMING

- A. Surface Preparation:
 - 1. Provide surface preparations to meet SSPC-SP 6.
 - 2. Coordinate required surface profile with approved paint submittal prior to beginning surface preparation.
 - 3. Prior to blasting, remove any grease and oil using solvent cleaning to meet SSPC-SP 1.
 - 4. Remove weld spatter, slivers and similar surface discontinuities.
- B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted with slip-critical connections.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop primer to surfaces that are inaccessible after assembly or erection.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Erector to check all AESS members upon delivery for twist, kinks, gouges or other imperfections which may result in rejection of appearance of member. Coordinate remedial action with fabricator prior to erecting steel.

3.02 PREPARATION

- A. Provide connections for temporary shoring, bracing and supports only where noted on approved fabrication documents. Temporary connections not shown are to be made at locations not exposed to view in final structure or as approved by Architect.
- B. Handle, lift and align pieces using nylon straps or chains with softeners required to maintain appearance of AESS through process of erection.

3.03 ERECTION

- A. AESS 1 and 2: Basic elements; feature elements not in close view:
 - 1. Employ special care to handle and erect AESS. Erect finished pieces using nylon straps or chains with softeners such that they are not damaged.
 - 2. Place weld tabs for temporary bracing and safety cabling at points concealed from view in completed structure or where approved by Architect during pre-installation meeting. Obtain Architect approval of methods for removing temporary devices and finishing AESS members prior to erection.

3. AESS Erection Tolerances: Erect to standard frame tolerances for structural steel per Chapter 7 of AISC 303.
4. Set AESS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
5. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
6. Remove all backing and run out tabs.
7. When temporary braces or fixtures are required to facilitate erection, take care to avoid any blemishes, holes or unsightly surfaces resulting from use or removal of such temporary elements.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Structural Requirements:
 1. Comply with quality control requirements per AISC 360, Chapter N and AISC 303, Section 10. Refer to Section 05 12 00 for additional requirements.

3.05 CLEANING

- A. Touch-up Painting: Complete cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint to blend with adjacent surfaces of AESS. Perform touch-up work in accordance with manufacturer's instructions and as specified in Section 09 91 13, 09 91 23, and 09 96 00.

END OF SECTION

SECTION 05 16 17
STRAND GUARDRAIL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes the following metal fabrications:
 - 1. Strand guardrail.
- B. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 05 Section "Structural Steel" for structural steel framing system components.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Shop drawings detailing fabrication and installation of strand guardrail system. Include plans, elevations, sections, and details of fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts.
- C. Installation drawings shall include:
 - 1. Number, arrangement, and length of strand guardrails.
 - 2. Jacking force required to achieve specified final effective force for all strand guardrails.
 - 3. Cable elongations corresponding to jacking force and final effective force for all strand guardrails.
 - 4. Detailing of anchorage devices.
 - 5. Other incidental features.
- D. Submit following information with Installation Drawing submittal:
 - 1. Sealed calculations, prepared under supervision of a Professional Engineer licensed in Texas for jacking force required to achieve specified final effective strand pretension for all strand guardrails considering strand length, losses due to anchorage seating, and materials and equipment being supplied.
 - 2. Certified calibration curve for each jack to show the gauge pressure corresponding to the required jacking force.
- E. Samples representative of materials and finished products as may be requested by Engineer/Architect.

- F. Qualification data for firms and persons specified in the "Quality Assurance" article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.
- G. Stressing records to Engineer/Architect promptly upon completion of stressing operations.
- H. Certification from Installer that stressing process and records have been reviewed, and that forces specified have been provided.
- I. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
- J. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing guardrail strand fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Provide barrier cable systems produced in PTI-certified plant conforming to all material and installation requirements of PTI "Specifications for Seven Wire Strand Barrier Cable Applications".
- C. Installer Qualifications: All barrier cable systems using seven-wire prestressing steel strands shall be installed by PTI certified installers.
- D. Work shall conform to requirements of PTI "Specifications for Seven Wire Strand Barrier Cable Applications" except where more stringent requirements are shown on Drawings or specified in this Section.
- E. Inspection Agency, employed by Owner shall keep barrier cable stressing records and submit to Engineer/Architect. Report will document:
 - 1. Calculated elongation, based upon actual elastic modulus and cross sectional area of strands used.
 - 2. Actual field elongation measured for each guardrail strand.
 - 3. Gauge pressure required to achieve required jacking force [per calibration chart] for each strand.
 - 4. Actual gage pressures for each strand.
 - 5. Jack and gauge identification numbers.

1.5 REFERENCES

- A. American Institute of Steel Construction (AISC):
 - 1. AISC, "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. AISC, "Manual of Steel Construction."
 - 3. AISC, "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings."
- B. American Society for Testing and Materials (ASTM):

1. ASTM A36, "Specification for Structural Steel."
2. ASTM A123, "Specification for Zinc (Hot-Dip Galvanized) Coatings On Iron and Steel Products."
3. ASTM A164, "Specification for Electrodeposited Coatings of Zinc on Steel."
4. ASTM A386, "Specification for Zinc Coating (Hot-Dip) on Assembled Steel Products."
5. ASTM A416, "Specification for Steel Strand, Uncoated Seven-Wire Stress-Relieved, for Prestressed Concrete."
6. ASTM A475, "Specification for Zinc-Coated Steel Wire Strand."
7. ASTM A882, "Standard Specification for Epoxy-Coated Seven-Wire Prestressing Steel Strand."
8. ASTM B454, "Specification for Mechanically Deposited Coatings of Cadmium and Zinc on Ferrous Metals."

C. Post-Tensioning Institute

1. "Specification for Seven Wire Strand Barrier Cable Applications."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which strand guardrails must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 FERROUS METALS

- A. General: Comply with Post-Tensioning Institute's "Specification for Seven Wire Steel Strand Barrier Cable Applications."
- B. Guardrail Strand and Terminal Fittings:
1. Seven wire, steel strand, 0.5 in. diameter, ASTM A416, with minimum ultimate tensile strength of 270,000 psi.
 2. Epoxy-coated strand shall comply with requirements of ASTM A882 "Standard Specification for Epoxy-Coated 7-Wire Steel Strand. Thickness: 30 mil minimum. Color: black.
 3. Anchor bodies shall be galvanized and compatible with strand system furnished. Anchor bodies shall comply with Post-Tensioning Institute "Specification for Unbonded Single Strand Tendons." Environment: corrosive. Repair damaged metal surfaces by cleaning and applying two coats of galvanizing repair paint to galvanized surfaces. Apply two coats of galvanizing repair paint to wedge grippers after stressing is complete.
 4. Anchor back seating force. Unless noted otherwise, back seat all anchors to a force equal to 80% of the minimum ultimate tensile strength (MUTS) of the strand.

2.2 FABRICATION, GENERAL

- A. Form strand guardrail from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated

or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

- B. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed strand guardrail assemblies to prevent over stressing. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 100 F°.
- C. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure strand guardrails rigidly in place and to support indicated loads.
- D. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- E. Fabricate joints that will be exposed to weather in a manner to exclude water.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchor bodies where necessary for securing miscellaneous metal fabrications to in-place construction.
- B. If the guardrail strands are required to be post-tensioned:
 - 1. Backstress all fixed and stressing anchorages.
 - 2. Stress, and then immediately backstress, individual guardrail strands one at a time.
 - 3. Backstress the guardrail strand to a force equal to 80% of the minimum ultimate tensile strength (MUTS) of the strand.
 - 4. Prevent damage to the column or other member to which the guardrail strand is anchored.
 - 5. For related procedures refer to the PTI Guide Specification.
- C. Do not cut strand ends until Contractor receives Engineer/Architect's written approval of stressing records.

3.3 ADJUSTING AND CLEANING

- A. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

20011 Gregg County Parking Garage and Office

END OF SECTION 051617

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

SECTION 05 31 00
STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel roof deck.
- B. Openings in deck shall be provided by contractor needing the opening.

1.3 SUBMITTALS

- A. Product data for each type of deck, accessory, and product specified.
- B. Shop drawings showing layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.
 - 1. For steel deck indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional Engineer/Architect who was responsible for its preparation.
- C. Product certificates signed by manufacturers of steel deck certifying that their products comply with specified requirements.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" article.
- E. Product test reports from qualified independent testing agencies evidencing compliance with requirements of the following based on comprehensive testing:
 - 1. Mechanical fasteners.
- F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence steel deck's compliance with the building code in effect for the Project.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Engineer/Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- D. Engineer Qualifications: Professional engineer legally authorized to practice in Texas and experienced in providing engineering services of the kind indicated that have resulted in installation of steel deck similar to this Project in material, design, and extent and that have a record of successful in-service performance.

1.5 REFERENCES

- A. American Institute of Steel Construction (AISC):
 - 1. AISC, "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. AISC, "Manual of Steel Construction."
 - 3. AISC, "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings."
- B. American Iron and Steel Institute (AISI):
 - 1. AISI, "Specification for the Design of Cold-Formed Steel Structural Members."
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A36, "Specification for Structural Steel."
 - 2. ASTM A653, "Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality."
 - 3. ASTM A525, "Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process."
 - 4. ASTM A653, "Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality."
 - 5. ASTM A611, "Specification for Steel Sheet, Carbon, Cold-Rolled, Structural Quality."
- D. American Welding Society (AWS):
 - 1. AWS D1.1, "Structural Welding Code-Steel."
- E. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. NAAMM, "Metal Stair Manual."
- F. Steel Deck Institute (SDI):

1. SDI Pub. #27, "Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. American Buildings Co.
 2. ASC Pacific Inc.
 3. Bowman Metal Deck Armco, Inc.
 4. Consolidated Systems, Inc.
 5. Epic Metals Corp.
 6. Marlyn Steel Products, Inc.
 7. Robertson A United Dominion Co.
 8. Roof Deck, Inc.
 9. United Steel Deck, Inc.
 10. Verco Manufacturing Co.
 11. Vulcraft Div. of Nucor Corp.
 12. Walker Div. of Butler Manufacturing Co.
 13. Wheeling Corrugating Co., Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels without top-flange stiffening grooves conforming to SDI Publication No. 28 "Specifications and Commentary for Steel Roof Deck" and the following:
 1. Galvanized Steel Sheet: ASTM A 653, Grade A, G 60 zinc coated according to ASTM A 525.
 2. Profile Depth: As indicated on drawings.
 3. Design Uncoated-Steel Thickness: As indicated on drawings.
 4. Span Condition: As indicated on drawings.
 5. Side Joints: Overlapped or interlocking seam at Contractor's option.

2.3 ACCESSORIES

- A. General: Provide accessory materials for steel deck that comply with requirements indicated and recommendations of the steel deck manufacturer.
- B. Mechanical Fasteners: Manufacturer's standard, corrosion-resistant, low-velocity, powder-actuated or pneumatically driven carbon steel fasteners; or self-drilling, self-threading screws.
- C. Side Lap Fasteners: Manufacturer's standard, corrosion-resistant, hexagonal washer head; self-drilling, carbon steel screws, No. 10 (4.8 mm) minimum diameter.
- D. Miscellaneous Roof Deck Accessories: Steel sheet, 0.0359-in.- (0.91-mm-) thick minimum ridge and valley plates, finish strips, and reinforcing channels, of same material as roof deck.
- E. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material and thickness as deck panels, unless otherwise indicated.
- F. Weld Washers: Manufacturer's standard uncoated-steel sheet weld washers, shaped to fit deck rib, 0.0598 in. thick with 0.375-in. minimum diameter prepunched hole.
- G. Recessed Sump Pans: Manufacturer's standard size, single piece steel sheet 0.071-in.- thick minimum, of same material as deck panels, with 1.5-in.- minimum deep level recessed pans and 3-in.- wide flanges. Cut holes for drains in the field.
- H. Flat Receiver Pan: Manufacturer's standard size, single-piece steel sheet, 0.071-in.- thick minimum units, of same material as deck panels. Cut holes for drains in the field.
- I. Steel Sheet Accessories: ASTM A 653, G 60 coating class, galvanized according to ASTM A 525.
- J. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94% zinc dust by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of steel deck.

3.2 PREPARATION

- A. Do not place deck panels on concrete supporting structure until concrete has cured and is dry.
- B. Locate decking bundles to prevent overloading of supporting members.

3.3 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary of SDI Publication No. 28, manufacturer's recommendations, and requirements of this Section.

- B. Place deck panels on supporting framing and adjust to final position with ends accurately aligned and bearing on supporting framing before being permanently fastened. Do not stretch or contract side lap interlocks.
- C. Place deck panels flat and square and fasten to supporting framing without warp or deflection.
- D. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to the decking.
- E. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
- F. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
- G. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's instructions.

3.4 ROOF DECK INSTALLATION

- A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1.5 in. (38 mm) long, and as follows:
 - 1. Weld Diameter: 0.75 in., nominal.
 - 2. Weld Spacing: Weld edge ribs of panels at each support with the pattern indicated on the drawings.
- B. Side Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding 18 in., using one of the following methods:
 - 1. Mechanically fasten with self-drilling No. 10- diameter or larger carbon steel screws.
 - 2. Fasten with 2.0-in.- long minimum welds.
- C. End Bearing: Install deck ends over supporting framing with a minimum end bearing of 1.5 in., with end joints as follows:
 - 1. End Joints: Lapped 2 in. minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking, and weld flanges to top of deck. Space welds not more than 12 in. apart with at least one weld at each corner.
- E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's recommendations. Weld to substrate to provide a complete deck installation.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Qualified independent testing agency employed and paid by Owner will perform field quality-control testing.
- B. Field welds will be subject to inspection.

- C. Testing agency will report test results promptly and in writing to Contractor and Engineer/Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional testing will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces with galvanized repair paint according to ASTM A 780 and the manufacturer's instructions.
- B. Provide final protection and maintain conditions to ensure steel decking is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 00

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel framing and supports for mechanical and electrical equipment.
 - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 3. Elevator machine beams, hoist beams, and divider beams.
 - 4. Steel shapes for supporting elevator door sills.
 - 5. Shelf angles.
 - 6. Metal ladders.
 - 7. Elevator pit sump covers.
 - 8. Elevator system support.
 - 9. Metal bollards.
 - 10. Pipe guards.
 - 11. Abrasive metal nosings.
- B. Products furnished, but not installed, under this Section:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Sections:
 - 1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts and other items cast into concrete.
 - 2. Division 4 Section "Unit Masonry Assemblies" for installing loose lintels, anchor bolts, and other items built into unit masonry.
 - 3. Division 5 Section "Structural Steel."
 - 4. Division 5 Section "Metal Stairs."
 - 5. Division 5 Section "Pipe and Tube Railings."
 - 6. Division 5 Section "Ornamental Metal."
 - 7. Division 10 Section "Wire Mesh Partitions."
 - 8. Division 14 Section "Electric Traction Elevators (MRL)"

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design elevator guiderail, hoistbeam, and divider beams, ladders, steel systems as required by selected elevator manufacturer, including comprehensive engineering analysis by a professional engineer who is legally qualified to practice in the State of Texas, using performance requirements and design criteria indicated.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Metal nosings and treads.
 - 2. Paint products.
 - 3. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- C. Samples for Verification: For each type and finish of extruded nosing.
- D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Qualification Data: For qualified professional engineer.
- F. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- G. Welding certificates.
- H. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Coordinate supply and installation of elements required by elevator manufacturer's system as required in excess of those elements provided for in the contract drawings as part of base bid.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.
- F. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches .
 - 2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, with G90 coating; 0.108-inch nominal thickness.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563 , and, where indicated, flat washers.

- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593, with hex nuts, ASTM F 594, and, where indicated, flat washers; Alloy Group 2.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594 .
- H. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Division 9 painting Sections."
- B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.

2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.
 - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3 unless otherwise indicated.
 - 2. For elevator pit ladders, comply with ASME A17.1.
- B. Steel Ladders:
 - 1. Space siderails 16 inches apart unless otherwise indicated.
 - 2. Space siderails of elevator pit ladders 12 inches apart.
 - 3. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
 - 4. Rungs: 3/4-inch- square steel bars.
 - 5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 - 6. Provide non-slip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
 - 7. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than [1/2 inch (12 mm)] [3/4 inch (19 mm)] in least dimension.
 - 8. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
 - 9. Galvanize exterior ladders, including brackets and fasteners.

2.9 ELEVATOR PIT SUMP COVERS

- A. Fabricate from 1/8-inch rolled-steel floor plate with four 1-inch-diameter holes for water drainage and for lifting.
- B. Provide steel angle supports as required.

2.10 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

20011 Gregg County Parking Garage and Office

- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim.

2.11 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
- B. Fabricate bollards with 5/8-inch-thick steel baseplates for bolting to supported concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
- C. Fabricate bollards with 5/8-inch-thick steel baseplates with HAS for embedding into concrete slab
- D. Galvanize bollards and plates after fabrication.

2.12 PIPE GUARDS

- A. Fabricate pipe guards from 3/8-inch- thick by 18-inch- wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 3-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.
- B. Galvanize pipe guards prior to painting, color to be selected by Owner.

2.13 ABRASIVE METAL NOSING

- A. Cast-Metal Units: Cast aluminum with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Safety Tread Co., Inc.
 - b. Barry Pattern & Foundry Co., Inc.
 - c. Safe-T-Metal Company, Inc.
 - d. Wooster Products Inc.
 - 2. Nosings: Cross-hatched units, 4 inches wide with 1/4-inch lip, for casting into concrete steps.
- B. Apply bituminous paint to concealed surfaces of cast-metal units.
- C. Provide concealed integral anchor.

2.14 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

2.15 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.16 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 2. After galvanizing, thoroughly clean railings of grease, oil, flux, and other foreign material, and treat with metallic phosphate process.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Division 9 painting Sections unless indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges

and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

3.3 INSTALLING METAL BOLLARDS

- A. Anchor bollards to concrete as shown on drawings.
- B. Fill bollards solidly with concrete, mounding top surface to shed water.

3.4 INSTALLING PIPE GUARDS

- A. Provide pipe guards at exposed vertical pipes in parking garage where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch bolts at each pipe guard. Mount pipe guards with top edge 27 inches above driving surface.

3.5 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

- A. Center nosings on tread widths unless otherwise indicated.
- B. For nosings embedded in concrete steps, align nosings flush with riser faces and level with tread surfaces.
- C. Seal thresholds exposed to exterior with elastomeric sealant complying with Division 7 Section "Joint Sealants" to provide a watertight installation.

3.6 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use non-shrink grout, either metallic or non-metallic, in concealed locations where not exposed to moisture; use non-shrink, non-metallic grout in exposed locations unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.7 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055010

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

**SECTION 05 51 33
METAL LADDERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop-fabricated metal ladders.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1910.28 - Duty to have Fall Protection and Falling Object Protection Current Edition.
- B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices Current Edition.
- C. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements 2018.
- D. ANSI/ASSP Z359.16 - Safety Requirements for Climbing Ladder Fall Arrest Systems 2016.
- E. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire 2019.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets on each ladder safety system product to be used, including installation instructions.
- C. Certificate: Provide documentation that ladder safety system products of this section meet or exceed cited 29 CFR 1910.28, 29 CFR 1910.29, ANSI/ASSP Z359.16, and ANSI A14.3 requirements.

PART 2 PRODUCTS

2.01 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.02 FABRICATED LADDERS

- A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
 - 1. Side Rails: 3/8 by 2 inches (9 by 50 mm) members spaced at 20 inches (500 mm).
 - 2. Rungs: One inch (25 mm) diameter solid round bar spaced 12 inches (300 mm) on center.
 - 3. Space rungs 7 inches (175 mm) from wall surface.
 - 4. Location: At roof access hatch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Confirm that the ladder structure to which the ladder safety system is installed is capable of withstanding the loads applied by the system in the event of a fall.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.

- B. Install ladder safety system in accordance with manufacturer's instructions.
- C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

**SECTION 05 52 13
PIPE AND TUBE RAILINGS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Delegated-Design of Steel pipe and tube railings.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
 - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of connecting and finishing members at intersections.
- D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- D. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- E. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steel Pipe and Tube Railings:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work.
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Wagner, R & B, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction, and layout per ADA and JHA requirements.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.

b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.4 STEEL AND IRON

A. Tubing: ASTM A 500 (cold formed).

B. Pipe: ASTM A 53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A 36.

D. Cast Iron: Either gray iron, ASTM A 48, or malleable iron, ASTM A 47, unless otherwise indicated.

E. Expanded Metal: ASTM F 1267, Type I (expanded), Class 1 (uncoated).

1. Style Designation: [3/4 number 13] [1-1/2 number 10].

2.5 FASTENERS

A. General: Provide the following:

1. Un-galvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
3. Aluminum Railings: Type 304 stainless-steel fasteners.
4. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting" Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- E. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work.
- F. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- G. Intermediate Coats and Topcoats: Provide products that comply with Section 099113 "Exterior Painting"
- H. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work.
- I. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work.
- J. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- K. Non-shrink, Non-metallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- L. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: at exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Non-welded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- K. Form Changes in Direction as Follows:
 - 1. As detailed.
 - 2. By bending or by inserting prefabricated elbow fittings.
- L. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- Q. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- R. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

2.8 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 1. Hot-dip galvanize steel railings, including hardware, after fabrication.
 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Non-welded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

- A. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.
- C. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges to building construction as follows:
1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 2. For hollow masonry anchorage, use toggle bolts.
 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
 4. For steel-framed partitions, use hanger or lag bolts set into fire-treated wood backing between studs. Coordinate with stud installation to locate backing members.
 5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with Zinc rich coating to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces and repair galvanizing to comply with ASTM A 780/A 780M.
 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting".

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roofing nailers.
- B. Preservative treated wood materials.
- C. Fire retardant treated wood materials.
- D. Communications and electrical room mounting boards.
- E. Concealed wood blocking, nailers, and supports.
- F. Miscellaneous wood nailers, furring, and grounds.

1.02 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing 2003 (Reapproved 2017).
- C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing 2010 (Reapproved 2017).
- D. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing 2019a.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- F. AWPA U1 - Use Category System: User Specification for Treated Wood 2018.
- G. PS 1 - Structural Plywood 2009 (Revised 2019).
- H. PS 2 - Performance Standard for Wood-Based Structural-Use Panels 2010.
- I. PS 20 - American Softwood Lumber Standard 2020.
- J. SPIB (GR) - Grading Rules 2014.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Southern Pine, unless otherwise indicated.
 - 2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 - 3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 - 4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- B. Other Applications:
 - 1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 - 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
 - 3. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
 - 3. Anchors: Toggle bolt type for anchorage to hollow masonry.
- B. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.
 - 1. Manufacturers:
 - a. Franklin International, Inc; Titebond Fast Set Polyurethane Construction Adhesive: www.titebond.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Fire Retardant Treatment:
 - 1. Manufacturers:
 - a. Lonza Group; [____]: www.wolmanizedwood.com/#sle.
 - b. Hoover Treated Wood Products, Inc; [____]: www.frtw.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat all exterior rough carpentry items.
 - c. Do not use treated wood in direct contact with the ground.
 - 3. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for

an additional 20 minutes.

- a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
- b. Treat rough carpentry items as indicated .
- c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:

1. Manufacturers:

- a. Lonza Group; [____]: www.wolmanizedwood.com/#sle.
- b. Koppers Performance Chemicals, Inc; [____]: www.koppersperformancechemicals.com/#sle.
- c. Viance, LLC; Preserve ACQ: www.treatedwood.com/#sle.
- d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.

- a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
- b. Treat lumber exposed to weather.
- c. Treat lumber in contact with roofing, flashing, or waterproofing.
- d. Treat lumber in contact with masonry or concrete.
- e. Treat lumber less than 18 inches (450 mm) above grade.
- f. Treat lumber in other locations as indicated.

3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.

- a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
- b. Treat plywood in contact with roofing, flashing, or waterproofing.
- c. Treat plywood in contact with masonry or concrete.
- d. Treat plywood less than 18 inches (450 mm) above grade.
- e. Treat plywood in other locations as indicated.

4. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.

- a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

- F. Provide the following specific non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Wall paneling and trim.
 - 9. Joints of rigid wall coverings that occur between studs.
 - 10. Televisions
 - 11. Counters
 - 12. Fire extinguisher cabinets
 - 13. Signage
 - 14. Corner guards and other wall protection

3.04 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

- A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
 - 1. Use plywood or other acceptable structural panels at building corners, for not less than 96 inches (2440 mm), measured horizontally.
- B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.
 - 4. Size: 48 by 96 inches (2440 by 4880 mm), installed horizontally at ceiling height.

3.06 TOLERANCES

- A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
- B. Variation from vertical in plane wall tolerance (Other than Floors): 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.07 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.

3.08 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 01 74 19 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

**SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Hardware.

1.02 RELATED REQUIREMENTS

- A. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0 2021, with Errata.
- C. BHMA A156.9 - Cabinet Hardware 2020.
- D. NEMA LD 3 - High-Pressure Decorative Laminates 2005.
- E. UL (DIR) - Online Certifications Directory Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
 - 2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches (300 mm) square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Premium grade.
- C. Cabinets at [_____]:
 - 1. Finish - Exposed Exterior Surfaces: Decorative laminate.

2. Finish - Exposed Interior Surfaces: Decorative laminate.
3. Finish - Semi-Exposed Surfaces: Decorative laminate
4. Finish - Concealed Surfaces: Melamine.
5. Door and Drawer Front Edge Profiles: Square edge with thin applied band, exposed laminate body at corners to be sealed with a matching 2mm PVC bead.
6. Door and Drawer Front Retention Profiles: Fixed panel.
7. Casework Construction Type: Type A - Frameless.
8. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
9. Adjustable Shelf Loading: 50 lbs. per sq. ft.
 - a. Deflection: L/144.
10. Cabinet Doors and Drawer Fronts: Flush style.
11. Drawer Side Construction: Multiple-dovetailed.
12. Drawer Construction Technique: Dovetail joints.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- B. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

2.03 LAMINATE MATERIALS

- A. Manufacturers:
 1. Wilsonart LLC; [____]: www.wilsonart.com/#sle.
 2. Formica: www.formica.com
 3. Octolam ; www.octolam.com
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.04 COUNTERTOPS

- A. Countertops are specified in Section 12 36 00.

2.05 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.06 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments.
- C. Fixed Specialty Shelf Supports:
 1. Material: Steel.
 2. Manufacturer's standard, factory-applied, textured powder coat.
 3. Color: White.
- D. Countertop Supports:
 1. Material: Aluminum
 2. Finish/Color: As selected by architect from manufacturer's available options.
 3. Manufacturers:
 - a. Rakks/Rangine Corporation; Sill Supports: www.rakks.com/#sle
- E. Drawer and Door Pulls: Extruded aluminum pull, 8" width of drawer, satin finish..
- F. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.

- G. Catches: Magnetic.
- H. Drawer Slides:
 - 1. Type: Extension types as indicated.
 - 2. Static Load Capacity: Commercial grade.
 - 3. Mounting: Side mounted.
 - 4. Stops: Integral type.
 - 5. Features: Provide self closing/stay closed type.
 - 6. Manufacturers:
 - a. Accuride International, Inc: www accuride.com/#sle.
 - b. Grass America Inc; [____]: www.grassusa.com/#sle.
 - c. Hettich America, LP; [____]: www.hettich.com/#sle.
 - d. Knappe & Vogt Manufacturing Company: www.knappeandvogt.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- I. Drawer Systems: Integrated drawer slide and side.
 - 1. Side Type: Single Wall.
 - 2. Static Load Capacity: Residential/Light Commercial grade.
 - 3. Mounting: Side mounted.
 - 4. Stops: Integral type.
 - 5. Features: Provide self closing/stay closed type.
- J. Hinges: European style concealed self-closing type, steel with satin finish.
 - 1. Manufacturers:
 - a. Grass America Inc: www.grassusa.com/#sle.
 - b. Hardware Resources; [____]: www.hardwareresources.com/#sle.
 - c. Hettich America, LP; [____]: www.hettich.com/#sle.
 - d. Blum, Inc; [____]: www.blum.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- K. Soft Close Adapter: Concealed, frame-mounted, screw-adjustable damper ; steel with satin finish.

2.07 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)
 - 1. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches (400 mm) on center.
- F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.

- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.
- E. Secure cabinets to floor using appropriate angles and anchorages.
- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

**SECTION 07 11 13
BITUMINOUS DAMPPROOFING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes cold-applied, emulsified asphalt dampproofing applied to the following surfaces:
 - 1. Exterior, below-grade surfaces of concrete foundation walls.
 - 2. Back side of concrete retaining walls, below grade.
 - 3. Interior face of exterior concrete walls, above grade.
 - 4. Interior face of exterior concrete and masonry walls, above grade (where detailed)

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
- B. Material Certificates: For each product, signed by manufacturers.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cold-Applied, Emulsified-Asphalt Dampproofing:
 - a. Euclid Chemical Company (The).
 - b. Gardner Asphalt Corporation.

- c. Henry Company.
 - d. Karnak Corporation.
 - e. Koppers Industries, Inc.
 - f. Malarkey Roofing Company.
 - g. Meadows, W. R., Inc.
 - h. Sonneborn, Div. of ChemRex, Inc.
 - i. Tamms Industries.
2. Protection Course, Asphalt-Board Type:
- a. Grace, W. R. & Co.; Construction Products Div.
 - b. Meadows, W. R., Inc.
 - c. Sonneborn, Div. of ChemRex, Inc.

2.2 BITUMINOUS DAMPPROOFING

- A. Cold-Applied, Emulsified-Asphalt Dampproofing:
- 1. Trowel Coats: ASTM D 1227, Type II, Class 1.
 - 2. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
 - 3. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.3 MISCELLANEOUS MATERIALS

- A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
- B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- C. Protection Course, Asphalt-Board Type: Premolded, 1/8-inch- (3-mm-) thick, multi-ply, semirigid board consisting of a mineral-stabilized asphalt core sandwiched between layers of asphalt-saturated felt and faced on 1 side with polyethylene film.
- D. Protection Course, Polystyrene Type: Fan-folded, rigid, extruded-polystyrene board insulation; nominal thickness not less than 3/16 inch (5 mm).
- E. Protection Course, Roll-Roofing Type: Smooth-surfaced roll roofing complying with ASTM D 224, Type II.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
- 1. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
 - 1. Apply additional coats if recommended by manufacturer or required to achieve coverages indicated.
 - 2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.
- B. Apply dampproofing to footings and foundation walls where opposite side of wall faces building interior whether indicated or not.
 - 1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches (150 mm) over outside face of footing.
 - 2. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- (200-mm-) wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required.
- C. Apply dampproofing to provide continuous plane of protection on interior face of above grade, exterior concrete walls unless walls are indicated to receive direct application of paint.
 - 1. Continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by delaying construction of intersecting walls until dampproofing is applied.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. On Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat, one fibered brush or spray coat at not less than 3 gal./100 sq. ft. (1.2 L/sq. m), or one trowel coat at not less than 4 gal./100 sq. ft. (1.6 L/sq. m).
- B. On Backs of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft. (0.5 L/sq. m).
- C. On Interior Face of Exterior Concrete Walls: Where above grade and indicated to be furred and finished, apply one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

3.5 INSTALLATION OF PROTECTION COURSE

- A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing material manufacturer's written recommendations for attaching protection course. Support protection course with spot application of trowel-grade mastic where not otherwise indicated.

3.6 CLEANING

- A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

SECTION 07 14 16

FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. The waterproofing system shall consist of a cold liquid applied reinforced waterproofing membrane, flashings and overburden as specified.
- B. Work shall include, but is not limited to, the following:
 - 1. Preparation of existing concrete and new steel and all flashing substrates.
 - 2. Cold fluid-applied, reinforced flashings.
 - 3. Cold fluid-applied, reinforced waterproofing membrane.
 - 4. All related materials and labor required to complete specified waterproofing necessary to receive specified manufacturer's warranty.

1.02 DEFINITIONS

- A. ASTM D 1079-Definitions of Term Relating to Roofing and Waterproofing.
- B. The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual, Fifth Edition Glossary.

1.03 REFERENCES

- A. AMERICAN SOCIETY OF CIVIL ENGINEERS - Reference Document ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- B. AMERICAN STANDARD OF TESTING METHODS (ASTM):
 - 1. ASTM C 836 - Standard Specification for High Solids Content, Cold Liquid applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
 - 2. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants

1.04 SUBMITTALS

- A. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and/or general requirements for each component.
- B. Safety Data Sheets: Submit manufacturer's Safety Data Sheets (SDS) for each component.
- C. Sample/Specimen Warranty from the manufacturer and contractor.
- D. Contractor Authorization: Submit written certification from manufacturer indicating the applicator is authorized by the manufacturer to install the specified materials and system.
- E. Closeout Submittals:
 - 1. Provide manufacturer's and contractor's warranties upon substantial completion of the waterproofing.

1.05 WARRANTY

- A. Provide Manufacturer's 10-year Limited Materials Warranty for the specified cold fluid-applied waterproofing.

1.06 QUALITY ASSURANCE

- A. MANUFACTURER QUALIFICATIONS:
 - 1. Manufacturer shall have 20 years of manufacturing experience.
 - 2. Manufacturer shall have trained technical service representatives employed by the manufacturer, independent of sales.
 - 3. Manufacturer shall provide site visit reports in a timely manner.
- B. CONTRACTOR QUALIFICATIONS:
 - 1. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding period through satisfactory project completion.
 - 2. Applicators shall have completed projects of similar scope using same or similar materials specified.
 - 3. Contractor shall provide full time, on-site superintendent or foreman experienced with the specified roofing from beginning through satisfactory project completion.
 - 4. Applicators shall be skilled in the application methods for all materials.
 - 5. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
 - 6. Contractor shall maintain a copy of all submittal documents, on-site, available at all times for reference.
- C. SUBSTRATE EVALUATION:
 - 1. Contractor shall evaluate substrate moisture content and adhesion of waterproofing materials to substrate throughout the work and record with daily inspection reports or other form of reporting acceptable to the owner or his designated representative and waterproofing manufacturer.
 - a. Moisture content: Evaluate substrate moisture content to determine acceptability for application of the specified liquid applied waterproofing materials.
 - b. Adhesion: Evaluate soundness and surface preparation of concrete and/or masonry substrates. Prepare representative areas using specified methods complete with waterproofing membrane.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Refer to each product data sheet or other published literature for specific requirements.
- B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.
- C. Protect and store materials in a dry, well-vented, weatherproof location protected from damaging exposures, direct sunlight and extreme heat.
- D. Do not use at temperatures below 5°C (40°F). Maintain cold fluid-applied materials above room temperature before applying.

- E. Properly dispose of all pails, product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged materials shall be removed from job site and replaced with new, suitable materials.

1.08 SITE CONDITIONS

A. SAFETY:

1. The applicator shall be responsible for complying with all project-related safety and environmental requirements.
2. The applicator shall review project conditions and determine when and where conditions are appropriate to utilize the specified materials. When conditions are determined by the applicator to be unsafe or undesirable to proceed, measures shall be taken to prevent or eliminate the unsafe or undesirable exposures and conditions, or equivalent approved materials and methods shall be utilized to accommodate requirements and conditions.
3. The applicator shall refer to product Safety Data Sheets (SDS) for health, safety, and environment related hazards, and take all necessary measures and precautions to comply with exposure requirements.

B. ENVIRONMENTAL CONDITIONS:

1. Do not apply materials to frozen or frost covered surfaces.
2. Do not use at temperatures below 2°C (35°F). Maintain cold fluid-applied materials above room temperature before applying.
3. Monitor substrate temperature and material temperature, as well as all environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Materials and methods shall be adjusted as necessary to accommodate varying project conditions. Materials shall not be installed when conditions are unacceptable to achieve the specified results.
4. Precipitation and dew point: Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of materials. Ensure all materials and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.

1.09 PERFORMANCE REQUIREMENTS

A. GENERAL:

1. Cold fluid-applied waterproofing shall be capable of preventing moisture migration to the structure.
2. Cold fluid-applied waterproofing shall be capable of accommodating substrate movement and sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and moisture migration, or interruption of the drainage plane.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. SINGLE SOURCE MANUFACTURER: All materials shall be provided by a single supplier with 20 years history or more in the US.
 - 1. Comply with the Manufacturer's requirements as necessary to provide the specified warranty.
- B. PRODUCT QUALITY ASSURANCE PROGRAM: Manufacturer shall be an ISO 9001 registered company.
- C. ACCEPTABLE MANUFACTURER:
 - 1. SOPREMA, located at: 310 Quadral Dr.; Wadsworth, OH 44281; Tel: 800-356-3521; Tel: 330-334-0066; Website: www.soprema.us.
 - 2. Approved Equivalent

2.02 COLD FLUID-APPLIED WATERPROOFING MATERIALS

- A. COLD FLUID-APPLIED WATERPROOFING
 - 1. SPRAY APPLIED:
 - a. BASIS OF DESIGN, SOPREMA Inc. COLPHENE LM BARR: cold fluid-applied, single component, waterproofing membrane that cures by exposure to atmospheric and substrate moisture to form a continuous, tough, reinforced elastic seal.
 - I. Conforms to ASTM C 836
 - II. Viscosity: 35,000 cP @ 73°F (23°C)
 - III. Density: 11.3 (1.35) lbs/gal (g/mL)
 - IV. Tack free time: 40 to 60 mins.
 - V. Solid content by weight: 95%
 - VI. Hardness shore: 70
 - VII. Average permeability: 0.85 perm inches
 - VIII. Vertical film thickness: PASS
 - IX. Adhesive in peel: PASS
 - X. Adhesive in peel after water immersion: PASS
 - XI. Low temp crack bridging: PASS
 - XII. Extensibility heat aging: PASS
 - XIII. Service temperature: -40°F to 200°F (-40°C to 93°C)
- B. COLD FLUID-APPLIED FABRIC REINFORCEMENT:
 - 1. BASIS OF DESIGN SOPREMA, Inc. COLPHENE LM REBARR: stitchbonded, high performance fabric for use with COLPHENE LM BARR cold fluid-applied waterproofing.
 - a. Tensile Strength Film (ASTM D-1682): 41 lbs
 - b. Trapezoid tear (ASTM D1117): 14.2 lbs
 - c. Mullen burst: 127 psi
 - d. Weight of Fabric 2.9 oz/sq.yd.

2.03 AUXILIARY MATERIALS

- A. BASIS OF DESIGN SOPREMA, Inc. SOPRASEAL SEALANT: ASTM C920, 19 g/L low VOC, moisture curing polyether sealant approved for application. 10.1 oz (300 ml) or 20 oz (600 ml) sausages.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.
- B. The applicator shall not begin work until conditions have been properly examined and determined to be clean, dry, free of releasing agents, paint or other residue or coatings, otherwise satisfactory to receive specified materials.
- C. Verify substrate is flat, free of fins or planar irregularities greater than 6.4 mm in 3 m (1/4 inch in 10 ft).
- D. Verify concrete is sufficiently cured, visibly dry and free of moisture.
- E. Verify that masonry joints are stuck flush and completely filled with mortar.
- F. Verify that walls are capped to prevent moisture and precipitation from entering the walls during construction.
- G. Examine conditions by conducting preliminary qualitative peel tests as necessary to ensure satisfactory adhesion.
- H. The applicator shall examine all substrates including, but not limited to: walls, penetrations, terminations, transitions and fixtures.
- I. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified cold fluid-applied waterproofing and associated work.

3.02 PREPARATION

- A. Before commencing work each day, the applicator shall prepare all substrates to ensure conditions are satisfactory to proceed with the installation of specified materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.
- B. Protect all surrounding areas and surfaces from damage and staining during application of waterproofing.
- C. Report all unsatisfactory conditions to the General Contractor.
- D. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate applicator's acceptance of conditions.
- E. Protect finished work and adjacent areas throughout the project.
 - 1. Allow at least 2 hours to dry, or more depending upon environmental conditions, before installing the specified cladding.
 - 2. Do not use at temperatures below 2°C (35°F). Maintain cold fluid-applied materials above room temperature before applying.

3.03 FLASHINGS

- A. Flashings
 - 1. All flashings must be installed in accordance with specific design and building code requirements.
 - 2. Openings must be flashed according to design and building code requirements.

3. Apply base coat of cold fluid-applied waterproofing and embed waterproofing manufacturer's reinforcement mesh into wet base coat. Apply top coat of cold fluid-applied waterproofing over the reinforcement.
4. Visually inspect the cold fluid-applied waterproofing for voids, pinholes, surface deficiencies, etc. Repair deficiencies and areas that are not intact. Apply additional cold fluid-applied waterproofing as necessary such that it is free of voids, pinholes, etc. All substrate joints, terminations, inside and outside corners must be reinforced with waterproofing manufacturer's reinforcement mesh.

3.04 APPLICATION

- A. General: Apply products in accordance with manufacturer's current application procedures and in accordance with project requirements.
- B. Apply cold fluid-applied waterproofing at 120 wet mil thickness or at the manufacturer's recommended thickness.
- C. Visually inspect the cold fluid-applied waterproofing for voids, pinholes, surface deficiencies, etc. Repair deficiencies and areas that are not intact. Apply additional cold fluid-applied waterproofing as necessary such that it is free of voids, pinholes, etc. All joints, terminations, inside and outside corners must be reinforced with waterproofing manufacturer's reinforcement mesh.

3.05 CLEANING AND PROTECTION

- A. Applicator shall protect cold fluid-applied waterproofing system from damage during application. General Contractor shall make provision to protect cold-fluid applied waterproofing during the remainder of construction period. Repair any damage that may occur after installation in a manner consistent with the scope and intent of this specification.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. Remove masking materials after installation.
- D. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

END OF SECTION 079233

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

SECTION 07 18 00
TRAFFIC COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

- A. A single installer shall be responsible for providing complete water proofing system including all products specified in following Sections:
 - 1. Division 07 Section, "Traffic Coatings"
 - 2. Division 07 Section, "Water Repellents"
 - 3. Division 07 Section, "Joint Sealants"
 - 4. Division 07 Section, "Expansion Joint Assemblies"
- B. This Section includes traffic coating: Fluid applied, waterproofing, traffic-bearing elastomeric membrane with integral wearing surface, where surface to which membrane is to be applied is one or more of following:
 - 1. Over enclosed space:
 - a. Electrical and storage rooms (two feet beyond perimeter walls of rooms below)
 - 2. Over stair tower roofs.
 - 3. Over PT crane leavouts, CJs and pourstrips (6" beyond edges)
- C. Materials shall be compatible with materials or related Work with which they come into contact, and with materials covered by this Section.
- D. Related Sections: Following Sections contain requirements that relate to this Section.
 - 1. Division 03 Section, "Cast-in-Place Concrete."
 - 2. Division 07 Section, "Water Repellents"
 - 3. Division 07 Section, "Concrete Joint Sealants"
 - 4. Division 07 Section, "Expansion Joint Assemblies"
 - 5. Division 09 Section, "Pavement Markings."

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Distribute reviewed submittals to all others whose Work is related.
- B. Submittals and Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions.

1.4 ACTION SUBMITTALS

- A. Product Data: For each system indicated, submit the following at least 60 days prior to application.
 - 1. Product description, technical data, appropriate applications and limitations.
 - 2. Primer type and application rate
 - 3. Material, and wet mils required to obtain specified dry thickness for each coat.
 - 4. Type, gradation and aggregate loading required within each coat.
- B. Samples:
 - 1. One 4 in. by 4 in. stepped sample showing each component for each system indicated.
- C. Sample Warranty: For each system indicated.

1.5 INFORMATION SUBMITTALS

- A. Certificates
 - 1. Certification that products and installation comply with applicable federal, state where project is located, and local EPA, OSHA and VOC requirements regarding health and safety hazards.
 - 2. Evidence of applicator's being certified by manufacturer. Evidence shall include complete copy of manufacturer's licensing/certification document, spelling out repair responsibility for warranty claims.
 - 3. Certification from Manufacturer that finishes as specified are acceptable for system to be installed at least 1 month before placement of any concrete which will receive traffic coating.
 - 4. Certification stating static coefficient of friction meets minimum requirements of Americans with Disabilities Act (ADA).
 - 5. Certification stating materials have been tested and listed for UL 790 Class "A" rated materials/system by UL for traffic coating application specified on project. Containers shall bear UL labels.
 - 6. Certification from manufacturer confirming compatibility with existing underlying coatings and/or substrate.
- B. Manufacturer's Instructions: for each system indicated.
 - 1. Crack treatment and surface preparation method and acceptance criteria.
 - 2. Method of application of each coat.
 - 3. Maximum and minimum allowable times between coats.
 - 4. Final cure time before resumption of parking and/or paint striping.
 - 5. Any other special instructions required to ensure proper installation.
- C. Field Quality Control:
 - 1. Quality Control Plan as defined in Part 3.
 - 2. Two copies each of manufacturer's technical representative's log for each visit.
 - 3. Testing agency field reports.
- D. Qualification Statements
 - 1. Manufacturer's qualifications as defined in "Quality Assurance" article.
 - 2. Installer's qualifications as defined in "Quality Assurance" article.

3. Signed statement from applicator certifying that applicator has read, understood, and shall comply with all requirements of this Section.

1.6 CLOSEOUT SUBMITTALS

- A. Three copies of System Maintenance Manual.
- B. Final executed Warranty.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Owner retains right to reject any manufacturer.
 1. Evidence of acceptable previous work on WALKER-designed projects. If none, so state.
 2. Evidence of financial stability acceptable to Engineer/Architect.
 3. Listing of 20 or more projects completed with submitted system, to include:
 - a. Name and location of project.
 - b. Type of system applied.
 - c. On-Site contact with phone number.
- B. Manufacturer's technical representative, acceptable to Engineer/Architect, shall be on site during surface preparation and initial stages of installation.
- C. Installer's Qualifications: Owner retains right to reject any manufacturer.
 1. Evidence of compliance with Summary article paragraph "A single installer. . ."
 2. Evidence that installer has successfully performed or has qualified staff who have successfully performed at least 5 verifiable years of installations similar to those involved in this Contract, and minimum 10 projects with submitted system.
 3. Listing of 5 or more installations in climate and size similar to this Project performed by installer's superintendent.
- D. Testing Agency: Independent testing laboratory employed by Owner and acceptable to Engineer/Architect.
- E. Certifications
 1. Traffic coating shall satisfy current National Volatile Organic Compound (VOC) Emission Standards for Architectural Coatings.
 2. Licensing/certification document from manufacturer that confirms system installer is a licensed/certified applicator for the manufacturer and is legally licensed to perform work in the state this project is being constructed.
 3. Licensing/certification agreement shall include following information:
 - a. Applicator's financial responsibility for warranty burden under agreement terms.
 - b. Manufacturer's financial responsibility for warranty burden under agreement terms.
 - c. Process for dispute settlement between manufacturer and applicator in case of system failures where cause is not evident or cannot be assigned.
 - d. Authorized signatures for both Applicator Company and Manufacturer.
 - e. Commencement date of agreement and expiration date (if applicable).

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials to site in original, unopened containers, bearing following information:
 - 1. Name of product.
 - 2. Name of manufacturer.
 - 3. Date of preparation.
 - 4. Lot or batch number.
- B. Store materials under cover and protect from weather. Replace packages or materials showing any signs of damage with new material at no additional cost to Owner.

1.9 FIELD CONDITIONS

- A. Weather and Substrate Conditions: Proceed with work only when existing and forecast weather and temperature of concrete substrate will permit work in accordance with manufacturer's recommendations.

1.10 WARRANTY

- A. System Manufacturer: Furnish Owner with written total responsibility Joint and Several Warranty, detailing responsibilities of manufacturer and applicator with regard to warranty requirements (Joint and Several). Warranty shall provide that system will be free of defects, water penetration and chemical damage related to system design, workmanship or material deficiency, consisting of:
 - 1. Any adhesive or cohesive failures.
 - 2. Spalling surfaces.
 - 3. Weathering.
 - 4. Surface crazing (does not apply to traffic coating protection course).
 - 5. Abrasion or tear failure resulting from normal traffic use.
 - 6. Failure to bridge cracks less than 0.0625 in.
- B. If material surface shows any of defects listed above, supply labor and material to repair all defective areas and to repaint all damaged line stripes.
- C. Warranty period shall be a 5 year Joint and Several Warranty commencing with date of acceptance of work.
- D. Perform any repair under this warranty at no cost to Owner.
- E. Address following in terms of Warranty: length of warranty, change in value of warranty – if any-based on length of remaining warranty period, transferability of warranty, responsibilities of each party, notification procedures, dispute resolution procedures, and limitations of liability for direct and consequential damages.
- F. Vandalism and abnormally abrasive maintenance equipment are not normal traffic use and are exempted from warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of 1 of following, only where specifically named in product category:
1. Advanced Polymer Technology (APT), Harmony, PA
 2. BASF Building Systems (BASF), Shakopee, MN
 3. Deneef Construction Chemicals (Deneef), Houston, TX.
 4. Lymtal International Inc. (Lymtal), Lake Orion, MI.
 5. Neogard Division of Jones-Blair Company (Neogard), Dallas, TX.
 6. Pacific Polymers, Inc. a Division of ITW (Pacific Polymers), Garden Grove, CA
 7. Poly-Carb Inc. (Poly-Carb), Twinsburg, OH.
 8. Polycoat Products Division of Amer. Polymers (Polycoat), Santa Fe Springs, CA.
 9. Pecora Corporation (Pecora), Harleysville, PA
 10. Sika Corporation (Sika), Lyndhurst, NJ.
 11. Technical Barrier Systems, Inc. (TBS), Oakville, Ontario.
 12. Tremco (Tremco), Cleveland, OH.

2.2 MATERIALS, TRAFFIC COATING

1. Heavy Duty:
 - a. Autogard HD-48, Autogard E, Neogard.
 - b. Elasto-Deck 5000-HT, Pacific Polymers.
 - c. Iso-Flex 750U-HL HVT/760U-HL HVT Deck Coating System, LymTal.
 - d. MasterSeal Traffic 1500, BASF.
 - e. Qualideck Heavy Vehicular (152/252/372/512), APT
 - f. Sikalastic 710/715, Sika.
 - g. Vulkem 350/345/346/346 Deck Coating System, Tremco.
 - h. Pecora-Deck 800 Series.
 - i. Kelmar TE Exposure 3, TBS.
 - j. Flexodeck Mark 170.2 Solvent Free Heavy Duty, Poly-Carb.
 - k. Poly-I-Gard 246HD, Polycoat.
- B. Provide ultraviolet screening for all traffic coating placed on this project.
- C. Finish top coat shall be colored grey.
- D. Substitutions: None for this project. Contact Engineer/Architect for consideration for future projects.

2.3 MATERIALS, CRACK SEALER

- A. Repair for isolated random horizontal cracks 0.01 in. to 0.06 in. wide. Acceptable products:
1. Denedeck Crack Sealer, Deneef.
 2. Iso-Flex 609 Epoxy Crack Sealer, Lymtal.
 3. MasterSeal 630, BASF.
 4. Sikadur 55 SLV Epoxy Crack Healer/Sealer, Sika.
 5. SikaPronto 19TF, Sika.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive Work and report immediately in writing to Engineer/Architect any deficiencies in surface which render it unsuitable for proper execution of Work.
- B. Coordinate and verify that related Work meets following requirements before beginning surface preparation and application:
 - 1. Concrete surfaces are finished as acceptable for system to be installed. Correct all high points, ridges, and other defects in a manner acceptable to Engineer/Architect.
 - 2. Curing compounds used on concrete surfaces are compatible with system to be installed.
 - 3. Concrete surfaces have completed proper curing period for system selected.
 - 4. Joint Sealants are compatible with traffic coatings.

3.2 PREPARATION

- A. Seal all openings to occupied space to prevent cleaning materials, solvents and fumes from infiltration. All protective measures and/or ventilating systems required to prevent infiltration are incidental to this Work.
- B. Acid etching is prohibited.
- C. Remove all laitance and surface contaminants, including oil, grease and dirt as specified by manufacturer's written recommendations.
- D. Before applying materials, apply system to small area to assure that it will adhere to substrate and joint sealants and dry properly and to evaluate appearance.
- E. All cracks on concrete surface shall be prepared in accordance with manufacturer's recommendations.
- F. All random cracks on concrete surface less than 0.03 in. wide and showing no evidence of water and/or salt water staining on ceiling below shall receive detail coat unless more complete treatment required in accordance with manufacturer's recommendations. Rout and seal random cracks, construction joints and control joints prior to installation of primer or base coat. Crack preparation including installation of joint sealant material, where required, is incidental to traffic coating work.
- G. Mask off adjoining surfaces not to receive traffic coating and mask off drains to prevent spillage and migration of liquid materials outside membrane area. Provide neat/straight lines at termination of traffic coating.

3.3 INSTALLATION/APPLICATION

- A. Installation should include all of the following steps:
 - 1. Surface Preparation: Prepare concrete for system application.
 - 2. Crack/Construction/Control/Cove Joint Sealing: Detail for crack bridging.
 - 3. Primer Coat: Insure proper adhesion of membrane to substrate.
 - 4. Base Coat: Provide crack spanning in conjunction with Crack Detail noted above.
 - 5. Aggregate Coat – to hold aggregate in system, providing skid and wear close up resistance.
 - 6. Aggregate: Correct size, shape, hardness and amount necessary to insure proper skid and wear resistance.

7. Top Coat: Lock aggregate into place, provide a maintainable surface and provide resistance to ponding water, UV degradation, color loss and chemical intrusion.
- B. Do all Work in accordance with manufacturer's written instructions and specifications including, but not limited to, moisture content of substrate, atmospheric conditions (including relative humidity and temperature), coverages, mil thicknesses and texture, and as shown on Drawings.
- C. A primer coat is required for all systems. No exception.
- D. Do not apply traffic coating material until concrete has been air dried at temperatures at or above 40°F for at least 30 days after curing period specified.
- E. Cease material installation under adverse weather conditions, or when temperatures are outside manufacturer's recommended limitations for installation, or when temperature of work area or substrate are below 40°F.
- F. All adjacent vertical surfaces shall be coated with traffic coating minimum of 4 in. above coated horizontal surface. Requirement includes, but is not limited to pipes, columns, walls, curbs (full height of vertical faces of all curbs) and islands.
- G. Complete all Work under this Section before painting line stripes.
- H. Clean off excess material and material smears adjacent to joints as work progresses using methods and materials approved by manufacturers.

3.4 FIELD QUALITY CONTROL

- A. Develop a quality control plan for assured specified uniform membrane thickness that utilizes grid system of sufficiently small size to designate coverage area of not more than 5 gallons at specified thickness. In addition, employ wet mil gauge to continuously monitor thickness during application. Average specified wet mil thickness shall be maintained within grid during application with minimum thickness of not less than 80% of average acceptable thickness. Immediately apply more material to any area not maintaining these standards.
- B. Testing Agency employ wet mil gauge to periodically monitor thickness during application.
- C. Install 1 trial section of coating system specified. Do not proceed with further coating application until trial sections accepted in writing by Engineer/Architect. Remove and replace rejected trial sections with acceptable application. Trial section shall also be tested for:
 1. Wet mil thickness application.
 2. Adhesion to concrete substrate.
 3. Overall dry mil thickness.
- D. Use trial sections to determine adequacy of pre-application surface cleaning. Obtain Owner, Engineer/Architect and manufacturer acceptance of:
 1. Cleaning before proceeding with traffic coating application.
 2. Visual appearance of finished coating application.
 3. Conformance to ADA static coefficient of friction.
 4. Elcometer or equivalent pull test to quantify traffic coating adhesion to concrete and existing traffic coating.
- E. Determine overall coating system mil thickness:

20011 Gregg County Parking Garage and Office

1. Contractor shall provide 6 in. by 6 in. bond breaker (coating coupon) on concrete surface for each 25,000 sq ft, or fraction thereof, of coating to be placed as directed by Engineer/Architect and manufacturer. Dimensionally locate coupon for easy removal.
2. Contractor shall assist Testing Agency in removing coating coupons from concrete surface at completion of manufacturer-specified cure period. Contractor shall repair coupon area per coating manufacturer's instructions.
3. Testing Agency shall determine dry mil thickness of completed Traffic Coating System, including bond breaker. Take 9 readings (minimum), 3 by 3 pattern at 2 in. on center. No reading shall be taken closer than 1 in. from coupon edge. Report individual readings and overall coating system average to Engineer/Architect. Readings shall be made with micrometer or optical comparator.

END OF SECTION 071800

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

**SECTION 07 19 00
WATER REPELLENTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

- A. A single installer shall be responsible for providing complete water proofing system including all products specified in the following Sections:
 - 1. Division 07 Section, "Traffic Coatings"
 - 2. Division 07 Section, "Water Repellents"
 - 3. Division 07 Section, "Concrete Joint Sealants"
 - 4. Division 07 Section, "Expansion Joint Assemblies"
- B. This Section includes penetrating concrete sealer on these surfaces:
 - 1. Supported concrete floor and concrete roof surfaces including curbs, walks, islands and pour strips.
 - 2. Concrete stair treads and landings.
 - 3. Slab-on-grade within parking facility, including curbs, walks, and islands.
- C. Related Sections: Following Sections contain requirements that relate to this Section.
 - 1. Division 03 Section, "Cast-in-Place Concrete"
 - 2. Division 07 Section, "Traffic Coatings"
 - 3. Division 07 Section, "Concrete Joint Sealants"
 - 4. Division 07 Section, "Expansion Joint Assemblies"
 - 5. Division 09 Section, "Pavement Markings."

1.3 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM D6489, "Standard Test Method for Determining the Water Absorption of Hardened Concrete Treated with a Water Repellent Coating."

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Materials shall be compatible with materials or related Work with which they come into contact, and with materials covered by this Section.
 - 2. Distribute reviewed submittals to all others whose Work is related.

- B. Submittals and Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated at least 60 days prior to application.
 - 1. Product description, technical data, appropriate applications, and limitations.
 - 2. Areas and application rates of materials to be applied.
 - 3. Proposed alternate application methods, if any.

1.6 INFORMATION SUBMITTALS

- A. Certificates
 - 1. Certification that products and installation comply with applicable federal, state of Texas, and local EPA, OSHA and VOC requirements regarding health and safety hazards.
 - 2. Evidence of applicator's being certified by manufacturer. Evidence shall include complete copy of manufacturer's licensing/certification document, spelling out repair responsibility for warranty claims.
- B. Field Quality Control
 - 1. ASTM D6489 Test Results
 - 2. Two copies of manufacturer's technical representative's log for each visit.
- C. Qualification Statements
 - 1. Manufacturer's qualifications as defined in the "Quality Assurance" article.
 - 2. Installer's qualifications as defined in the "Quality Assurance" article.
 - 3. Signed statement from applicator certifying that applicator has read, understood, and shall comply with all requirements of this Section.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Owner retains right to reject any manufacturer.
 - 1. Evidence of acceptable previous work on WALKER-designed projects. If none, so state.
 - 2. Evidence of financial stability acceptable to Engineer/Architect.
 - 3. Listing of 20 or more projects completed with submitted system, to include:
 - a. Name and location of project.
 - b. Type of system applied.
 - c. On-Site contact with phone number.
- B. Installer's Qualifications: Owner retains right to reject any installer.
 - 1. Evidence of compliance with Summary article paragraph "A single installer. . ."

2. Evidence that installer has successfully performed or has qualified staff who have successfully performed at least 5 verifiable years of installations similar to those involved in this Contract, and minimum 10 projects with submitted system.
 3. Listing of 5 or more installations in climate and size similar to this Project performed by installer's superintendent.
- C. Testing Agency: Independent testing laboratory employed by Owner and acceptable to Engineer/Architect.
- D. Certifications
1. Sealer shall satisfy the current national and local Volatile Organic Compound (VOC) Emission Standards for Architectural Coatings.
 2. Licensing/certification document from system manufacturer that confirms system installer is a licensed/certified applicator for the manufacturer and is legally licensed to perform work in the state of Texas.
 3. Licensing/certification agreement must provide following information:
 - a. Applicator's financial responsibility for warranty burden under agreement terms.
 - b. Manufacturer's financial responsibility for warranty burden under agreement terms.
 - c. Process for dispute settlement between manufacturer and applicator in case of system failures where cause is not evident or cannot be assigned.
 - d. Officers' signatures for both Applicator Company and Manufacturer.
 - e. Commencement date of agreement and expiration date (if applicable).

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials to site in original, unopened containers, bearing following information:
1. Name of product.
 2. Name of manufacturer.
 3. Date of preparation.
 4. Lot or batch number.
- B. Store materials under cover and protect from weather. Replace packages or materials showing any signs of damage with new material at no additional cost to Owner.

1.9 FIELD CONDITIONS

- A. Weather and Substrate Conditions: Do not proceed with application (except with written recommendation of manufacturer) under any of the following conditions:
1. Ambient temperature is less than 40° F.
 2. Substrate surfaces have cured for less than 1 month.
 3. Rain or temperatures below 40° F predicted for a period of 24 hours.
 4. Less than 24 hours after surfaces became wet.
 5. Substrate is frozen or surface temperature is less than 40° F.
 6. Wind velocities higher than manufacturer's specified limit to prevent solvent flash-off.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following, only where specifically named in product category:
1. Advanced Chemical Technologies Inc. (ACT), Oklahoma City, OK.
 2. BASF Building Systems (BASF), Shakopee, MN.
 3. Deneef Construction Chemicals (Deneef), Houston, TX.
 4. Evonik Degussa Corporation (Evonik Degussa), Parsippany, NJ.
 5. Euclid Chemical Company (Euclid), Cleveland, OH.
 6. Lymtal International Inc. (Lymtal), Lake Orion, MI.
 7. Prosoco, Inc. (Prosoco), Lawrence, KS
 8. Sika Corporation (Sika), Lyndhurst, NJ.

2.2 MATERIALS, CONCRETE SEALER

- A. Silane (40% solids, 600 g/L or less VOC):
1. MasterProtect H 440 HZ, 125 sf/g, BASF.
 2. Iso-flex 618-40 VOC, 125sf/g, Lymtal.
 3. Protectosil Chem-Trete 40 VOC, 125 sf/g, Evonik Degussa.
 4. Sikagard 740W ,125 sf/g, Sika
 5. Sil-Act ATS-42, 125 sf/g, ACT.
- B. Proposed substitutions: None for this project. Contact Engineer/Architect for consideration for future projects.

2.3 MATERIALS, CRACK SEALER

- A. Repair for isolated random horizontal cracks 0.01 in. to 0.06 in. wide. Acceptable products:
1. SikaPronto 19TF, Sika.
 2. Sikadur 55 SLV Epoxy Crack Healer/Sealer, Sika.
 3. MasterSeal 630, BASF.
 4. Denedeck Crack Sealer, Deneef.
 5. Iso-Flex 609 Epoxy Crack Sealer, Lymtal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive Work and report immediately in writing to Engineer/Architect any deficiencies in surface which render it unsuitable for proper execution of Work.
- B. Coordinate and verify that related Work meets following requirements before beginning surface preparation and application:
1. Concrete surface finishes are acceptable for system to be installed.
 2. Curing compounds used on concrete surfaces are compatible with system to be installed.
 3. Concrete surfaces have completed proper curing period for system selected.

4. Control joint and expansion joint Work is complete and has been accepted by Engineer/Architect.

3.2 PREPARATION

- A. Seal all openings to occupied space to prevent cleaning materials, solvents and fumes from infiltration. All protective measures and/or ventilating systems required to prevent infiltration are incidental to this Work.
- B. Acid etching is prohibited.
- C. Repair or replace all sealant materials damaged by surface preparation operations.
- D. Shot blast clean all surfaces to be sealed as acceptable to sealer manufacturer before sealer application, if applicable. Shot blasting is not recommended or required for new slabs that are water cured per ACI 308, Paragraph 2.2. Cleaning method and materials shall be sufficient to allow absorption criteria stated in Field Quality Control article to be met. Prepare by sandblasting all surfaces inaccessible to shotblast equipment.
- E. Equipment used during floor slab cleaning shall not exceed height limitation of facility and shall not exceed 3,000 lb axle load or vehicle gross weight of 6,000 lb.
- F. Mask off adjoining surfaces not to receive sealer and mask off drains to prevent spillage and migration of liquid materials outside sealer area. Provide neat/straight lines at termination of sealer.

3.3 INSTALLATION/APPLICATION

- A. Do all Work in accordance with manufacturer's written instructions and specifications including, but not limited to, moisture content of substrate, atmospheric conditions (including relative humidity and temperature), coverage, mil thickness and texture, and as shown on Drawings.
- B. Clean all surfaces affected by sealer material overspray and repair all damage caused by sealer material overspray to adjacent construction or property at no cost to Owner.
- C. Clean off excess material as work progresses using methods and materials approved by manufacturer.

3.4 FIELD QUALITY CONTROL

- A. Install 3 trial sections of sealer to verify treated surface is not glazing as result of sealer application. If application of sealer causes glazing at trial section, contact sealer manufacturer to obtain written recommendations for solving problem. Do not proceed with sealer application following trial section applications until directed to do so in writing by Engineer/Architect.

3.5 NON-CONFORMING WORK

- A. Unsatisfactory Field Quality Control test results shall be grounds for rejection of sealer or sealer application rate. Perform sealer reapplication at no additional cost to Owner.

END OF SECTION 071900

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

**SECTION 07 21 00
THERMAL INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at over roof deck and exterior wall behind stucco wall finish.

1.02 REFERENCE STANDARDS

- A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board 2021.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- C. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies 2018.
- D. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components 2019.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.04 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

2.02 FOAM BOARD INSULATION MATERIALS

- A. Polyisocyanurate (ISO) Board Insulation with Facers Both Sides: Rigid cellular foam, complying with ASTM C1289.
 - 1. Location: Roof Board Insulation.
 - 2. Classifications:
 - a. Type I: Faced with aluminum foil on both major surfaces of core foam.
 - 1) Class 2 - Glass fiber reinforced or non-reinforced core foam.
 - 2) Compressive Strength: 16 psi (110 kPa), minimum.
 - 3) Thermal Resistance, R-value (RSI-value): At 1-1/2 inch (38.1 mm) thick; 9.0 (1.59) at 75 degrees F (24 degrees C).
 - 3. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 4. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 5. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
 - 6. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
 - 7. Thermal Resistance: R-value (RSI-value) of 25 ([_____]).
 - 8. Board Edges: Square.
 - 9. Manufacturers:
 - a. Rmax Inc; THERMAROOF® PLUS-3: www.rmax.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

- A. Board Installation Over Roof Deck, General:
 - 1. See applicable roofing specification section for specific board installation requirements.
 - 2. Fasten insulation to deck in accordance with roofing manufacturer's written instructions and applicable Factory Mutual requirements.
 - 3. Do not apply more insulation than can be covered with roofing in same day.

3.03 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

**SECTION 07 21 19
FOAMED-IN-PLACE INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Foamed-in-place insulation.

1.02 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.
- B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics 2019.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- E. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials 2021a.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.
- C. Certificates: Certify that products of this section meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.
- E. Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- F. Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience, and approved by manufacturer.

1.05 FIELD CONDITIONS

- A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.
- B. Do not apply foam when temperature is within 5 degrees F (2.78 degrees C) of dew point.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Foamed-In-Place Insulation:
 - 1. BASF Corporation; WALLTITE US Series Closed Cell: www.spf.basf.com/#sle.
 - 2. Carlisle Spray Foam Insulation; [_____]: www.carlisesfi.com/#sle.
 - 3. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
 - 1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and overcoat limitations.
 - 2. Thermal Resistance: R-value (RSI-value) of 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature when tested in

accordance with ASTM C518.

3. Water Vapor Permeance: Vapor retarder; 2 perms (115 ng/(Pa s sq m)), maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
5. Air Permeance: 0.04 cfm per square foot (0.2 L/(s/sq m)), maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf (75 Pa).
6. Closed Cell Content: At least 90 percent.
7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify work within construction spaces or crevices is complete prior to insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.
- B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.
- C. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.
- D. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 PROTECTION

- A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

**SECTION 07 25 00
WEATHER BARRIERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 RELATED REQUIREMENTS

- A. Section 07 21 00 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.
- C. Section 07 92 00 - Joint Sealants: Sealing building expansion joints.
- D. Section 09 21 16 - Gypsum Board Assemblies: Water-resistive barrier under exterior cladding.

1.03 DEFINITIONS

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

1.04 REFERENCE STANDARDS

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2021.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials 2021a.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- D. Manufacturer's Installation Instructions: Indicate preparation.
- E. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- F. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.
- G. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.06 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:

1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.07 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

- A. Air Barrier:
 1. On outside surface of sheathing of exterior walls use air barrier sheet, mechanically fastened type.

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

- A. Air Barrier Sheet, Mechanically Fastened:
 1. Air Permeance: 0.004 cfm/sq ft (0.02 L/(s sq m)), maximum, when tested in accordance with ASTM E2178.
 2. Water Vapor Permeance: 5 perms (286 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F (23 degrees C).
 3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.
 4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
 5. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches (50 mm) wide, compatible with sheet material; unless otherwise specified.
 6. Manufacturers:
 - a. DuPont de Nemours, Inc; Tyvek Commercial Wrap D with Tyvek Fluid Applied Flashing - Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap NF, StraightFlash, StraightFlash VF, Tyvek Wrap Caps, and Tyvek Tape: www.dupont.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.
- B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
 1. Manufacturers:
 - a. DuPont de Nemours, Inc; FlexWrap NF: www.dupont.com/#sle.
 - b. DuPont de Nemours, Inc; StraightFlash: www.dupont.com/#sle.
 - c. DuPont de Nemours, Inc; StraightFlash VF: www.dupont.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
 1. Width: 5-1/2 inches (140 mm).
 2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

- B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
- C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- D. Mechanically Fastened Sheets - On Exterior:
 - 1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
 - 2. Overlap seams as recommended by manufacturer but at least 6 inches.
 - 3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches (305 mm).
 - 4. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
 - 5. Install water-resistive barrier over jamb flashings.
 - 6. Install air barrier and vapor retarder underneath the jamb flashings.
 - 7. Install head flashings under weather barrier.
 - 8. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
- E. Openings and Penetrations in Exterior Weather Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto weather barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
 - 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
 - 3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches (230 mm) wide, covering entire depth of framing.
 - 4. At head of openings, install flashing under weather barrier extending at least 2 inches (50 mm) beyond face of jambs; seal weather barrier to flashing.
 - 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 - 6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Coordination of ABAA Tests and Inspections:
 - 1. Provide testing and inspection required by ABAA QAP.
 - 2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
 - 3. Cooperate with ABAA testing agency.
 - 4. Allow access to air barrier work areas and staging.
 - 5. Do not cover air barrier work until tested, inspected, and accepted.
- C. Do not cover installed weather barriers until required inspections have been completed.
- D. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- E. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

**SECTION 07 42 13
METAL WALL PANELS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured metal panels for soffit panels, with related flashings.

1.02 REFERENCE STANDARDS

- A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
 - 1. Physical characteristics of components shown on shop drawings.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions and recommendations.
- C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, [____], and methods of anchorage.
- D. Samples: Submit two samples of wall panel and soffit panel, 12 inches by 12 inches (305 mm by 305 mm) in size illustrating finish color, sheen, and texture.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.
- G. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum three years of documented experience.

1.05 MOCK-UP

- A. Construct mock-up, [____] feet ([____] m) long by [____] feet ([____] m) wide; include panel and soffit system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, related insulation, and [____] in mock-up.
- B. Locate where directed by Architect.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a twenty year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
- C. Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for metal wall panels.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. Metal Soffit Panels: Metalworks Linear Classics manufactured by Armstrong.

2.02 MANUFACTURED METAL PANELS

- A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
 - 1. Provide exterior wall panels and soffit panels.
 - 2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
 - 3. Maximum Allowable Deflection of Panel: $L/180$ for length(L) of span.
 - 4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
 - 5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
 - 6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
 - 7. Corners: Factory-fabricated in one continuous piece with minimum 18 inch (450 mm) returns.
- B. Exterior Wall Panels:
 - 1. Profile: Vertical; style as indicated.
 - 2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
 - 3. Panel Width: 12 inches ([] mm).
 - 4. Color: As selected by Architect from manufacturer's full line.
- C. Soffit Panels:
 - 1. Profile: Style as indicated, with venting provided.
 - 2. Color: As selected by Architect from manufacturer's full line.
- D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
- E. Expansion Joints: Same material, thickness and finish as exterior sheets; [] gage, [] inch ([] mm) thick; manufacturer's standard brake formed type, of profile to suit system.
- F. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
- G. Anchors: Galvanized steel.

2.03 ACCESSORIES

- A. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.
- B. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building framing members are ready to receive panels.
- B. Verify that water-resistive barrier has been installed over substrate completely and correctly.

3.02 INSTALLATION

- A. Install panels on walls and soffits in accordance with manufacturer's instructions.
- B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- C. Fasten panels to structural supports; aligned, level, and plumb.
- D. Locate joints over supports.
- E. Lap panel ends minimum 2 inches (51 mm).
- F. Use concealed fasteners unless otherwise approved by Architect.
- G. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.03 TOLERANCES

- A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: $1/16$ inch (1.6 mm).

- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch (6.4 mm).

3.04 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.
- C. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

END OF SECTION

**SECTION 07 52 00
MODIFIED BITUMINOUS MEMBRANE ROOFING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Modified bituminous roofing membrane, conventional application.
- B. Insulation, flat and tapered.
- C. Cover boards.
- D. Base flashings.
- E. Roofing cant strips, accessories, and walkway pads.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board 2021.
- B. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing 2011 (Reapproved 2016).
- C. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing 2016a.
- D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).
- E. ASTM D6163/D6163M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements 2021.
- F. ASTM D6222/D6222M - Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements 2016.
- G. FM (AG) - FM Approval Guide current edition.
- H. NRCA (RM) - The NRCA Roofing Manual 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of associated flashings and counterflashings installed by other sections.
- B. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog data for membrane and bitumen materials, base flashing materials, insulation, surfacing, and cover board.
- C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, mechanical fastener layout, and []].
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Manufacturer's Field Reports: Indicate procedures followed.
- G. Manufacturer's Qualification Statement.
- H. Installer's Qualification Statement.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

- B. Store materials in weather protected environment, clear of ground and moisture; ballast materials may be stored outdoors.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

1.08 FIELD CONDITIONS

- A. Do not apply roofing membrane when environmental conditions are outside the ranges recommended by manufacturer.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is below 40 degrees F (5 degrees C).
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a two year period after Date of Substantial Completion.
- C. Provide twenty year manufacturer's material and labor warranty to cover failure to prevent penetration of water.
 - 1. Limitation: No Dollar Limitation

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Membrane Materials:
 - 1. Basis of Design: Mulehide; SA-APP Mod Bit Cap and Base Sheet: www.mulehide.com
 - 2. Firestone Building Products Company; [____]: www.firestonebpco.com/#sle.
 - 3. GAF; [____]: www.gaf.com/#sle.
 - 4. Polyglass USA, Inc; Elastoflex SA V Self-Adhered SBS Roof Membrane: www.polyglass.us/#sle.

2.02 ROOFING - CONVENTIONAL APPLICATION

- A. Modified Bituminous Roofing: Comply with NRCA (RM) and NRCA Specification Plate [____], with insulation.
- B. Acceptable Insulation Types - Constant Thickness Application: Any of the types specified.
 - 1. Minimum 2 layers of polyisocyanurate board.
- C. Acceptable Insulation Types - Tapered Application: Any of the types specified.
 - 1. Tapered polyisocyanurate or extruded polystyrene board.

2.03 MEMBRANE AND SHEET MATERIALS

- A. Membrane: Polymer modified asphalt, reinforced with non-woven fabric; granule surfaced; with the following characteristics:
 - 1. Minimum Quality of base sheet: ASTM D6163/D6163M Type I; styrene-butadiene-styrene (SBS) modified, glass fiber reinforced.
 - 2. Minimum Quality of cap sheet: ASTM D6222/D6222M Type I; atactic polypropylene (APP) modified, polyester reinforced.
- B. Flexible Flashing Material: Same material as membrane.

2.04 BITUMINOUS MATERIALS

- A. Bitumen: Asphalt, ASTM D312/D312M Type IV; for adhering insulation, use Type III.
- B. Primer: ASTM D41/D41M, asphalt type.
- C. Roof Cement: ASTM D4586/D4586M, Type II, asbestos free.

2.05 COVER BOARDS

- A. Cover Boards: Faced with high compressive strength polyisocyanurate (ISO) insulation complying with ASTM C1289, and the following characteristics:
 - 1. Classification: Type II, Class 4 - Faced with coated or uncoated polymer-bonded glass fiber mat facers on both major surfaces of the core foam.
 - 2. Grade and Compressive Strength: Grade 1, 80 psi (Grade 1, 551 kPa).
 - 3. Board Size: 48 by 96 inches (1220 by 2440 mm).
 - 4. Board Thickness: 1/2 inch (12.7 mm), nominal.
 - 5. Manufacturers:

2.06 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
 - 1. Classifications:
 - a. Type I: Faced with aluminum foil on both major surfaces of the core foam.
 - 1) Class 1 - Non-reinforced core foam.
 - 2) Compressive Strength: 16 psi (110 kPa), minimum.
 - 3) Thermal Resistance, R-value (RSI-value): At 1-1/2 inch (38.1 mm) thick; 9.0 (1.59) at 75 degrees F (24 degrees C).
 - b. Type II:
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
 - 3) Thermal Resistance, R-value (RSI-value): At 1-1/2 inch (38.1 mm) thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F (24 degrees C).
 - 2. Board Size: 48 by 96 inch (1220 by 2440 mm).
 - 3. Tapered Board: Slope as indicated; minimum thickness [] inch ([] mm); fabricate of fewest layers possible.
 - 4. Board Edges: Square.
 - 5. Manufacturers:
 - a. Basis Of Design: Mulehide; PolyIso: www.mulehide.com
 - b. GAF; EnergyGuard Polyiso Insulation: www.gaf.com/#sle.
 - c. Polyglass USA, Inc; Polytherm ISO Board: www.polyglass.us/#sle.
 - d. RMAX; Thermarroof Plus-3.

2.07 ACCESSORIES

- A. Cant and Edge Strips: Asphalt-impregnated wood fiberboard, compatible with roofing materials ; cants formed to 45 degree angle.
- B. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- C. Roofing Nails: Galvanized, hot dipped type, size and configuration as required to suit application.
- D. Strip Reglet Devices: Galvanized steel, maximum possible lengths per location, with attachment flanges.
- E. Sealants: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 CONCRETE DECK PREPARATION

- A. Fill surface honeycomb and variations with latex filler.

- B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

3.03 INSULATION INSTALLATION - CONVENTIONAL APPLICATION

- A. Attachment of Insulation: Mechanically fasten each layer of insulation to deck in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.
- B. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.
- C. Lay subsequent layers of insulation with joints staggered minimum 6 inch (150 mm) from joints of preceding layer.
- D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- F. Do not apply more insulation than can be covered with membrane in same day.

3.04 MEMBRANE APPLICATION

- A. Apply modified bituminous membrane roofing system in accordance with manufacturer's recommendations and NRCA (RM) applicable requirements.
- B. Apply membrane; lap and seal edges and ends permanently waterproof.
- C. Apply smooth, free from air pockets, wrinkles, fish-mouths, or tears. Ensure full bond of membrane to substrate.
- D. At end of day's operation, install waterproof cut-off. Remove cut-off before resuming roofing.
- E. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 8 inches (200 mm) onto vertical surfaces.
 - 2. Apply flexible flashing over membrane.
- F. Around roof penetrations, mop in and seal flanges and flashings with flexible flashing.
- G. Coordinate installation of roof drains and sumps and related flashings.

3.05 SURFACING - CONVENTIONAL APPLICATION

- A. Apply roof coatings in accordance with roofing and coating manufacturers' instructions.
- B. Apply aggregate adhesive to membrane in quantity sufficient to bond aggregate.
- C. Embed aggregate at rate of 400 pounds per square (1,957 kg/100 sq m).
- D. Evenly distribute aggregate and ensure bond with membrane. Extend aggregate to bottom edge of cant strips.
- E. Butt aggregate to edge of traffic pads.
- F. Install walkway pads by setting in hot bitumen. Set joints 6 inches (150 mm) apart.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field quality control and inspection.
- B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.07 CLEANING

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- C. Repair or replace defaced or damaged finishes caused by work of this section.

3.08 PROTECTION

- A. Protect installed roofing and flashings from construction operations.

- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

**SECTION 07 62 00
SHEET METAL FLASHING AND TRIM**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.
- B. Sealants for joints within sheet metal fabrications.
- C. Precast concrete splash pads.

1.02 REFERENCE STANDARDS

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- D. ASTM B32 - Standard Specification for Solder Metal 2020.
- E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- F. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- G. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- H. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).
- I. CDA A4050 - Copper in Architecture - Handbook current edition.
- J. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples ___by___ inch (___by___ mm) in size illustrating metal finish color.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Maintain one copy of each document on site.
- C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with [] years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239) inch (0.61 mm) thick base metal, shop pre-coated with PVDF coating.
 - 1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Architect from manufacturer's standard colors.

- B. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) (0.81 mm) thick; plain finish shop pre-coated with modified silicone coating.
 - 1. Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
 - 2. Color: As selected by Architect from manufacturer's standard colors.

2.02 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.
- G. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

2.03 GUTTER AND DOWNSPOUT FABRICATION

- A. Gutters: [] Square profile.
- B. Downspouts: Round profile.
- C. Steel thickness: 24 gauge
- D. Finish: Factory finished with aluminum-zinc alloy-coated steel complying with ASTM A792/A792M; minimum AZ50 (AZM150) coating.
- E. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 5 years in accordance with SMACNA (ASMM).
- F. Accessories: Profiled to suit gutters and downspouts.
 - 1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
 - 2. Gutter Supports: 1" gutter straps and brackets at 30" o.c..
 - 3. Downspout Supports: 1" gutter straps and brackets at 30" o.c..
- G. Splash Pads: Precast concrete type, of 12" x 24" and profiles indicated; minimum 3000 psi (21 MPa) at 28 days, with minimum 5 percent air entrainment.
 - 1. Provide one per each downspout that is located over landscape.
- H. Downspout Boots: Steel.
 - 1. Manufacturer: Downspoutboots.com
 - 2. Product: O-Series - Sized to fit downspout profile.
 - 3. Finish: Powdercoat black with high performance coating.
- I. Seal metal joints.

2.04 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer: Zinc chromate type.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- E. Plastic Cement: ASTM D4586/D4586M, Type I.
- F. Solder: ASTM B32; Sn50 (50/50) type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Solder metal joints for full metal surface contact, and after soldering wash metal clean with neutralizing solution and rinse with water.
- E. Secure gutters and downspouts in place with concealed fasteners.
- F. Connect downspouts to downspout boots, and grout connection watertight.
- G. Set splash pads under downspouts.

END OF SECTION

**SECTION 07 72 00
ROOF ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof hatches.
- B. Roof walkways and platforms.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1910.23 - Ladders current edition.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
- D. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 ROOF HATCHES AND VENTS

- A. Roof Hatch Manufacturers:
 - 1. Bilco Company; Type S50TB Thermally Broken: www.bilco.com/#sle.
- B. Roof Hatches and Smoke Vents: Factory-assembled galvanized steel frame and cover, complete with operating and release hardware.
 - 1. Style: Provide flat metal covers unless otherwise indicated.
 - 2. Thermally Broken Hatches: Added insulation to frame and cover; available in each manufacturer's standard, single leaf sizes; special sizes available upon request
 - 3. For Ladder Access: Single leaf; 36 by 36 inches (914 by 914 mm).
- C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
 - 1. Insulation: Manufacturer's standard; 1 inch (25 mm) rigid glass fiber, located on outside face of curb.
- D. Metal Covers: Flush, insulated, hollow metal construction.
 - 1. Capable of supporting 40 psf (1.92 kPa) live load.
 - 2. Insulation: Manufacturer's standard 1 inch (25 mm) rigid glass fiber.
 - 3. Gasket: Neoprene, continuous around cover perimeter.
- E. Safety Railing System: Manufacturer's standard accessory safety rail system mounted directly to curb.
 - 1. Comply with 29 CFR 1910.23, with a safety factor of two.
 - 2. Posts and Rails: Aluminum tube.
 - 3. Gate: Same material as railing; automatic closing with latch.
 - 4. Finish: Manufacturer's standard, factory applied finish.

5. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
 6. Fasteners: Stainless steel, Type 316.
 7. Manufacturers:
 - a. BILCO Company; Bil-Guard 2.0: www.bilco.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf (475 kPa) load.
 2. Hinges: Heavy duty pintle type.
 3. Hold open arm with vinyl-coated handle for manual release.
 4. Latch: Upon closing, engage latch automatically and reset manual release.
 5. Manual Release: Pull handle on interior.
 6. Locking: Padlock hasp on interior.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

- A. Clean installed work to like-new condition.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

**SECTION 07 84 00
FIRESTOPPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).
- C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems 2015 (Reapproved 2019).
- D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems 2020a.
- E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers 2020a.
- F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus 2020.
- G. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies 2013 (Reapproved 2017).
- H. ITS (DIR) - Directory of Listed Products current edition.
- I. FM (AG) - FM Approval Guide current edition.
- J. UL 1479 - Standard for Fire Tests of Penetration Firestops Current Edition, Including All Revisions.
- K. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems Current Edition, Including All Revisions.
- L. UL (DIR) - Online Certifications Directory Current Edition.
- M. UL (FRD) - Fire Resistance Directory Current Edition.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Installer Qualification: Submit qualification statements for installing mechanics.

1.04 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Verification of minimum three years documented experience installing work of this type.

- D. Firestopping applicator shall provide a letter of certification stating that all firestopping systems have been installed in accordance with the contract documents. Letter shall be co-signed by the prime contractor.
- E. Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.
- F. Applicator shall be responsible for verifying that sealants used are compatible with joint substrates.

1.05 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products; [____]: www.3m.com/firestop/#sle.
 - 2. Hilti, Inc; [____]: www.us.hilti.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
- B. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
- C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
- D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 - 1. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- E. Obtain firestop systems for each kind of penetration and construction condition indicated from a single manufacturer. Materials of different manufacturers shall not be intermixed in the same firestop system or opening.
- F. Coordinate this work as required with work of other trades. It is the contractor's responsibility to ensure sequencing & scheduling of product installation including access.
- G. Items shall be tested to specific parameters, including the type and numbers of penetrating items, the size of the penetrating items, the maximum allowable annular space, and the rated hourly requirement of the structure.
- H. Only firestop products that have been third party tested in accordance with UL 1479 and ASTM E814 for specific fire rated construction penetrations shall be considered and used.

- I. Maintain effective barrier against flame, smoke, gasses and water per ASTM E814 and UL 1479.
- J. Tested and listed firestop systems are to be used before an engineering judgment or equivalent fire resistance rated assembly is installed.

2.04 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 - 1. Color: as selected from the manufacturer's full range of colors.
 - 2. Primer: type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
 - 3. Permanent damming/backing material: Semi-refractory fiber (mineral wool) insulation.
Permanent forming materials:
 - a. Mineral fiberboard.
 - b. Mineral fiber matting.
 - c. Sheet metal.
 - d. Alumina silicate fire board.
 - 4. Installation accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.
- B. Each trade must control sizing of their penetration holes made to accommodate their penetrating items.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency.
- C. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- D. Install labeling required by code.
- E. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems; after installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- F. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 - 1. Completely fill voids and cavities formed by openings, forming materials, accessories and penetrating items.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
 - 4. Where required by code, all membrane-penetrations in rated walls shall be protected with firestopping products that meet the requirements of third party time/temperature testing.
- G. Install all products according to manufacturer's instructions.
- H. Observe site conditions, condition of surfaces and installation, quality of workmanship, and initiate instructions when necessary. A representative directly employed by the manufacturer shall document above observations; include environmental conditions under

which firestopping materials were installed.

- I. Identify damaged or re-entered seals requiring repair or modifications. Remove loose or damaged materials. If penetrating items are to be added, remove sufficient material to insert new elements; care must be used not to cause damage to the balance of seal. Ensure that surfaces to be sealed are clean and dry.
- J. Use only materials approved by manufacturer as suitable for repair of original seal; do not mix manufacturers' products.

3.04 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174, and ASTM E2393.
- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.
- C. Inspect installed firestopping in accordance with ASTM E2174 for compliance with specifications and submitted schedule. Keep areas of work accessible and notify code authorities or designated inspectors of work completion released for inspection. Document completion and inspection, as required.

3.05 CLEANING

- A. Clean adjacent surfaces of firestopping materials.
- B. Remove excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur. Care shall be exercised in cleaning and removal operations so as not to mar or damage finishes on materials adjacent to joints; contractor shall repair or replace marred or damaged materials at no cost to owner.
- C. Leave finished work in neat, clean condition with no evidence of spillovers or damage to adjacent surfaces.

3.06 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

**SECTION 07 91 06
DECK AND PARKING JOINT SEALS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Watertight Joint System for Decks, Stadiums & Below-Grade Walls

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Convene at Project site 2 weeks prior to beginning work of this Section.
 - 2. Attendance: Contractor, Construction Manager, joint seal installer, and related trades
- B. Review and discuss:
 - 1. Joint seal manufacturer's requirements, project conditions, substrate requirements allowable structural movement at joints, and protection of completed work.
 - 2. Transitions in plane and direction, and requirement for continuity of seal through watertight transitions from wall expansion joint to other interfacing expansion joint systems at adjacent construction.

1.03 SUBMITTALS

- A. Shop Drawings:
 - 1. Indicate joint locations, dimensions, and adjacent construction.
 - 2. Provide details for transitions in plane and direction for continuity of seal through watertight transitions from wall expansion joint to other interfacing expansion joint systems at adjacent construction.
- B. Product Data: Material description and application instructions.
- C. Samples:
 - 1. Minimum 2 x 2 inch joint seal samples showing available colors.
 - 2. Minimum 6 inch long samples of each joint seal.
- D. Manufacturer's certification that:
 - 1. Products are capable of withstanding temperature of 150 degrees F (65 degrees C) for 3 hours while compressed to minimum of movement capability dimension without evidence of bleeding of impregnation medium from material.
 - 2. Same material after heat stability test and after cooling to room temperature will self-expand to maximum of movement capability dimension within 24 hours at 68 degrees F (20 degrees C).

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Minimum 10 years documented experience in production of specified materials.
 - 2. Certified to ISO 9001 and 14001.
- B. Installer Qualifications: Minimum 2 years documented experience in work of this Section.

1.05 DELIVERY, STORAGE AND HANDLING

- A. In accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Emseal Joint Systems, Ltd., www.emseal.com.
- B. Substitutions: See Section 01 60 00-Product Requirements.

2.02 MATERIALS

- A. Deck and Parking Joint Seal:
 - 1. Source: DSM System.
 - 2. Description: Precompressed, silicone coated and acrylic impregnated-foam hybrid installed into field-applied epoxy adhesive, with silicone sealant band on joint faces.
 - 3. Form: Precompressed to less than nominal material size for installation into designed joint size equal to material nominal size.
 - 4. Movement capability: Plus or minus 50 percent, total 100 percent; pass ASTM E1399.

5. Color: Standard Gray at all interior location. Color to match brick veneer at exterior locations.
6. Adhesive: Epoxy type, furnished by joint seal manufacturer.
7. Silicone: Field applied sealant band at face of seal to substrate interface, furnished by joint seal manufacturer; same material and color as factory coating.
 - a. Abrasion resistance: Maximum 1 percent weight loss, tested to ASTM D4060.
 - b. Fuel resistance: Pass ASTM C719 and ASTM C1135.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean joints thoroughly; remove loose and foreign matter that could impair adhesion or performance.

3.02 INSTALLATION

- A. Install joint seal in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Remove joint seal from precompressed packaging, immediately insert into joint, and allow to expand.
- C. Use temporary retainers if required to maintain joint seals in position until expansion is complete.

END OF SECTION

**SECTION 07 92 00
JOINT SEALANTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer 2015.
- B. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants 2018.
- C. ASTM C834 - Standard Specification for Latex Sealants 2017.
- D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2019.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- F. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems 2016.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- H. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2018.
- I. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants 2018.
- J. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints 2019 (Reapproved 2020).
- K. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness 2015 (Reapproved 2021).

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
 - 5. Substrates for which use of primer is required.
 - 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
 - 7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 - 8. Sample product warranty.
 - 9. Certification by manufacturer indicating that product complies with specification requirements.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

- F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- G. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
- H. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

1.04 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document covering installation requirements on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- D. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.
 - 2. Compatibility Testing: In accordance with ASTM C1087.
 - 3. Allow sufficient time for testing to avoid delaying the work.
 - 4. Deliver to manufacturer sufficient samples for testing.
 - 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 - 6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- E. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
 - 1. Identification of testing agency.
 - 2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
 - a. Test date.
 - b. Copy of test method documents.
 - c. Age of sealant upon date of testing.
 - d. Test results, modeled after the sample form in the test method document.
 - e. Indicate use of photographic record of test.
- F. Field Adhesion Test Procedures:
 - 1. Allow sealants to fully cure as recommended by manufacturer before testing.
 - 2. Have a copy of the test method document available during tests.
 - 3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
 - 4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
 - 5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
 - 6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
- G. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
 - 1. Sample: At least 18 inch (457 mm) long.
 - 2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch (25 mm) by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
 - 3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to

products or installation procedures.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
 - 1. Dow Chemical Company; DOWSIL™ 790 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - 2. Pecora Corporation; Dynatred: www.pecora.com/#sle.
 - 3. Sika Corporation; Sikaflex® Construction Sealant: www.usa-sika.com/#sle.
 - 4. W.R. Meadows, Inc; POURTHANE® NS: www.wrmeadows.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
 - 1. Dow Chemical Company; DOWSIL™ 890-SL : consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - 2. Pecora Corporation; 300 SL: www.pecora.com/#sle.
 - 3. Sika Corporation; Sikaflex® Self-Leveling Sealant: www.usa-sika.com/#sle.
 - 4. W.R. Meadows, Inc; POURTHANE® SL: www.wrmeadows.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Other joints indicated below.
 - 2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
 - 1) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - c. Other joints indicated below.
 - 3. Do not seal the following types of joints.
 - a. Intentional weepholes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
 - 1. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
- C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.

1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
 2. Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.
 3. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
 4. Wall, Ceiling, and Floor Joints Where Tamper-Resistance is Required: Non-sag tamper-resistant silyl-terminated polyurethane sealant.
 5. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
 6. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
 7. Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.
- D. Interior Wet Areas: restrooms and cafe; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.
- E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".
- F. Areas Where Tamper-Resistance is Required: As indicated on drawings.

2.03 JOINT SEALANTS - GENERAL

- A. Colors: As selected by Architect from manufacturer's full range.

2.04 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
 2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 4. Color: To be selected by Architect from manufacturer's standard range.
- B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.
 2. Manufacturers:
 - a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
 - b. Sika Corporation; Sikasil GP: www.usa-sika.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
- D. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .
1. Movement Capability: Plus and minus 35 percent, minimum.
- E. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's standard range.

2.05 SELF-LEVELING SEALANTS

- A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
- B. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Composition: Multi-component, 100 percent solids by weight.

2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
3. Color: Match adjacent finished surfaces.
4. Joint Width, Minimum: 1/8 inch (3 mm).

2.06 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
 1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
 2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
 3. Open Cell: 40 to 50 percent larger in diameter than joint width.
 4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.
- D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
 2. Notify Architect of date and time that tests will be performed, at least 7 days in advance.
 3. Record each test on Preinstallation Adhesion Test Log as indicated.
 4. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
 5. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where

specific dimensions are indicated.

- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.05 POST-OCCUPANCY

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

END OF SECTION

SECTION 07 92 33
CONCRETE JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

- A. A single installer shall be responsible for providing complete water proofing system including all products specified in the following Sections:

1. Division 07 Section, "Traffic Coatings"
2. Division 07 Section, "Water Repellents"
3. Division 07 Section, "Joint Sealants"
4. Division 07 Section, "Expansion Joint Assemblies"

- B. This Section includes the following:

1. Exterior joints in the following horizontal traffic bearing surfaces:
 - a. Construction joints in cast-in-place concrete.
 - b. Control joints in slab-on-grade, slabs and topping slabs.
 - c. Perimeter of all floor drains.
 - d. Perimeter of floor penetrations identified on the Drawings.
 - e. Other joints as indicated on the Drawings.
2. Exterior joints in the following vertical and horizontal non-traffic surfaces:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between precast concrete units.
 - c. Cove joints at intersection of horizontal and vertical concrete.
 - d. Exterior horizontal joints between precast and cast-in-place concrete. Color to match precast concrete.
 - e. Vertical and horizontal joints between precast beams and columns at tiers exposed directly to weather.
 - f. Other joints as indicated on the Drawings.

- C. Related Sections: Following Sections contain requirements that relate to this Section.

1. Division 03 Section, "Cast-in-Place Concrete."
2. Division 03 Section, "Plant-Precast Structural Concrete."
3. Division 07 Section, "Firestopping."
4. Division 07 Section, "Traffic Coatings."
5. Division 07 Section, "Water Repellents."
6. Division 07 Section, "Expansion Joint Assemblies."
7. Division 09 Section, "Pavement Markings."

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Materials shall be compatible with materials or related Work with which they come into contact, and with materials covered by this Section.
 - 2. Distribute reviewed submittals to all others whose Work is related.
 - 3. Coordinate layout of joint system and approve methods for providing joints with precast concrete and concrete contractors.
 - 4. Inspect site before precast production to insure proper joint configuration.

- B. Submittals and Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions.

1.4 ACTION SUBMITTALS

- A. Product Data: For each system indicated at least 30 days prior to application.
 - 1. Product description, technical data, appropriate applications and limitations.
 - 2. Primer type and application rate

- B. Samples:
 - 1. One for each system indicated.

- C. Sample Warranty: For each system indicated.

1.5 INFORMATION SUBMITTALS

- A. Certificates:
 - 1. Evidence of installer's being certified by manufacturer. Evidence shall include complete copy of manufacturer's licensing/certification document, spelling out repair responsibility for warranty claims.
 - 2. Certification from the Manufacturer that joint details as specified are acceptable for system to be installed at least 1 month before placement of any concrete which will receive joint sealant.

- B. Field Quality Control:
 - 1. Two copies each of manufacturer's technical representative's log for each visit.
 - 2. Testing agency field and test reports.

- C. Qualification Statements:
 - 1. Manufacturer's qualifications as defined in the "Quality Assurance" article.
 - 2. Installer's qualifications as defined in the "Quality Assurance" article.
 - 3. Signed statement from this Section applicator certifying that applicator has read, understood, and shall comply with all requirements of this Section.

1.6 CLOSEOUT SUBMITTALS

- A. Final executed Warranty.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Owner retains right to reject any manufacturer.
 - 1. Evidence of acceptable previous work on WALKER-designed projects. If none, so state.
 - 2. Evidence of financial stability acceptable to Engineer/Architect.
 - 3. Listing of 20 or more projects completed with submitted sealant, to include:
 - a. Name and location of project.
 - b. Type of sealant applied.
 - c. On-Site contact with phone number.
- B. Manufacturer's technical representative, acceptable to Engineer/Architect, shall be on site during surface preparation and initial stages of installation.
- C. Installer's Qualifications: Owner retains right to reject any installer or subcontractor.
 - 1. Installer shall be legally licensed to perform work in the state of Texas. Evidence of compliance with Summary article paragraph "A single installer. . ."
 - 2. Evidence that installer has successfully performed or has qualified staff who have successfully performed at least 5 verifiable years of installations similar to those involved in this Contract, and minimum 10 projects with submitted sealant.
 - 3. Listing of 5 or more installations in climate and size similar to this Project performed by installer's superintendent.
- D. Testing Agency: Independent testing laboratory employed by Owner and acceptable to Engineer/Architect.
- E. Certifications:
 - 1. Licensing/certification document from system manufacturer that confirms sealant installer is a licensed/certified applicator for the manufacturer and is legally licensed to perform work in the state of Texas.
 - 2. Licensing/certification agreement shall include following information:
 - a. Applicator's financial responsibility for warranty burden under agreement terms.
 - b. Manufacturer's financial responsibility for warranty burden under agreement terms.
 - c. Process for dispute settlement between manufacturer and applicator in case of system failures where cause is not evident or cannot be assigned.
 - d. Authorized signatures for both Applicator Company and Manufacturer.
 - e. Commencement date of agreement and expiration date (if applicable).

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials to site in original, unopened containers, bearing following information:
 - 1. Name of product.
 - 2. Name of manufacturer.
 - 3. Date of preparation.

4. Lot or batch number.
- B. Store materials under cover and protect from weather. Replace packages or materials showing any signs of damage with new material at no additional cost to Owner.

1.9 FIELD CONDITIONS

- A. Weather and Substrate Conditions: Proceed with work only when existing and forecast weather and temperature of concrete substrate will permit work in accordance with manufacturer's recommendations.

1.10 WARRANTY

- A. Manufacturer: Furnish Owner with written total responsibility Joint and Several Warranty, detailing responsibilities of manufacturer and installer with regard to warranty requirements (Joint and Several). The warranty shall provide that sealant will be free of defects, water penetration and chemical damage related to system design, workmanship or material deficiency, consisting of:
 1. Any adhesive or cohesive failures.
 2. Weathering.
 3. Abrasion or tear failure resulting from normal traffic use.
- B. If material surface shows any of defects listed above, supply labor and material to repair all defective areas and to repaint all damaged line stripes.
- C. Warranty period shall be a 5 year Joint and Several Warranty commencing with date of acceptance of work.
- D. Perform any repair under this warranty at no cost to Owner.
- E. Address the following in the terms of the Warranty: length of warranty, change in value of warranty – if any- based on length of remaining warranty period, transferability of warranty, responsibilities of each party, notification procedures, dispute resolution procedures, and limitations of liability for direct and consequential damages.
- F. Vandalism and abnormally abrasive maintenance equipment are not normal traffic use and are exempted from warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of 1 of following, only where specifically named in product category:
 1. BASF Building Systems (BASF), Shakopee, MN.
 2. Dow Corning Corp. (Dow Corning), Midland, MI.
 3. Lyntal International Inc. (Lyntal), Lake Orion, MI.
 4. Pecora Corporation (Pecora), Harleysville, PA.
 5. Sika Corporation (Sika), North Canton, OH.

6. Tremco (Tremco), Cleveland, OH.

2.2 MATERIALS, JOINT SEALANT SYSTEM

- A. Provide complete system of compatible materials designed by manufacturer to produce waterproof, traffic-bearing control joints as detailed on Drawings.
- B. Compounds used for sealants shall not stain masonry or concrete. Aluminum pigmented compounds not acceptable.
- C. Color of sealants shall match adjacent surfaces.
- D. Closed cell or reticulated backer rods: Acceptable products:
 1. "Sof Rod," Nomaco Inc., 501 NMC Drive, Zebulon, NC 27597. (800) 345-7279 ext. 341.
 2. "ITP Soft Type Backer Rod," Industrial Thermo Polymers Limited, 2316 Delaware Ave., Suite 216, Buffalo, NY 14216. (800) 387-3847.
 3. "MasterSeal 921 Backer Rod," BASF.
- E. Bond breakers and fillers: as recommended by system manufacturer.
- F. Primers: as recommended by sealant manufacturer.
- G. Acceptable sealants are listed below. Sealants shall be compatible with all other materials in this Section and related work.
- H. Acceptable polyurethane control joint sealants (traffic bearing):
 1. MasterSeal SL-2 or MasterSeal SL-2 SG, BASF.
 2. Iso-flex 880 GB or Iso-flex 881, Lyntal.
 3. Dynatrol II-SG or Urexpan NR 200, Pecora.
 4. Sikaflex-2c SL or Sikaflex-2c NS TG, Sika.
 5. THC-900, THC-901, Vulkem 45SSL, Dymeric 240, Dymeric 240 FC or Dymonic 100, Tremco.
- I. Acceptable silicone control joint sealants (traffic bearing):
 1. Spectrem 800 or Spectrem 900SL, Tremco.
 2. 310-SL or 311-NS, Pecora.
 3. Dow Corning SL, FC or NS Parking Structure Sealant, Dow Corning.
- J. Acceptable polyurethane vertical and cove joints sealants (non-traffic bearing):
 1. Sikaflex-2c NS, Sika.
 2. MasterSeal NP-2, BASF.
 3. Dymeric 240/240FC, Dymonic 100 or THC 901 (cove only), Tremco.
 4. Dynatred, Pecora.
 5. Iso-flex 881, Lyntal.
- K. Acceptable silicone vertical and cove joint sealants (non-traffic bearing):
 1. Spectrem 1 or Spectrem 4-TS, Tremco.
 2. 311-NS, Pecora.
 3. Dow Corning NS Parking Structure Sealant, Dow Corning.

- L. Proposed Substitutions: None for this project. Contact Engineer/Architect for consideration for future projects.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive Work and report immediately in writing to Engineer/Architect any deficiencies in surface which render it unsuitable for proper execution of Work.
- B. Coordinate and verify that related Work meets following requirements before beginning installation
 - 1. Concrete surfaces are finished as acceptable for system to be installed.
 - 2. Curing compounds used on concrete surfaces are compatible with system to be installed.
 - 3. Concrete surfaces have completed proper curing period for system selected.

3.2 PREPARATION

- A. Seal all openings to occupied space to prevent cleaning materials, solvents and fumes from infiltration. All protective measures and/or ventilating systems required to prevent infiltration are incidental to this Work.
- B. Correct unsatisfactory conditions before installing sealant system.
- C. Acid etching is prohibited.
- D. Grind joint edges smooth and straight with beveled grinding wheel before sealing. All surfaces to receive sealant shall be dry and thoroughly cleaned of all loose particles, laitance, dirt, dust, oil, grease or other foreign matter. Obtain written approval of method from system manufacturer before beginning cleaning.
- E. Final preparation of joints shall be a sandblast with medium that removes dust and ground material from surfaces to receive sealant.
- F. Check preparation of substrate for adhesion of sealant.
- G. Prime and seal joints and protect as required until sealant is fully cured. A primer coat is required for all systems.

3.3 INSTALLATION/APPLICATION

- A. Do all Work in strict accordance with manufacturer's written instructions and specifications including, but not limited to, moisture content of substrate, atmospheric conditions (including relative humidity and temperature), thicknesses and texture, and as shown on Drawings.
- B. Completely fill joint without sagging or smearing onto adjacent surfaces.
- C. Self-Leveling Sealants: Fill horizontal joints slightly recessed to avoid direct contact with wheel traffic.

- D. Non-Sag Sealants: Tool joints concave: Wet tooling not permitted.
- E. Clean off excess material and material smears adjacent to joints as work progresses using methods and materials approved by manufacturers.
- F. Cease material installation under adverse weather conditions, or when temperatures are outside manufacturer's recommended limitations for installation, or when temperature of work area or substrate are below 40°F.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency:
 - 1. Check shore hardness per ASTM standard specified in sealant manufacturer's printed data.

END OF SECTION 079233

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

SECTION 07 95 00
EXPANSION JOINT ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. A single installer shall be responsible for providing complete water proofing system including all products specified in the following Sections:
 - 1. Division 07 Section, "Traffic Coatings"
 - 2. Division 07 Section, "Water Repellents"
 - 3. Division 07 Section, "Concrete Joint Sealants"
 - 4. Division 07 Section, "Expansion Joint Assemblies"
- B. This Section includes the following:
 - 1. Standard expansion joint systems:
 - a. Elastomeric concrete edged, extruded rubber joint system
 - b. Traffic Rated Traffic Joints as Scheduled in Contract Drawings
 - 2. Vertical expansion joint systems
- C. Related Sections: The following Sections contain requirements that relate to this section:
 - 1. Division 03 Section "Cast-in-Place Concrete".
 - 2. Division 03 Section "Precast Architectural Concrete".
 - 3. Division 03 Section "Unbonded Post-Tensioned Concrete".
 - 4. Division 07 Section "Concrete Joint Sealants" for liquid-applied joint sealants.
 - 5. Division 09 Section "Pavement Markings".

1.3 DEFINITIONS

- A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage (plus or minus) of nominal value of joint width. Movement capability is to include anticipated movements from concrete shrinkage, concrete shortening and creep from post-tensioning or prestressing, cyclic thermal movements, and seismic movements.

- D. Nominal Joint Width: Width of linear opening specified in practice and in which joint system is installed.
- E. Nominal Form Width: Linear gap in joint system at time of forming or erection of structural elements bounding the expansion joint.
- F. Service Load Level: Defined level of load under which joint assembly remains elastic and fully functional.
- G. Fatigue Load Level: Defined level of load under which joint assembly remains elastic and fully functional, including all noise mitigation components, for the stated number of cycles.
- H. Collapse Load Level: Defined level of load under which joint assembly remains capable of bridging the gap, although plates may yield and components may break.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. General:

- a. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.
- b. Coordinate requirements for transitions, tolerances, levelness, and plumbness to ensure the installed expansion joint system can perform with expected movement capabilities.
- c. Coordinate and assign responsibility for preparation of concrete surfaces adjacent to expansion joints.
- d. Expansion joint surface areas each side of joint gap shall have a vertical differential less than $\frac{1}{4}$ " and meet requirements of expansion joint manufacturer.
- e. Minor surface defects shall be repaired according to manufacturer's recommendations. Repair materials shall be compatible with intended system materials and shall be approved by the Engineer prior to surface preparation and installation.
- f. Submit for approval repair products and procedures for all major defects. Repair description shall indicate materials, manufacturer's requirements, expected service life, and maintenance requirements. Take all precautions necessary to avoid damaging adjacent surfaces and embedded reinforcement. Contractor is responsible for any damages. Concrete repairs shall be of rectangular configuration, with no feather-edged surfaces. Final surface preparation of all repairs shall be sandblasting, or approved equivalent.
- g. Coordinate layout of joint system and approval of methods for providing joints.

2. Blockouts:

- a. Float expansion joint blockouts to remove all air pockets, voids and spalls caused by form work.
- b. Blockouts shall be plumb with maximum tolerance per Manufacturer or not more than 0.125 inches deviation in 12 inches. Noncompliant blockouts shall be considered major defects.
- c. Blockouts shall be straight and true with maximum tolerance per Manufacturer or not more than 0.250 inches deviation in 10 lineal feet. Noncompliant blockouts shall be considered major defects.

- B. Preinstallation Meetings: Meet at project site well in advance of time scheduled for Work to proceed to review requirements for Work and conditions that could interfere with successful expansion joint system performance. Require every party concerned with concrete formwork, blockout, concrete placement, or others required to coordinate or protect the Work thereafter, to attend. Include Engineer of Record and manufacturer's technical representative and warranty officer.
- C. Submittals and Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated:
 - 1. Construction details, material descriptions, dimensions, and finishes.
 - 2. Proposed method of preparation of concrete surface to receive expansion joint systems.
 - 3. Proposed method and details for treatment of cracks, bugholes, or other potential concrete surface defects in areas to receive expansion joint systems.
 - 4. Horizontal spacing between embedded metals and plates to allow for volume change due to thermal conditions.
 - 5. Temperature adjustment table showing formed gap at the time of concrete placement calculated at 10°F increments and a calculation showing joint system is capable of movement within the design temperature range.
- B. Shop Drawings: For each type of product indicated:
 - 1. Placement Drawings: Show project conditions including, but not limited to, line diagrams showing plans, elevations, sections, details, splices, blockout requirement, and terminations. Provide isometric or clearly detailed drawings depicting how components interconnect. Include reviewed and approved details from others whose work is related. Other information required to define joint placement or installation.
 - 2. Joint System Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - a. Manufacturer and model number for each joint system.
 - b. Joint system location cross-referenced to Drawings.
 - c. Form width.
 - d. Nominal joint width.
 - e. Movement capability.
 - f. Minimum and maximum joint width.
 - g. Materials, colors, and finishes.
 - h. Product options.
 - 3. Components and systems required to be designed by a professional engineer, shall bear such professional's written approval when submitted.
- C. Samples:
 - 1. Samples for each type of joint system indicated.
 - a. Submit 2 samples for each type. Full width by 6 inches (150 mm) long, for each system required.

D. Test and Evaluation Reports:

1. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for current products.

1.6 INFORMATIONAL SUBMITTALS

A. Certificates

1. Certification that products and installation comply with applicable federal, state of Texas, and local EPA, OSHA and VOC requirements regarding health and safety hazards.
2. ADA Certification: Prior to installation, submit written certification from manufacturer indicating that expansion joints conform to Americans with Disabilities Accessibility Guidelines for Buildings and Facilities, as published by U.S. Architectural & Transportation Barriers Compliance Board, 1331 F Street, N.W., Suite 1000, Washington, DC 20004-1111. 1-800-872-2253 and the Texas Accessibility Standards.
 - a. Submit test reports from accredited laboratory attesting to joint systems' movement capability and ADA compliance.
 - b. Static coefficient of friction shall meet minimum requirements of Americans with Disabilities Act (ADA).
3. Signed statement from installer/applicator certifying that installer/applicator has read, understood, and shall comply with all requirements of this Section.
4. Signed statement from manufacturer's representative that they have read, understood, and shall comply with all requirements of this section.

B. Field Quality Control

1. Two copies each of manufacturer's technical representative's log for each visit.

C. Qualification Statements

1. Manufacturer's qualifications as defined in the "Quality Assurance" article within 60 days of project award.
2. Installer's qualifications as defined in the "Quality Assurance" article.
3. Evidence of manufacturer's certification of installer/applicator. Evidence shall include complete copy of manufacturer's licensing/certification document, spelling out repair responsibility for warranty claims.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Contracts: 2 copies of Maintenance Program contracts.

B. Operation and Maintenance Data

1. Maintenance Manual: 3 copies of System Maintenance Manual.

C. Warranty Documentation: 2 executed copies of Labor and Material Warranty including all terms, conditions and maintenance requirements.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Owner retains right to reject any manufacturer.
 - 1. Evidence of compliance with Experience Record and Qualifications paragraph below.
 - 2. Evidence of acceptable previous work on WALKER-designed projects. If none, so state.
 - 3. Copy of sample warranty that meets the requirements of the "Warranty" article in Section 1.
 - 4. Evidence of financial stability acceptable to Owner or Engineer/Architect.
 - 5. Evidence of compliance with "Single Installer" requirement.

- B. Experience Record and Qualifications: Verification of systems shall be established by either System Validation.
 - 1. System Validation: Submitted system for similar applications with minimum five (5) years experience and five (5) verified projects completed. Validation submittal shall include:
 - a. Field history as defined below.
 - 2. Acceptable field history consists of successful performance of five (5) installations in place over the previous five (5) years under similar project loads, traffic frequency, footprints, and joint sizes. Include sketches, photos, and references for each installation. Installations shall have experienced at least moderate levels of traffic.

- C. Installer Qualifications: An employer of workers, including superintendent for this project, trained and approved by manufacturer.

- D. Testing Agency: Independent testing laboratory employed by Owner and acceptable to Engineer/Architect.

- E. Certifications
 - 1. Materials shall be compatible with materials or related Work with which they come into contact and the related materials sections.
 - 2. Manufacturer/Applicator: Review and approve all details before construction. Confirm in writing to Owner.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials to site in original, unopened containers, bearing following information:
 - 1. Name of product.
 - 2. Name of manufacturer.
 - 3. Date of preparation.
 - 4. Lot or batch number.

- B. Store materials under cover and protect from weather. Replace packages or materials showing any signs of damage with new material at no additional cost to Owner.

1.10 WARRANTY

- A. Warranty period shall be a 5 year labor and materials warranty commencing with date of acceptance of work.
- B. Installation Requirements: Include a written plan of construction and coordination requirements, to allow joint system installation to proceed with specified warranty, that specifically addresses the following:
 - 1. Block out acceptance criteria.
 - 2. Surface preparation acceptance criteria.
 - 3. Crack, surface defect, and detailing recommendations.
 - 4. Method of protection of surrounding surfaces.
 - 5. Method of expansion joint system installation description.
 - 6. Primer type and application rate.
 - 7. Method of preparation of all glands and reinforced membranes.
 - 8. Temperature, humidity and other weather constraints. Specify substrate moisture testing criteria, if any.
 - 9. Final cure time before removal of protection, resumption of traffic, and/or paint striping.
 - 10. Any other special instructions required to ensure proper installation.
- C. Quality Service Requirements: Show evidence of licensed/approved installer. List of names, addresses and phone numbers, with copies of certification/approval agreement with each, satisfies requirement. Licensing/certification agreement shall include following information:
 - 1. Installer's financial responsibility for warranty burden under agreement terms.
 - 2. Manufacturer's financial responsibility for warranty burden under agreement terms.
 - 3. Process for dispute settlement between manufacturer and installer in case of system failures where cause is not evident or cannot be assigned.
 - 4. Authorized signatures for both Installer Company and Manufacturer.
 - 5. Commencement date of agreement and expiration date (if applicable).
 - 6. Provide copy of contractor's field application quality control procedures.
- D. Warranty shall be jointly executed by Manufacturer and Installer for labor and materials. Detail responsibilities of General Contractor, manufacturer and installer with regard to warranty requirements, as outlined in the Manufacturer's warranty and related Licensing/Certification documents. Warranty shall provide that system shall be free of defects, water penetration and chemical damage related to system design, workmanship or material deficiency, consisting of:
 - 1. Any water leakage through expansion joint system or leaking conditions of reinforced membrane, other waterproofing components, or glands.
 - 2. Any adhesive or cohesive failures of the system.
 - 3. Loose anchor blocks or bolts.
 - 4. Tears, weathering, or degradation in gland from normal use.
 - 5. Expansion joint glands are considered defective if they buckle upwards beyond the level of the floor surface after installation or downward in excess of ½ inch below the floor surface.
- E. If expansion joint systems or components show any of defects listed above, supply labor and material to repair all defects at no cost to Owner.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. A single Installer shall be responsible for providing complete expansion joint system. Obtain all joint systems through one source from a single manufacturer.
- B. Drawings indicate size, profiles, and dimensional requirements of joint systems and are schematic for systems indicated.
- C. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

2.2 PERFORMANCE REQUIREMENTS

- A. Intent of this section is to insure that installed expansion joints allow pedestrian and vehicular traffic to pass in a smooth, quiet fashion with minimal maintenance required over a period of not less than 10 years. Expansion joints shall not only function as structural bridging elements, but must also accommodate structural expansions/contractions and minimize water leakage.
- B. Expansion joint systems shall be capable of resisting a differential vertical movement of ½ inch.
- C. Materials shall be supplied in lengths to minimize or eliminate the need to splice waterproofing components.
 - 1. Waterproofing materials directly exposed to vehicular traffic shall be supplied with no joints in vehicle drive aisles.
 - 2. All mitered splices shall be performed at the factory and provide sufficient gland length for butt splicing with field splicing equipment.
 - 3. All Santoprene butt to butt splices shall be heat welded.
 - 4. Butt to butt splices with other materials shall be per manufacturer's recommendations.
- D. Walking Surfaces: Expansion joint assemblies at walking areas subject to pedestrian traffic shall provide a smooth, slip resistant walking surface for pedestrians with these minimum requirements:
 - 1. Shall provide walking surfaces in accordance with ASTM – F 1637 Standard Practice for Safe Walking Surfaces.
 - 2. Shall be designed to comply with “Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)” and the Texas Accessibility Standards. Americans with Disabilities Accessibility Guidelines for Buildings and Facilities, as published by U.S. Architectural & Transportation Barriers Compliance Board, 1331 F Street, N.W., Suite 1000, Washington, DC 20004-1111. 1–800-872-2253.
 - 3. Adjoining walkway surfaces shall be flush and meet the following minimum requirements:
 - a. Changes in level of less than ¼ inch in height may be without edge treatment as shown in ADA Figure 303.2.
 - b. Changes in Level between ¼ inch and ½ inch in height shall be beveled with a slope no greater than 1:2 as shown in ADA Figure 303.3.
 - c. Changes in level greater than ½ inch in height are not permitted unless they can be transitioned by means of a ramp.
 - d. Openings in floor or ground surfaces shall not allow passage of a sphere more than ½ inch diameter except as allowed for elevators and platform lifts as shown in ADA Figure 302.3.

2.3 MANUFACTURERS

- A. Subject to compliance with requirements, provide products from one of following manufacturers (listed in alphabetical order), only where specifically named in product categories:
1. Balco Inc., Wichita, KS (Balco).
 2. Construction Specialties, Inc., Muncy, PA (C/S).
 3. Emseal Joint Systems, Westborough, MA (Emseal).
 4. Erie Metal Specialties, Inc., Akron, NY (EMS).
 5. Lymtal International Inc. Lake Orion, MI (Lymtal).
 6. MM Systems Corporation, Atlanta, GA (MM).
 7. Tremco, Cleveland, OH (Tremco).
 8. Watson Bowman Acme Corporation, a Division of BASF Construction Chemicals NA, Amherst, NY (WBA).

NOTE: No substitutions will be accepted for traffic rated joints subject to vehicle traffic. Refer to products noted in project plans.

2.4 PRODUCTS, STANDARD EXPANSION JOINT SYSTEMS

- A. Elastomeric concrete edged, extruded rubber expansion joint system.
1. DuraFlex Chambered Wing Seal CS and DCS Series, Balco.
 2. Iso-Flex Winged Joint System J Series, LymTal.
 3. Lokcrete Membrane System (LMS) Series, MM.
 4. Polycrete/Membrane System, Type CR Series, EMS.
 5. Thermaflex Membrane/Nosing System, Type TM and TCR Series, Emseal.
 6. Vulkem WF series Vehicular Expansion Joint System, Tremco.
 7. Wabo®Crete Membrane System ME Series, WBA.
 8. ZB 200/400 Series, C/S.
- B. Substitutions: None for this project. Contact Engineer/Architect for consideration for future projects.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and blockouts where expansion joint systems will be installed for installation tolerances and other conditions affecting performance of Work.
- B. Check elevations on each side of expansion joint gap to ensure flush slab-to-slab transition.
- C. Coordinate and verify that related Work meets following requirements:
1. Check adhesion to substrates and recommend appropriate preparatory measures.
 2. Curing compounds used on concrete surfaces are compatible with Work to be installed.
 3. Concrete surfaces have completed proper curing period for system selected.
 4. Coordinate expansion joint system with other related Work before installation of expansion joint.
 5. Verify expansion joints are compatible with Joint Sealants and traffic toppings.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

- E. Cease installation if expansion joint blockouts and/or openings exhibit cracked edges, voids or spalls. Repair with approved material prior to installation of expansion joint.
- F. Correct unsatisfactory conditions in manner acceptable to Manufacturer and Engineer before installing joint system.

3.2 PREPARATION

- A. Prepare for installation of expansion joint systems in accordance with manufacturer's recommendations
- B. Surface Preparation:
 - 1. Acid etching: Prohibited.
 - 2. Prepare substrates according to joint system manufacturer's written instructions.
 - 3. Clean joints thoroughly in accordance with manufacturer's instructions to remove all laitance, unsound concrete and curing compounds which may interfere with adhesion.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing joint assemblies and materials unless more stringent requirements are indicated.
- B. Proceed with work only when existing and forecast weather and temperature of concrete substrate will permit work in accordance with manufacturer's recommendations.
- C. Cease material installation under adverse weather conditions, or when temperatures are outside manufacturers recommended limitations for installation, or when temperature of work area or substrate are below 40°F.
- D. During months when historic mean daily temperature at Project is more than 19° F. colder than annual mean daily temperature, premolded sealant shall be installed on temporary basis to prevent hot weather buckling. Provide permanent installation during acceptable weather conditions.
- E. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.
- F. Seal all openings to occupied spaces to prevent cleaning materials, solvents and fumes from infiltration. All protective measures and/or ventilating systems required to prevent infiltration are incidental to this Work.
- G. Clean off excess material and material smears adjacent to joints as work progresses using methods and materials approved by manufacturer.

3.4 FIELD QUALITY CONTROL

- A. Field Tests and Inspections: Prior to opening to traffic, test joint seal for leaks by maintaining continuously wet for 12 hours. Repair leaks revealed by examination of seal underside. Repeat test and repairs until all leaks stopped for full 12 hours.

- B. Manufacturer Services: Provide qualified manufacturer's technical representative for periodic inspection of Work at critical time of the installation, including but not limited to pre-concrete formwork and placement site meetings, block out inspection, surface defect repair, surface preparation, expansion gland installation and waterproofing system installation.

3.5 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed surfaces to comply with manufacturer's written instructions.
- B. Protect installation from damage by work of other Sections. Where necessary due to heavy construction traffic, install temporary protection over joints.

END OF SECTION 079500

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

**SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.
- B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2018.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2020.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- H. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- I. ITS (DIR) - Directory of Listed Products current edition.
- J. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2007.
- K. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.
- L. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
- M. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.
- N. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2013.
- O. UL (DIR) - Online Certifications Directory Current Edition.
- P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company; [____]: www.assaabloydss.com/#sle.
 - 2. Curries, an Assa Abloy Group company; [____]: www.assaabloydss.com/#sle.
 - 3. Mesker, dormakaba Group; FDJ Series Drywall Frames:
www.meskeropeningsgroup.com/#sle.
 - 4. Republic Doors, an Allegion brand; [____]: www.republicdoor.com/#sle.
 - 5. Steelcraft, an Allegion brand; [____]: www.allegion.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Exterior Doors: Thermally insulated.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - 3. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
 - 4. Weatherstripping: Refer to Section 08 71 00.
- C. Interior Doors, Non-Fire-Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.

- d. Door Face Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.
- e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
- D. Fire-Rated Doors:
 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - a. Attach fire rating label to each fire rated unit.
 4. Door Thickness: 1-3/4 inch (44.5 mm), nominal.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Full profile/continuously welded type.
 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvanized) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 2. Frame Metal Thickness: 14 gage, 0.067 inch (1.7 mm), minimum.
 3. Frame Finish: Factory primed and field finished.
 4. Weatherstripping: Separate, see Section 08 71 00.
- C. Interior Door Frames, Non-Fire Rated: Knock-down type.
 1. Frame Metal Thickness: 14 gage, 0.067 inch (1.7 mm), minimum.
 2. Frame Finish: Factory primed and field finished.
- D. Door Frames, Fire-Rated: Face welded type.
 1. Fire Rating: Same as door, labeled.
 2. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch (150 mm), maximum, above floor at 45 degree angle.
 3. Frame Metal Thickness: 14 gage, 0.067 inch (1.7 mm), minimum.
 4. Frame Finish: Factory primed and field finished.
- E. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch (102 mm) high to fill opening without cutting masonry units.
- F. Frames Wider than 48 inches (1219 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

2.06 ACCESSORIES

- A. Louvers: Roll formed steel with overlapping frame; finish same as door components ; factory-installed.
 1. In Fire-Rated Doors: UL (DIR) or ITS (DIR) listed fusible link louver, same rating as door.
- B. Glazing: As specified in Section 08 80 00, factory installed.
- C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.
- B. Coat inside of other frames with bituminous coating to a thickness of 1/16 inch (1.6 mm).

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install prefinished frames after painting and wall finishes are complete.
- C. Install fire rated units in accordance with NFPA 80.
- D. Coordinate frame anchor placement with wall construction.
- E. Install door hardware as specified in Section 08 71 00.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

**SECTION 08 11 16
ALUMINUM DOORS AND FRAMES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum frames.

1.02 REFERENCE STANDARDS

- A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's descriptive literature for each type of door; include information on fabrication methods.
- C. Selection Samples: Complete set of color and finish options, using actual materials, for Architect's selection.
- D. Verification Samples: Actual pieces of products in each finish specified, not less than 6 inches (150 mm) square or 6 inches (150 mm) long for linear components. For finishes subject to color variation, include not less than two samples illustrating extreme range to be anticipated.
- E. Test Report: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum components in manufacturer's standard protective packaging, palletted, crated, or banded together.
- B. Inspect delivered components for damage and replace. Repaired components will not be accepted.
- C. Store components in clean, dry, indoor area, under cover in manufacturer's packaging until installation.
- D. Protect materials and finish from damage during handling and installation.

1.06 FIELD CONDITIONS

- A. Do not begin installation of interior aluminum components until space has been enclosed and ambient thermal conditions are being maintained at levels consistent with final project requirements.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Aluminum Frames:
 - 1. Cline Aluminum Doors, Inc; [____]: www.clinedoors.com/#sle.
 - 2. Wilson Partitions; [____]: www.wilsonpart.com/#sle.

3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS AND FRAMES

- A. Aluminum Frames for Doors, Sidelights, or Transoms: Extruded aluminum, non-thermally broken hollow or C-shaped sections; no steel components.
 1. Frame Depth: To fit wall thicknesses as indicated on drawings.
 2. Finish: To match aluminum storefront mullions.
- B. Dimensions and Shapes: As indicated on drawings; dimensions indicated are nominal.
 1. Provide the following clearances:
 - a. Hinge and Lock Stiles: 1/8 inch (3.2 mm).
 - b. Between Meeting Stiles: 1/4 inch (6.4 mm).
 - c. At Top Rail and Bottom Rail: 1/8 inch (3.2 mm).

2.03 COMPONENTS

- A. Frames: Extruded aluminum shapes, not less than 0.062 inch (1.6 mm) thick, reinforced at hinge and strike locations.
 1. Corner Brackets: Extruded aluminum, fastened with stainless steel screws.
 2. Trim: Extruded aluminum, not less than 0.062 inch (1.6 mm) thick, removable snap-in type without exposed fasteners.

2.04 FINISHES

- A. Class I Natural Anodized Finish: Clear anodic coating; AAMA 611 AA-M12C22A41, minimum dry film thickness (DFT) of 0.7 mils, 0.0007 inch (0.018 mm).
- B. Color: To match aluminum storefront mullions.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall surfaces and openings are ready to receive frames and are within tolerances specified in manufacturer's instructions.
- B. Verify that frames installed by other trades for installation of doors of this section are in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions.

3.02 PREPARATION

- A. Perform cutting, fitting, forming, drilling, and grinding of frames as required for project conditions.
- B. Replace components with damage to exposed finishes.
- C. Separate dissimilar metals to prevent electrolytic action between metals.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and approved shop drawings.
- B. Set frames plumb, square, level, and aligned to receive doors. Anchor frames to adjacent construction in strict accordance with manufacturer's recommendations and within specified tolerances.
- C. Where aluminum surfaces contact metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact by painting dissimilar metal with heavy coating of bituminous paint.
- D. Hang doors and adjust hardware to achieve specified clearances and proper door operation.

3.04 CLEANING

- A. Upon completion of installation, thoroughly clean door and frame surfaces in accordance with AAMA 609 & 610.
- B. Do not use abrasive, caustic, or acid cleaning agents.

3.05 PROTECTION

- A. Protect products of this section from damage caused by subsequent construction until Date of Substantial Completion.
- B. Replace damaged or defective components that cannot be repaired to a condition indistinguishable from undamaged components.

END OF SECTION

**SECTION 08 14 16
FLUSH WOOD DOORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. High Pressure Decorative Laminate (HPDL) Faced Doors

1.02 RELATED REQUIREMENTS

- A. Section 08 11 13 - Hollow Metal Doors and Frames.
- B. Section 08 71 00 - Door Hardware.
- C. Section 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

- A. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- B. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights 2019c.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0 2021, with Errata.
- E. NEMA LD 3 - High-Pressure Decorative Laminates 2005.
- F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
- G. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.
- H. WDMA I.S. 1A - Interior Architectural Wood Flush Doors 2013.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D. Samples: Submit two samples of door construction, 12 by 12 inch (____ by ____ mm) in size cut from top corner of door.
- E. Samples: Submit two samples of door veneer, 8 by 10 inch (____ by ____ mm) in size illustrating wood grain, stain color, and sheen.
- F. Manufacturer's Installation Instructions: Indicate special installation instructions.
- G. Specimen warranty.
- H. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges

with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. High Pressure Decorative Laminate (HPDL) Faced Doors:
 - 1. Ampco Products, Inc; []: www.ampco.com/#sle.
 - 2. Poncraft Door Co; []: www.poncraft.com/#sle.
 - 3. VT Industries, Inc; []: www.vtindustries.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS

- A. Doors: Refer to drawings for locations and additional requirements.
 - 1. Quality Standard: Premium Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
 - 2. High Pressure Decorative Laminate (HPDL) Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. High pressure decorative laminate (HPDL) finish as indicated on drawings.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

2.04 DOOR FACINGS

- A. High Pressure Decorative Laminate (HPDL) Facing for Fire Doors: NEMA LD 3, SGF; [] color; textured, low gloss finish.
- B. High Pressure Decorative Laminate (HPDL) Facing for Non-Fire-Rated Doors: NEMA LD 3, HGS; [] color; textured, low gloss finish.
- C. Facing Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
 - 1. Provide solid blocks at lock edge for hardware reinforcement.
 - 2. Provide solid blocking for other throughbolted hardware.
- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- E. Provide edge clearances in accordance with the quality standard specified.

2.06 FACTORY FINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
- B. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
 - 1. Transparent:
 - a. System - TR-6, Catalyzed Polyurethane.
 - b. Stain: As selected by Architect.
 - c. Sheen: Flat.
- C. Factory finish doors in accordance with approved sample.
- D. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

- A. Hollow Metal Door Frames: As specified in Section 08 11 13.
- B. Glazed Openings:
 - 1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
 - 2. Glazing: Single vision units, 1/4 inch (6.4 mm) thick glass.
 - 3. Tint: Clear.
- C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
- D. Door Hardware: As specified in Section 08 71 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 - 1. Install exterior doors in accordance with ASTM E2112.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

**SECTION 08 31 00
ACCESS DOORS AND PANELS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall and ceiling mounted access units.

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- D. Manufacturer's Installation Instructions: Indicate installation requirements.
- E. Project Record Documents: Record actual locations of each access unit.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units with Return Air Grille:
 - 1. Panel Material: Aluminum extrusions with gypsum board inlay.
 - 2. Size: As indicated on drawings.
 - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
- B. Wall-Mounted Units in Wet Areas:
 - 1. Panel Material: Stainless steel.
 - 2. Size: As indicated on drawings.
 - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
- C. Ceiling-Mounted Units with Return Air Grille:
 - 1. Panel Material: Aluminum extrusion with gypsum board inlay.
 - 2. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
 - 3. Size - Other Ceilings: As indicated on drawings.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL AND CEILING MOUNTED ACCESS UNITS

- A. Manufacturers:
 - 1. ACUDOR Products Inc: www.acudor.com/#sle.
 - 2. Bauco Access Panel Solutions Inc: www.accesspanelsolutions.com/#sle.
 - 3. Cendrex, Inc: www.cendrex.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 WALL AND CEILING MOUNTED ACCESS UNITS WITH RETURN AIR GRILLES

- A. Gypsum Board Inlay Access Panels: Provide rectangular and square access panel with recessed and gasketed aluminum perimeter frame that acts as finishing edge and having concealed mechanical touch-latch with safety cable and free-pivoting hinge.
 - 1. Rectangular Panel Frame Size: 24 by 36 inch (610 by 914 mm) set within 1/2 inch (12.7 mm) thick gypsum board.
 - 2. Square Panel Frame Size: 24 by 24 inch (610 by 610 mm) set within 1/2 inch (12.7 mm) thick gypsum board.
 - 3. Panel Frame: 1 inch (25.4 mm) margin with concealed countersunk screw mounting.
- B. Air Return Grille: Linear bar grille fitted with flush and concealed perimeter frame.

1. Grille: Fixed grilles with 1/4 inch (6.4 mm) thick by 5/8 inch (15.9 mm) deep bars at 1/2 inch (12.7 mm) on center providing 48 percent free space opening.
2. Grille Size: 12 by 12 inch (12.7 by 12.7 mm) set within 1/2 inch (12.7 mm) thick gypsum board.
3. Fabrication: Aluminum with factory powder coated finish.
4. Grille Frame: 1 inch (25.4 mm) margin with concealed countersunk screw mounting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

**SECTION 08 33 23
OVERHEAD COILING DOORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior coiling doors.
- B. Interior non-fire-rated coiling doors.
- C. Electric operators and control stations.
- D. Wiring from electric circuit disconnect to operators and control stations.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
- F. ITS (DIR) - Directory of Listed Products current edition.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- H. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts 2000, with Errata (2008).
- I. NEMA MG 1 - Motors and Generators 2018.
- J. UL (DIR) - Online Certifications Directory Current Edition.
- K. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.04 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Overhead Coiling Doors:
 - 1. Overhead Door; www.overheaddoor.com
 - 2. ASI Doors; www.asidoors.com
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COILING DOORS

- A. Exterior Coiling Doors Type OH1: Aluminum slat curtain.
 - 1. Capable of withstanding positive and negative wind loads of 20 psf (940 Pa) without undue deflection or damage to components.
 - 2. Basis of Design: ASI Doors; MODEL 109-LP
 - 3. Sandwich slat construction with insulated core of foamed-in-place polyurethane insulation; minimum R-value of 8.1 (RSI-value of 1.43).
 - a. Vision Lites: Dual pane glazed.
 - 1) Size: As indicated in drawings.
 - 2) Spacing: Manufacturer's standard for door width.
 - 3) Location on Door Curtain: As indicated on drawings.

4. Finish: Anodized, color as selected.
5. Electric operation.
- B. Interior Non-Fire-Rated Coiling Doors Type []: Steel slat curtain.
 1. Single Thickness Slats: Manufacturer's standard.
 2. Basis of Design: Overhaddoor.com; Upward Coiling Security Grilles 671
 3. Finish: Stainless Steel.
 4. Guides, Angles: Stainless steel.
 5. Electric operation.
 6. Mounting: Within framed opening.

2.03 MATERIALS AND COMPONENTS

- A. Metal Curtain Construction: Interlocking slats.
 1. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
 2. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
 3. Steel Slats: Minimum thickness, [] gauge, [] inch ([] mm); ASTM A653/A653M galvanized steel sheet.
 4. Single Wall Aluminum Slats: Minimum thickness; manufacturer's standard for door size and application, made from ASTM B221 (ASTM B221M), aluminum alloy Type 6063.
- B. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
- C. Guides - Angle: ASTM A36/A36M metal angles, size as indicated.
 1. Stainless Steel: ASTM A 666, Type 304, rollable temper.

2.04 ELECTRIC OPERATION

- A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
 1. Provide interlock switches on motor operated units.
- B. Electric Operators:
 1. Mounting: Side mounted.
 2. Motor Enclosure:
 - a. Exterior Coiling Doors: NEMA MG 1, Type 4; open drip proof.
 - b. Interior Coiling Doors: NEMA MG 1, Type 1; open drip proof.
 3. Motor Rating: 1/3 HP (250 W); continuous duty.
 4. Motor Voltage: 120 volts, single phase, 60 Hz.
 5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
 6. Controller Enclosure: NEMA 250, Type 4.
 7. Brake: Manufacturer's standard type, activated by motor controller.
 8. Manual override in case of power failure.
 9. See Section 26 05 83 for electrical connections.
- C. Control Station: Provide standard three button, 'Open-Close-Stop' momentary-contact control device for each operator complying with UL 325.
 1. 24 volt circuit.
 2. Surface mounted, at interior door jamb.
 3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
 - a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
- D. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Section 26 05 83.
- F. Complete wiring from disconnect to unit components.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch (1.6 mm).
- C. Maximum Variation From Level: 1/16 inch (1.6 mm).
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet (3.2 mm per 3 m) straight edge.

3.04 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION

**SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.
- D. Door hardware.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.
- B. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site 2015.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.
- C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections 2009.
- D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.
- E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
- J. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).
- K. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014 (Reapproved 2021).
- L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit two samples [2 x 4] inches ([_____] mm) in size illustrating finished aluminum surface, glass, infill panels, glazing materials.

- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

- A. Center-Set Style, Thermally-Broken, Exterior Storefront:
 - 1. Manufacturers:
 - a. Kawneer North America;[Trifab® 451T Framing System]: www.kawneer.com/#sle.
 - b. Oldcastle BuildingEnvelope;[Series 3000 Thermal MultiPlane]: www.oldcastlebe.com/#sle.
 - c. Tubelite, Inc;[T14000]: www.tubeliteinc.com/#sle.
 - d. Substitutions: See Section 01 60 00-Product Requirements.
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (51 mm wide by 114 mm deep).
- B. Center-Set Style, Not Thermally-Broken, Interior Storefront:
 - 1. Manufacturer:
 - a. Kawneer North America;[Trifab® 400 Framing System]: www.kawneer.com/#sle.
 - b. Oldcastle BuildingEnvelope;[FG-3000]: www.oldcastlebe.com/#sle.
 - c. Tubelite, Inc;[E14000]: www.tubeliteinc.com/#sle.
 - d. Substitutions: See Section 01 60 00-Product Requirements.
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (50 mm wide by 114 mm deep).

2.02 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Finish: Class I natural anodized.

- a. Factory finish all surfaces that will be exposed in completed assemblies.
 2. Finish Color: Clear Anodized.
 3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- B. Performance Requirements:
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Design Wind Loads: Comply with requirements of ASCE 7.
 - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
 2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf (390 Pa).
 3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft (0.3 L/sec sq m) of wall area, when tested in accordance with ASTM E283 at 6.27 psf (300 Pa) pressure differential across assembly.
 4. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.

2.03 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Framing members for interior applications need not be thermally broken.
 2. Glazing Stops: Flush.
- B. Glazing: As specified in Section 08 80 00.
- C. Swing Doors: Glazed aluminum.
1. Thickness: 1-3/4 inches (43 mm).
 2. Top Rail: 4 inches (100 mm) wide.
 3. Vertical Stiles: 4-1/2 inches (115 mm) wide.
 4. Bottom Rail: 10 inches (254 mm) wide.
 5. Glazing Stops: Square.
 6. Finish: Same as storefront.

2.04 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Fasteners: Stainless steel.
- D. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch (0.81 mm) minimum thickness; finish to match framing members.
- E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.05 HARDWARE

- A. For each door, include weatherstripping, sill sweep strip, and threshold.
- B. Other Door Hardware: As specified in Section 08 71 00.
- C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Set thresholds in bed of sealant and secure.
- J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 FIELD QUALITY CONTROL

- A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.
- B. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.
- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

**SECTION 08 56 59
SERVICE AND TELLER WINDOW UNITS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Service and teller window units.

1.02 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate work with adjacent materials specified in other sections and as indicated on drawings and approved shop drawings.
- B. Coordinate electrical service and rough-in requirements.
- C. Preinstallation Meeting: Prior to start of installation arrange a meeting on site to familiarize installer and installers of related work with requirements relating to this work.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product data for specified products indicating materials, operation, glazing, finishes, and installation instructions.
- C. Shop Drawings: Indicate configuration, sizes, rough-in, mounting, anchors and fasteners, and installation clearances.
- D. Test Data: Test reports for specific window model and glazing to be furnished, showing compliance with all specified requirements; window and glazing may be tested separately, provided window test sample adequately simulates the glazing to be used.
- E. Samples for Selection of Finishes:
- F. Manufacturer Qualification Statement.
- G. Installer Qualification Statement.
- H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least ten years documented experience, and with ability to provide test reports showing that their standard manufactured products meet the specified requirements.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.
- B. Store units in area protected from exposure to weather and vandalism.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty agreeing to repair or replace units and their components that fail in materials or workmanship within five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Service and Teller Window Units:
 - 1. Easi-Serv Products; [____]: www.easi-serv.com/#sle.

2. Quikserv Corp; [____]: www.quikserv.com/#sle.
3. Ready Access, Inc; [____]: www.ready-access.com/#sle.
4. [____].
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SERVICE AND TELLER WINDOW UNITS

- A. Location: Built within interior wall, as indicated on drawings.
- B. Type of Use: As indicated on drawings.
- C. Window Type: [____].
 1. Mounting: Flush with wall surface.
 2. Window Size: As indicated on drawings.
 3. Material: Aluminum.
 - a. Finish: Clear anodized.
- D. Glazing: Single (monolithic), 1/2 inch thick, clear.
 1. Tempered safety glazing.
- E. Glazing Connection: Aluminum Frame At Perimeter

2.03 MATERIALS

- A. Aluminum Extrusions: Minimum 1/8 inch (3.2 mm) thick frame and sash material complying with ASTM B221 and ASTM B221M.
 1. Mill Finished Aluminum Surfaces: Manufacturer's standard finish.
 2. Finish: Class I natural anodized.
- B. Monolithic Glass: Fully tempered float glass; minimum [1/2] inch ([____] mm) thickness.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Notify Architect if conditions are not suitable for installation of units; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install units in correct orientation (inside/outside or secure/non-secure).
- C. Anchor units securely in manner so as to achieve performance specified.
- D. Remove and replace defective work.

3.03 ADJUSTING

- A. Adjust operating components for smooth operation while also maintaining a secure, weather-tight enclosure and a tight fit at the contact points; lubricate operating hardware.

3.04 CLEANING

- A. Remove protective material from factory finished surfaces.
- B. Clean exposed surfaces promptly after installation without damaging finishes.

3.05 PROTECTION

- A. Provide temporary protection to ensure that service and teller windows are without damage upon Date of Substantial Completion.

END OF SECTION

**SECTION 08 71 00
DOOR HARDWARE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for wood, aluminum, and hollow metal doors.
- B. Hardware for fire-rated doors.
- C. Thresholds.
- D. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

- A. Section 08 11 13 - Hollow Metal Doors and Frames.
- B. Section 08 11 16 - Aluminum Doors and Frames.
- C. Section 08 14 16 - Flush Wood Doors.
- D. Section 08 43 13 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. BHMA A156.1 - Butts and Hinges 2021.
- C. BHMA A156.2 - Bored and Preassembled Locks and Latches 2017.
- D. BHMA A156.3 - Exit Devices 2020.
- E. BHMA A156.4 - Door Controls - Closers 2019.
- F. BHMA A156.6 - Architectural Door Trim 2021.
- G. BHMA A156.13 - Mortise Locks & Latches Series 1000 2017.
- H. BHMA A156.16 - Auxiliary Hardware 2018.
- I. BHMA A156.18 - Materials and Finishes 2020.
- J. BHMA A156.21 - Thresholds 2019.
- K. BHMA A156.22 - Gasketing 2021.
- L. BHMA A156.26 - Continuous Hinges 2021.
- M. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators 2019.
- N. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.
- O. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors 1993; also in WDHS-1/WDHS-5 Series, 1996.
- P. ITS (DIR) - Directory of Listed Products current edition.
- Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
- R. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.
- S. UL (DIR) - Online Certifications Directory Current Edition.
- T. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- C. Keying Requirements Meeting:
 - 1. Schedule meeting at project site prior to Contractor occupancy.
 - 2. Attendance Required:

- a. Contractor.
 - b. Owner.
 - c. Installer's Architectural Hardware Consultant (AHC).
 - d. Hardware Installer.
 - e. Owner's Security Consultant.
3. Agenda:
 - a. Establish keying requirements.
 - b. Verify locksets and locking hardware are functionally correct for project requirements.
 - c. Verify that keying and programming complies with project requirements.
 - d. Establish keying submittal schedule and update requirements.
 4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
 - a. Access control requirements.
 - b. Key control system requirements.
 - c. Schematic diagram of preliminary key system.
 - d. Flow of traffic and extent of security required.
 5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
 6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 2. Provide complete description for each door listed.
- D. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
 2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
 3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
 1. Submit manufacturer's parts lists and templates.
 2. Bitting List: List of combinations as furnished.
- G. Keying Schedule:
 1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
- H. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- I. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

- J. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Lock Cylinders: Ten for each master keyed group.
 - 3. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- C. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
 - 1. Closers: Five years, minimum.
 - 2. Exit Devices: Three years, minimum.
 - 3. Locksets and Cylinders: Three years, minimum.
 - 4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 - 3. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or [] as suitable for application indicated.

2.02 HINGES

- A. Manufacturers:
 - 1. McKinney; an Assa Abloy Group company; []: www.assaabloydss.com/#sle.
 - 2. Hager Companies; []: www.hagerco.com/#sle.
 - 3. Stanley, dormakaba Group; []: www.stanleyhardwarefordoors.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Hinges: Comply with BHMA A156.1, Grade 1.
 - 1. Continuous Hinges: Comply with BHMA A156.26.
 - 2. Provide hinges on every swinging door.
 - 3. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
 - 4. Provide ball-bearing hinges at each door with closer.
 - 5. Provide non-removable pins on exterior outswinging doors.
 - 6. Provide power transfer hinges where electrified hardware is mounted in door leaf.
 - 7. Provide following quantity of butt hinges for each door:

2.03 FLUSH BOLTS

- A. Manufacturers:

1. Ives, an Allegion brand; [____]: www.allegion.com/us/#sle.
 2. Pamex, Inc; [____]: www.pamexinc.com/#sle.
 3. Trimco; [____]: www.trimcohardware.com/#sle.
- B. Flush Bolts: Comply with BHMA A156.16, Grade 1.
1. Flush Bolt Throw: 3/4 inch (19 mm), minimum.
 2. Provides extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
 - a. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
 3. Manual Flush Bolts: Provide lever extensions for top bolt at over-sized doors.

2.04 EXIT DEVICES

- A. Manufacturers:
1. Precision, dormakaba Group; [____]: www.precisionhardware.com/#sle.
 2. Stanley, dormakaba Group; [____]: www.stanleyhardwarefordoors.com/#sle.
 3. Von Duprin, an Allegion brand; [____]: www.allegion.com/us/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Exit Devices: Comply with BHMA A156.3, Grade 1.
1. Lever design to match lockset trim.
 2. Provide cylinder with cylinder dogging or locking trim.
 3. Provide exit devices properly sized for door width and height.
 4. Provide strike as recommended by manufacturer for application indicated.
 5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.
 6. Provide electrified hardware for doors with access control.

2.05 ELECTRIC STRIKES

- A. Manufacturers:
1. Adams Rite, HES, or Securitron; an Assa Abloy Group company; [____]: www.assaabloydss.com/#sle.
 2. Pamex, Inc; [____]: www.pamexinc.com/#sle.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Electric Strikes: Comply with BHMA A156.31, Grade 1.
1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.
 2. Provide non-handed 24 VDC electric strike suitable for door frame material and scheduled lock configuration.
 3. Connect electric strikes into fire alarm where non-rated doors are scheduled to release with fire or sprinkler alarm condition.

2.06 LOCK CYLINDERS

- A. Manufacturers:
1. Best, dormakaba Group; [____]: www.bestaccess.com/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
1. Provide cylinders from same manufacturer as locking device.
 2. Provide cams and/or tailpieces as required for locking devices.

2.07 CYLINDRICAL LOCKS

- A. Manufacturers:
1. Best, dormakaba Group; [____]: www.bestaccess.com/#sle.
 2. Hager Companies; [____]: www.hagerco.com/#sle.
 3. Schlage, an Allegion brand; [____]: www.allegion.com/us/#sle.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
1. Bored Hole: 2-1/8 inch (54 mm) diameter.
 2. Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
 3. Backset: 2-3/4 inch (70 mm) unless otherwise indicated.
 4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated

requirements.

- a. Finish: To match lock or latch.

2.08 MORTISE LOCKS

A. Manufacturers:

1. Best, dormakaba Group; [____]: www.bestaccess.com/#sle.
2. Schlage, an Allegion brand; [____]: www.allegion.com/us/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.

1. Latchbolt Throw: 3/4 inch (19 mm), minimum.
2. Deadbolt Throw: 1 inch (25.4 mm), minimum.
3. Backset: 2-3/4 inch (70 mm) unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
 - a. Finish: To match lock or latch.

2.09 INTERIOR DOOR LEVER

A. Manufacturers:

1. Schlage, an Allegion brand; [____]: www.allegion.com/us/#sle.
2. Substitutions: See Section 01 60 00-Product Requirements.

B. B. Door Lever Type

1. Boardwalk (BWK)
2. Levers to comply with the Americans with Disabilities Act (ADA).

2.10 DOOR PULLS AND PUSH PLATES

A. Manufacturers:

1. Rockwood; an Assa Abloy Group company; [____]: www.assaabloydss.com/#sle.
2. Hager Companies; [____]: www.hagerco.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Door Pulls and Push Plates: Comply with BHMA A156.6.

1. Pull Type: Straight, unless otherwise indicated.
2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
 - a. Edges: Beveled, unless otherwise indicated.
3. Material: Aluminum, unless otherwise indicated.

2.11 CLOSERS

A. Manufacturers; Surface Mounted:

1. Corbin Russwin, Norton, Rixson, Sargent, or Yale; an Assa Abloy Group company; [____]: www.assaabloydss.com/#sle.
2. Hager Companies; [____]: www.hagerco.com/#sle.
3. LCN, an Allegion brand; [____]: www.allegion.com/us/#sle.
4. Stanley, dormakaba Group; [____]: www.stanleyhardwarefordoors.com/#sle.

B. Closers: Comply with BHMA A156.4, Grade 1.

1. Type: Surface mounted to door.
2. Provide door closer on each exterior door.
3. Provide door closer on each fire-rated and smoke-rated door.
4. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
5. At corridor entry doors, mount closer on room side of door.
6. At outswinging exterior doors, mount closer on interior side of door.
7. Provide concealed closers on aluminum storefront doors.
8. Provide closers with integrated overhead stop and holder.
9. Closer mounting plate to be installed within top rail of door.

2.12 KICK PLATES

A. Manufacturers:

1. Ives, an Allegion brand; [____]: www.allegion.com/us/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 - 1. Size: 8 inch (203 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.

2.13 FLOOR STOPS

- A. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Type: Manual hold-open, with dome floor stop.
 - 2. Material: Aluminum housing with rubber insert.

2.14 WALL STOPS

- A. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Provide wall stops to prevent damage to wall surface upon opening door.
 - 2. Type: Bumper, concave, wall stop.
 - 3. Material: Aluminum housing with rubber insert.

2.15 THRESHOLDS

- A. Manufacturers:
 - 1. Pemko; an Assa Abloy Group company; [____]: www.assaabloydss.com/#sle.
 - 2. National Guard Products, Inc; [____]: www.ngpinc.com/#sle.
 - 3. Zero International, Inc; [____]: www.zerointernational.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Thresholds: Comply with BHMA A156.21.
 - 1. Provide threshold at each exterior door, unless otherwise indicated.
 - 2. Type: Flat surface.
 - 3. Material: Aluminum.
 - 4. Threshold Surface: Fluted horizontal grooves across full width.
 - 5. Field cut threshold to profile of frame and width of door sill for tight fit.
 - 6. Provide non-corroding fasteners at exterior locations.

2.16 WEATHERSTRIPPING AND GASKETING

- A. Manufacturers:
 - 1. Pemko; an Assa Abloy Group company; [____]: www.assaabloydss.com/#sle.
 - 2. Hager Companies; [____]: www.hagerco.com/#sle.
 - 3. National Guard Products, Inc; [____]: www.ngpinc.com/#sle.
 - 4. Zero International, Inc; [____]: www.zerointernational.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
 - 1. Head and Jamb Type: Adjustable.
 - 2. Door Sweep Type: Encased in retainer.
 - 3. Material: Aluminum, with brush weatherstripping.
 - 4. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated; .
 - 5. Provide door bottom sweep on each exterior door, unless otherwise indicated.
 - 6. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - a. Intumescent Seals and Gasketing: Furnish concealed, Category A type gasketing systems on assemblies where an intumescent seal is required to meet IBC and UL-10C positive pressure labeling.
 - 7. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - a. Furnish smoke labeled perimeter gasketing at all smoke labeled openings or as required by code.

2.17 COAT HOOKS

- A. Manufacturers:
 - 1. Rockwood; an Assa Abloy Group company; [____]: www.assaabloydss.com/#sle.
- B. Coat Hooks: Provide on room side of restroom doors, screw fastened.
- C. Material: Stainless steel.

2.18 SILENCERS

- A. Manufacturers:
 - 1. Ives, an Allegion brand; [____]: www.allegion.com/us/#sle.
 - 2. Rockwood; an Assa Abloy Group company; [____]: www.assaabloydss.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
 - 1. Single Door: Provide three on strike jamb of frame.
 - 2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
 - 3. Material: Rubber, white color.

2.19 FIRE DEPARTMENT LOCK BOX

- A. Manufacturers:
 - 1. Knox Company; Knox-Box Rapid Entry System, 3200 Series: www.knoxbox.com/#sle.
- B. Fire Department Lock Box:
 - 1. Heavy-duty, recessed, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.
 - 2. Capacity: Holds 10 keys.
 - 3. Finish: Manufacturer's standard dark bronze.
 - 4. Options: Tamper switch connected to building fire alarm.

2.20 FINISHES

- A. Finishes: 619 Satin Nickel

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- C. Use templates provided by hardware item manufacturer.
- D. Do not install surface mounted items until application of finishes to substrate are fully completed.
- E. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
 - 1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
 - 2. For Aluminum-Framed Storefront Doors and Frames: Refer to Section 08 43 13.
 - 3. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
 - 4. Mounting heights in compliance with ADA Standards:
- F. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 01 40 00 - Quality Requirements.

- B. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.04 ADJUSTING

- A. Adjust work under provisions of Section 01 70 00 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.
- D. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

3.06 PROTECTION

- A. Protect finished Work under provisions of Section 01 70 00 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

**SECTION 08 80 00
GLAZING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
- B. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.
- C. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

1.03 REFERENCE STANDARDS

- A. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2019).
- B. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2021a.
- C. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2016.
- D. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2010.
- E. GANA (GM) - GANA Glazing Manual 2008.
- F. GANA (SM) - GANA Sealant Manual 2008.
- G. GANA (LGRM) - Laminated Glazing Reference Manual 2009.
- H. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use 1990 (2016).
- I. NFRC 100 - Procedure for Determining Fenestration Product U-factors 2017.
- J. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence 2014, with Errata (2017).
- K. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems 2017.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Insulating Glass Unit, Glazing Unit, Plastic Sheet Glazing Unit, Plastic Film, and [] Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples [12 by 12] by [] inch ([] by [] mm) in size of glass units.
- E. Samples: Submit [] inch ([] mm) long bead of glazing sealant, color as selected.
- F. Certificate: Certify that products of this section meet or exceed specified requirements.
- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), IGMA TM-3000, and [] for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 3. Glass thicknesses listed are minimum.
- B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
 - 1. In conjunction with vapor retarder and joint sealer materials described in other sections.
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.02 INSULATING GLASS UNITS

- A. Manufacturers:
 - 1. Vitro Architectural Glass (formerly PPG Glass); []: www.vitroglazings.com/#sle.
 - 2. Substitutions: Refer to Section 01 60 00 - Product Requirements.
- B. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 3. Spacer Color: Black.
 - 4. Edge Seal:
 - a. Color: Black.
 - 5. Purge interpane space with dry air, hermetically sealed.
- C. Type A - Insulating Glass Units: Vision glass, double glazed, tempered where required by code.
 - 1. Applications: Exterior glazing unless otherwise indicated.
 - 2. Outboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.

- a. Tint: Vitro - Solarban 70(2) Optigray.
 3. Inboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: Clear.
 4. Total Thickness: 1 inch (25.4 mm).
 5. Thermal Transmittance (U-Value), Summer - Center of Glass: .28, nominal.
 6. Solar Heat Gain Coefficient (SHGC): .24, nominal.
- D. Type IG-5 - Insulating Glass Units: Safety glazing.
1. Applications:
 - a. Glazed lites in exterior doors.
 - b. Glazed sidelights and panels next to doors.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 2. Glass Type: Same as Type A except use fully tempered float glass for both outboard and inboard lites.
 3. Total Thickness: 1 inch (25.4 mm).
 4. Thermal Transmittance (U-Value), Summer - Center of Glass: [____], nominal.

2.03 GLAZING UNITS

- A. Type A - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
 2. Glass Type: Annealed float glass, tempered where required by code.
 3. Tint: Clear.
 4. Thickness: 1/4 inch (6.4 mm), nominal.
- B. Type G-5 - Monolithic Safety Glazing: Non-fire-rated.
1. Applications:
 - a. Glazed lites in doors, except fire doors.
 - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
 2. Glass Type: Fully tempered safety glass as specified.
 3. Tint: Clear.
 4. Thickness: 1/4 inch (6.4 mm), nominal.

2.04 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.
- B. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 FIELD QUALITY CONTROL

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove non-permanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

**SECTION 08 83 00
MIRRORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass mirrors.
 - 1. Annealed float glass.
 - 2. Tempered safety glass.

1.02 REFERENCE STANDARDS

- A. ASTM C1036 - Standard Specification for Flat Glass 2021.
- B. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- C. GANA (GM) - GANA Glazing Manual 2008.
- D. GANA (SM) - GANA Sealant Manual 2008.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), and [] for glazing installation methods.
- B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

1.05 FIELD CONDITIONS

- A. Do not install mirrors when ambient temperature is less than 50 degrees F (10 degrees C).
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirror Glass; Type []: Clear, annealed float glass; ASTM C1036, with copper and silver coatings, and protective overcoating.
 - 1. Size: As indicated on drawings.

2.02 ACCESSORIES

- A. Mirror Attachment Accessories: Concealed wall hanger.
- B. Channel Frame: One piece, channel frame, stainless steel, Type 430, satin finish, 1/2 inch by 1/2 inch by 3/8 inch deep (12.7 mm by 12.7 mm by 9.5 mm deep) with 90 degree mitered corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for mirrored glazing are correctly sized and within tolerance.
- B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.
- C. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install mirrors in accordance with manufacturer's recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Frameless Mirrors: Set mirrors with clips, and anchor rigidly to wall construction.

3.04 CLEANING

- A. Remove wet glazing materials from finish surfaces.
- B. Remove labels after work is complete.
- C. Clean mirrors and adjacent surfaces.

END OF SECTION

**SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Acoustic insulation.
- E. Gypsum sheathing.
- F. Cementitious backing board.
- G. Gypsum wallboard.
- H. Joint treatment and accessories.
- I. Textured finish system.

1.02 RELATED REQUIREMENTS

- A. Section 05 40 00 - Cold-Formed Metal Framing: Structural steel stud framing.
- B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

1.03 REFERENCE STANDARDS

- A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.
- B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 1999 (Reaffirmed 2016).
- C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017.
- D. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board 2004 (Reapproved 2020).
- E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
- F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
- H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.
- I. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2018.
- J. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2020.
- K. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.
- L. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2017.
- M. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing 2018.
- N. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units 2021.
- O. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
- P. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels 2019, with Editorial Revision (2020).

- Q. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2016.
- R. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
- S. ASTM E413 - Classification for Rating Sound Insulation 2016.
- T. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015 (Reapproved 2021)e1.
- U. GA-216 - Application and Finishing of Gypsum Panel Products 2016, with Errata.
- V. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- E. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches (300 by 300 mm) in size, illustrating finish color and texture.
- F. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.
- B. Copies of Documents at Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. American Gypsum Company; [____]: www.americangypsum.com/#sle.
 - 2. CertainTeed Corporation; [____]: www.certainteed.com/#sle.
 - 3. Georgia-Pacific Gypsum; [____]: www.gpgypsum.com/#sle.
 - 4. National Gypsum Company; [____]: www.nationalgypsum.com/#sle.
 - 5. USG Corporation; [____]: www.usg.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 - 3. Thickness:
 - a. Vertical Surfaces: 5/8 inch (16 mm).
 - b. Ceilings: 5/8 inch (16 mm).
 - 4. Mold Resistant Paper Faced Products:
 - a. American Gypsum Company; M-Bloc.
 - b. American Gypsum Company; M-Bloc Type X.
 - c. American Gypsum Company; M-Bloc Type C.

- d. CertainTeed Corporation; M2Tech 1/2" Moisture & Mold Resistant Drywall.
 - e. CertainTeed Corporation; M2Tech 5/8" Type C Moisture & Mold Resistant Drywall.
 - f. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall.
 - g. Continental Building Products; Mold Defense.
 - h. Continental Building Products; Mold Defense Type X.
 - i. Georgia-Pacific Gypsum; ToughRock Mold-Guard.
 - j. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard.
 - k. National Gypsum Company; Gold Bond XP Gypsum Board.
 - l. National Gypsum Company; Gold Bond 3/4" Ultra-Shield FS XP Gypsum Board.
5. Glass Mat Faced Products:
- a. Continental Building Products; Weather Defense Platinum Interior.
 - b. Continental Building Products; Weather Defense Platinum Interior Type X.
 - c. Georgia-Pacific Gypsum; DensArmor Plus.
 - d. Georgia-Pacific Gypsum; DensArmor Plus Fireguard C.
 - e. National Gypsum Company; Gold Bond eXP Interior Extreme Gypsum Panel.
 - f. National Gypsum Company; Gold Bond eXP Fire-Shield Interior Extreme Gypsum Panel.
 - g. USG Corporation; USG Sheetrock Brand Glass-Mat Panels Mold Tough.
 - h. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including [_____].
 2. Application: Horizontal surfaces behind tile in wet areas including countertops.
 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 4. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Thickness: 1/2 inch (12.7 mm).
 - b. Products:
 - 1) National Gypsum Company; PermaBase Cement Board: www.nationalgypsum.com/#sle.
 - 2) USG Corporation; [_____]: www.usg.com/#sle.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.
- D. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
1. Application: Vertical surfaces behind thinset tile, except in wet areas.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Edges: Tapered.
 4. Products:
 - a. American Gypsum Company; M-Bloc.
 - b. American Gypsum Company; M-Bloc Type X.
 - c. Georgia-Pacific Gypsum; ToughRock Mold-Guard Gypsum Board.
 - d. Georgia-Pacific Gypsum; DensArmor Plus.
 - e. National Gypsum Company; Gold Bond XP Gypsum Board.
- E. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
 2. Thickness: 1/2 inch (13 mm).
 3. Edges: Tapered.
- F. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Exterior sheathing, unless otherwise indicated.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Fungal Resistance: No fungal growth when tested in accordance with ASTM G21.
 4. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
 5. Core Type: Regular.
 6. Regular Board Thickness: 1/2 inch (13 mm).

7. Edges: Square.
8. Glass Mat Faced Products:
 - a. American Gypsum Company; M-Glass Exterior Sheathing.
 - b. CertainTeed Corporation; GlasRoc 1/2" Exterior Sheathing.
 - c. Georgia-Pacific Gypsum; DensGlass Sheathing.
 - d. National Gypsum Company; Gold Bond eXP Sheathing.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 GYPSUM WALLBOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced.
Thickness: [3.5] inch ([] mm).
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
 1. Products:
 - a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
 - b. Liquid Nails, a brand of PPG Architectural Coatings; AS-825 Acoustical Sound Sealant: www.liquidnails.com/#sle.
 - c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Water-Resistive Barrier: As specified in Section 07 25 00.
- D. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
 1. Types: As detailed or required for finished appearance.
 2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
 3. Products:
 - a. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
 - b. Trim-tex, Inc: www.trim-tex.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
- F. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- G. Textured Finish Materials: Latex-based compound; plain.
- H. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- I. Nails for Attachment to Wood Members: ASTM C514.
- J. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
 1. Level ceiling system to a tolerance of 1/1200.
 2. Laterally brace entire suspension system.
 3. Install bracing as required at exterior locations to resist wind uplift.
- B. Studs: Space studs at 16 inches on center (at 406 mm on center).
 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

- C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- D. Blocking: Install wood blocking for support of:
 - 1. Framed openings.
 - 2. Wall mounted cabinets.
 - 3. Plumbing fixtures.
 - 4. Toilet partitions.
 - 5. Toilet accessories.
 - 6. Wall mounted door hardware.
 - 7. Television Mounts

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 - 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
 - 1. Seal joints, cut edges, and holes with water-resistant sealant.
 - 2. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.
- F. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
 - 1. Seal joints, cut edges, and holes with water resistant sealant.
- G. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- H. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For non-rated assemblies, install as follows:
 - 1. Single-Layer Applications: Screw attachment.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

3.07 TEXTURE FINISH

- A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

3.08 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

**SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal partition, ceiling, and soffit framing.
- B. Framing accessories.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members 2012.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
- D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
 - 2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
- C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Framing, Connectors, and Accessories:
 - 1. CEMCO; [____]: www.cemcosteel.com/#sle.
 - 2. ClarkDietrich; [____]: www.clarkdietrich.com/#sle.
 - 3. Simpson Strong Tie; [____]: www.strongtie.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING MATERIALS

- A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf (L/240 at 240 Pa).
 - 1. Studs: C shaped with knurled or embossed faces.
 - 2. Runners: U shaped, sized to match studs.
- B. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.
- C. Non-Loadbearing Framing Accessories:

1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.

2.03 FABRICATION

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing to structure where indicated and to ceiling in other locations.
- C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- D. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- E. Align and secure top and bottom runners at 24 inches (600 mm) on center.
- F. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- G. Align stud web openings horizontally.
- H. Secure studs to tracks using crimping method. Do not weld.
- I. Fabricate corners using a minimum of three studs.
- J. Double stud at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.
- K. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

3.03 CEILING AND SOFFIT FRAMING

- A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- B. Install furring independent of walls, columns, and above-ceiling work.
- C. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.
- D. Space main carrying channels at maximum 72 inch (1 800 mm) on center, and not more than 6 inches (150 mm) from wall surfaces. Lap splice securely.
- E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- F. Place furring channels perpendicular to carrying channels, not more than 2 inches (50 mm) from perimeter walls, and rigidly secure. Lap splices securely.

3.04 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION

**SECTION 09 30 00
TILING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Cementitious backer board as tile substrate.
- D. Non-ceramic trim.

1.02 REFERENCE STANDARDS

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium) 2019.
- B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar 2017.
- C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar 2017.
- D. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar 1999 (Reaffirmed 2021).
- E. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship 2019.
- F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive 2019.
- G. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar 2020.
- H. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy 1999 (Reaffirmed 2019).
- I. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout 1999 (Reaffirmed 2019).
- J. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout 1999 (Reaffirmed 2019).
- K. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework 2017.
- L. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.
- M. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar 1999 (Reaffirmed 2019).
- N. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone 2005 (Reaffirmed 2021).
- O. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar 2020.
- P. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive 2013 (Revised).
- Q. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar 2012 (Revised).
- R. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 1999 (Reaffirmed 2016).

- S. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation 2014.
- T. ANSI A137.1 - American National Standard Specifications for Ceramic Tile 2021.
- U. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products 2018.
- V. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation 2019.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 10 percent of each size, color, and surface finish combination, but not less than [] of each type.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- C. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

- A. Manufacturers:
 - 1. Crossville Studios: www.crossvilleinc.com.
 - 2. Anatolia; <https://www.anatoliatile.com/>
 - 3. American Olean; <https://www.americanolean.com/>
- B. Glazed Wall Tile, Type []: ANSI A137.1 standard grade.
 - 1. Size: As indicated on drawings.
 - 2. Color(s): As indicated on drawings.
- C. Porcelain Tile: ANSI A137.1 standard grade.
 - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.

2. Size: As indicated on drawings.
3. Surface Finish: Unglazed.
4. Color(s): As indicated on drawings.
5. Products: As indicated on drawings.

2.02 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: [____], style and dimensions to suit application, for setting using tile mortar or adhesive.
1. Applications:
 - a. Open edges of wall tile.
 - b. Open edges of floor tile.
 - c. Outside wall corners.
 - d. Thresholds at door openings.
 - e. Borders and other trim as indicated on drawings.
 2. Color: Champagne Bronze or as selected from manufacturer's full range
 3. Manufacturers:
 - a. Schluter-Systems: www.schluter.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SETTING MATERIALS

- A. Manufacturers:
1. Mapei; Granrapid System; www.mapei.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GROUTS

- A. Manufacturers:
1. Mapei; Kerapoxy CQ; www.mapei.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Applications: Where indicated.

2.05 MAINTENANCE MATERIALS

- A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
1. Applications: Between tile and plumbing fixtures.
 2. Color(s): As selected by Architect from manufacturer's full line.
 3. Products:
 - a. Mapei; Keracaulk S; www.mapei.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 ACCESSORY MATERIALS

- A. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Fluid or Trowel Applied Type:
 - a. Products:
 - 1) Mapei; Mapelastic Aquadefense; www.mapei.com.
 - (a) Include Reinforcing Fabric and Mapeband and accessories recommended by manufacturer.
- B. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch (12.7 mm) thick; 2 inch (51 mm) wide coated glass fiber tape for joints and corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
- E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep control and expansion joints free of mortar, grout, and adhesive.
- I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
 - 1. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.
- B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 INSTALLATION - WALL TILE

- A. Over cementitious backer units install in accordance with TCNA (HB) Method W223, organic adhesive.

3.06 CLEANING

- A. Clean tile and grout surfaces.

3.07 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

**SECTION 09 51 00
ACOUSTICAL CEILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.
- C. Supplementary acoustical insulation above ceiling.

1.02 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2017.
- C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
- D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2020.
- E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2019.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two samples 6 by 6 inch (____by____ mm) in size illustrating material and finish of acoustical units.
- D. Samples: Submit two samples each, 12 inches ([____] mm) long, of suspension system main runner, cross runner, and perimeter molding.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: 144 sq ft ([____] sq m) of each type and size.

1.05 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Basis of Design: Armstrong World Industries, Inc; Cirrus, Tegular: www.armstrongceilings.com/#sle.
 - 2. Rockfon; Artic Square Tegular Edge: www.rockfon.com
 - 3. CertainTeed Corporation; [____]: www.certainteed.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Suspension Systems:
 - 1. Same as for acoustical units.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACOUSTICAL UNITS

2.03 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 - 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System: Hot-dipped galvanized steel grid with aluminum cap.
 - 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 - 2. Profile: Tee; 15/16 inch (24 mm) face width.
 - 3. Color: White.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12-gage 0.08 inch (2 mm) galvanized steel wire.
- C. Perimeter Moldings: Same metal and finish as grid.
- D. Acoustical Insulation: ASTM C665 friction fit type, unfaced batts.
 - 1. Thickness: 2 inch (51 mm).
 - 2. Size: To fit acoustical suspension system.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Overlap and rivet corners.
- D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- G. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.

3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
 - 3. Double cut and field paint exposed reveal edges.
- F. Where round obstructions occur, provide preformed closures to match perimeter molding.
- G. Lay acoustical insulation for a distance of 48 inches (1219 mm) either side of acoustical partitions as indicated.

3.04 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

**SECTION 09 54 26
SUSPENDED WOOD CEILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wood grilles.

1.02 REFERENCE STANDARDS

- A. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.
- B. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2020.
- C. CISCA (WC) - Wood Ceilings Technical Guidelines 2009.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning, attachment of wood ceiling components to grid, accessory attachments, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
- C. Product Data: Provide data on wood ceiling components and suspension system components.
- D. Samples: Submit two full size samples illustrating material and finish of wood ceiling components.
- E. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for fire, acoustical, and seismic performance.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements for additional provisions.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with at least three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood ceiling components to project site in original, unopened packages.
- B. Store in fully enclosed space, flat, level and off the floor.

1.06 FIELD CONDITIONS

- A. Do not install suspended wood ceiling system until wet construction work is complete and permanent heat and air conditioning is installed and operating.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Suspended Wood Ceilings:
 - 1. Basis of Design: 9Wood; 1214-3 and 1216-3 Series: www.9wood.com/#sle.
 - 2. Armstrong World Industries, Inc; Woodworks: www.armstrongceilings.com/#sle.
 - 3. Madrid, Inc; []: www.madridinc.com/#sle.
 - 4. Rulon International; []: www.rulonco.com/#sle.
 - 5. Geometrik; geometrik.com

2.02 SUSPENDED WOOD CEILING SYSTEM

- A. Performance Requirements:
 - 1. Design for maximum deflection of 1/360 of span.

- B. Wood Grilles: Pre-assembled module of solid wood grilles with battens.
 - 1. Acoustical Backer: Fiberglass, 1 inch (25 mm) thick.
 - a. Color: Black.
 - 2. Veneer Species: Walnut.
 - 3. Attachment to Suspension Grid: Direct screw attachment to suspension grid.

2.03 FABRICATION

- A. Shop fabricate wood ceiling components to the greatest extent possible.
- B. Fabricate components to allow access to ceiling plenum as required.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not install ceiling until after interior wet work is dry.

3.02 PREPARATION

- A. Layout wood ceiling components in pattern according to reflected ceiling plan and as shown on shop drawings.
- B. Acclimate wood ceiling materials by removing from packaging in installation area a minimum of 48 hours prior to installation.

3.03 INSTALLATION

- A. General: Install suspended wood ceiling system in accordance with CISCA (WC).
- B. Suspension System:
 - 1. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
 - 2. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
 - 3. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
 - 4. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
 - 5. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
 - 6. Do not eccentrically load system or induce rotation of runners.
- C. Wood Ceiling:
 - 1. Install wood ceilings in accordance with manufacturer's instructions.
 - 2. Fit wood components in place, free from damaged edges or other defects detrimental to appearance and function.
 - 3. Install components in uniform plane, and free from twist, warp, and dents.
 - 4. Cut to fit irregular grid and perimeter edge trim.
 - 5. Make field cut edges of same profile as factory edges, seal and finish according to manufacturer.
 - 6. Install acoustical backer above wood ceiling components; fit tight between grid members.

3.04 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

3.05 CLEANING

- A. Clean and touch up minor finish damage. Remove and replace components that cannot be successfully cleaned and repaired.

END OF SECTION

**SECTION 09 65 00
RESILIENT FLOORING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Grounding and bonding of static control flooring to building grounding system.

1.03 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2021.
- B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile 2004 (Reapproved 2018).
- C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile 2020.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base 2021.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Verification Samples: Submit two samples, [6 x 6] by [] inch ([] by [] mm) in size illustrating color and pattern for each resilient flooring product specified.
- D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Flooring Material: 200 square feet ([] square meters) of each type and color.
 - 3. Extra Wall Base: 50 linear feet ([] linear meters) of each type and color.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).
- D. Do not double stack pallets.

1.07 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.01 TILE FLOORING

- A. Vinyl Tile - VT-1:
 - 1. Manufacturers:
 - a. EF Contract; www.efcontractflooring.com
 - 2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 - 3. Total Thickness: 0.100 inch (2.5 mm).
 - 4. Wear Layer: 20 mil
 - 5. Color: As indicated on drawings.

2.02 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TV, vinyl, thermoplastic; top set Style B, Cove.
 - 1. Manufacturers:
 - a. Johnsonite, a Tarkett Company; [_____]: www.johnsonite.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Height: 4 inch (100 mm).
 - 3. Thickness: 0.125 inch (3.2 mm).
 - 4. Toe Base: Standard 5/8"
 - 5. Finish: Satin.
 - 6. Length: Roll.
 - 7. Color: As indicated on drawings.
 - 8. Accessories: Premolded external corners and internal corners.

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 - 1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is fully cured.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 26 05 26 for grounding and bonding to building grounding system.

3. Fit joints and butt seams tightly.
 4. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
 - E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

3.05 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.
- C. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

**SECTION 09 68 13
TILE CARPETING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.02 REFERENCE STANDARDS

- A. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes 2019a.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and [_____].
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Carpet Tiles: Quantity equal to 10 percent of total installed of each color and pattern installed.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.05 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Tile Carpeting:
 - 1. EF Contract; www.efcontractflooring.com
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Tile Carpeting: Loop Pile, manufactured in one color dye lot.
 - 1. Color and size: As indicated on drawings..

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Rubber, [_____] color.
- C. Adhesives:
 - 1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified; in lieu of labeled product, independent test report showing compliance is acceptable.
- D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Fully adhere carpet tile to substrate.
- H. Trim carpet tile neatly at walls and around interruptions.
- I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

**SECTION 09 72 00
WALL COVERINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation and prime painting.
- B. Wall covering and borders.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

- A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems 2020.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on wall covering and adhesive.
- C. Shop Drawings: Indicate wall elevations with seaming layout.
- D. Samples: Submit two samples of wall covering, ____by____ inch (____by____ mm) in size illustrating color, finish, and texture.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Manufacturer's Qualification Statement.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Wall Covering Materials: 25 linear feet (8 linear m) of each color and pattern of wall covering; store where directed.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 MOCK-UP

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Inspect roll materials at arrival on site, to verify acceptability.
- B. Protect packaged adhesive from temperature cycling and cold temperatures.
- C. Do not store roll goods on end.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.01 WALL COVERINGS

- A. General Requirements:
 - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
 - 2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.
- B. Wall Covering - Type WC1: Fabric-backed vinyl roll stock.
 - 1. Color: As indicated on drawings.

2. Pattern: As indicated on drawings.
3. Size: As indicated on drawings.
4. Overcoating: Manufacturer's standard coating for stain resistance.
5. Manufacturers:
 - a. Koroseal/RJF International; [____]: www.koroseal.com/#sle.
- C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
- D. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
- E. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.
- B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.
- C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet (3 mm in 3 m) nor vary at a rate greater than 1/16 inch/ft (1.5 mm/300 mm).

3.02 PREPARATION

- A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.
- B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.
- C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- D. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.
- E. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply adhesive to wall surface immediately prior to application of wall covering.
- C. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.
- D. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.
- E. Butt edges tightly.
- F. Overlap adjacent panels as recommended by manufacturer.
- G. Horizontal seams are not acceptable.
- H. Do not install wall covering more than 1/4 inch (6 mm) below top of resilient base.
- I. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches (150 mm) of wall covering termination. Ensure full contact bond.
- J. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

- A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.
- B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

- A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

**SECTION 09 91 13
EXTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Exterior Concrete Paint to resemble Cast Stone
 - 2. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 3. Exposed surfaces of steel lintels and ledge angles.
 - 4. Mechanical and Electrical:
 - a. On the roof and outdoors, paint equipment that is exposed to weather or to view, including factory-finished materials.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Non-metallic roofing and flashing.
 - 6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
 - 7. Floors, unless specifically indicated.
 - 8. Brick, stone veneer, cast stone.
 - 9. Glass.
 - 10. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

- A. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating 2005 (Reapproved 2017).
- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- D. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
- E. SSPC-SP 2 - Hand Tool Cleaning 2018.
- F. SSPC-SP 6 - Commercial Blast Cleaning 2007.
- G. SSPC-SP 13 - Surface Preparation of Concrete 1997 (Reaffirmed 2003).

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
 - 5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.
 - 3. Allow 30 days for approval process, after receipt of complete samples by Architect.
 - 4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
 - 2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.
- B. Paints:
 - 1. Base Manufacturer: [_____].
 - 2. Sherwin-Williams Company; [_____]: www.sherwin-williams.com/#sle.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 - 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 - 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing

- properties, and capable of drying or curing free of streaks or sags.
3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 5. Supply each paint material in quantity required to complete entire project's work from a single production run.
 6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- C. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
 2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
 3. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, and primed metal.
1. Two top coats and one coat primer.
 2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
- B. Masonry/CMU, Opaque, Latex, 3 Coat:
1. One coat of block filler. Sherwin Williams Loxon Block Surfacers.
 2. Semi-gloss: Two coats of latex enamel; Sherwin Williams A6100 Series, A 100 Exterior latex Satin..
- C. Ferrous Metals, Unprimed, Alkyd, 3 Coat:
1. One coat of alkyd primer.
 2. Semi-gloss: Two coats of alkyd enamel; Pro Industrial ProCryl Acrylic SemiGloss.
- D. Ferrous Metals, Primed, Alkyd, 2 Coat:
1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
 2. Semi-gloss: Two coats of alkyd enamel; Sherwin Williams B531150 Series, WB Alkyd Urethane Enamel SemiGloss.
- E. Galvanized Metals, Latex, 3 Coat:
1. One coat SW B66310 Series, ProCryl Universal Water Based Primer.
 2. Gloss: Two coats of latex enamel; Two coats of of B66350 Series, SherCryl HPA SemiGloss.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Alkali Resistant Water Based Primer; MPI #3.
 - a. Products:
 - 1) Sherwin-Williams Loxon Concrete and Masonry Primer Sealer, LX02W50. (MPI #3)
 2. Rust-Inhibitive Water Based Primer.
 - a. Products:
 - 1) PPG Paints: 4020 PF Pitt-Tech Plus Interior/Exterior Waterborne Acrylic Primer Finish DTM Industrial Enamel. (MPI #134).
 - 2) Substitutions: Section 01 60 00 - Product Requirements.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Exterior Plaster and Stucco: 12 percent.
 - 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 3. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi (10,350 to 27,580 kPa) at 6 to 12 inches (150 to 300 mm). Allow to dry.
 - 3. Clean concrete according to ASTM D4258. Allow to dry.
 - 4. At locations indicated to be painted to match Cast Stone, lightly sandblast Pre-Cast Concrete Panel prior to painting.
 - 5. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- G. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi (4,140 to 10,350 kPa) at 6 to 12 inches (150 to 300 mm). Allow to dry.
- H. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- I. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- J. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- K. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- F. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

**SECTION 09 91 20
PAVEMENT MARKING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Contract Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and application of paint systems for the high build, two coat systems for the items of types, patterns, sizes, and colors described in this article.
- B. Provide the following systems as shown on Drawings:
 - 1. Parking Stall Stripes.
 - 2. Traffic Arrows, crosswalks, accessible stall access aisles, walkways, symbols, stop bars, words and other markings.
 - 3. International Symbol of Accessibility.
- C. Provide painting of curbs and curb ramps as described in the following paragraphs:
 - 1. Paint vertical surface and the first 6 in. of the abutting horizontal surface at the top of all curbs within parking facility except those which do not exceed 3'0" in width and abut a wall, spandrel panel, bumper wall guardrail or other construction (not including landscaping or equipment) which prevents passage of pedestrians.
 - 2. In parking areas within the project limits or constructed as part of this project, paint curb ramps (including flares), curb returns at curb ramps and any projecting elements at edges of accessible ramps without handrails. Paint curb returns at driveways and paint curb minimum of 3 ft either side of curb ramp or driveway, (or curb ramp flare length, whichever is greater) in accordance with Pavement Marking.
 - 3. Paint color for curbs and curb ramps shall be yellow.
- D. Proportion International Symbol of Accessibility in accordance with ICC A117.1-2009 Accessible and Usable Buildings or 2010 ADA Standards for Accessible Design and the Texas Accessibility Standards.
- E. Related Work:
 - 1. Pavement Marking Contractor shall verify compatibility with sealers, joint sealants, caulking and all other surface treatments as specified in Division 07.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Provide product data as follows:

1. Manufacturer's certification that the material complies with standards referenced within this Section.
 2. Intended paint use.
 3. Pigment type and content.
 4. Vehicle type and content.
- C. Submit list of similar projects (minimum of 5) where pavement-marking paint has been in use for a period of not less than 2 yrs.

1.4 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degrees F.
- B. Do not apply paints in rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

1.5 QUALITY ASSURANCE

- A. Provide written 1 year warranty to Owner that pavement markings will be free of defects due to workmanship, inadequate surface preparation, and materials including, but not limited to, fading and/or loss of markings due to abrasion, peeling, bubbling and/or delamination. Excessive delamination, peeling, bubbling or abrasion loss shall be defined as more than 15% loss of marking material within one year of substantial completion and/or occupancy of the parking area. With no additional cost to Owner, repair and/or recoat all pavement marking where defects develop or appear during warranty period and all damage to other Work due to such defects.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pavement marking materials shall meet Federal, State and Local environmental standards.
- B. Paint shall be manufactured and formulated from first grade raw materials and shall be free from defects or imperfections that might adversely affect product serviceability.
- C. Paints shall comply with the National Organic Compound Emission Standards for Architectural Coatings, Environmental Protection Agency, 40 CFR Part 59.
- D. The product shall not contain mercury, lead, hexavalent chromium, or halogenated solvents.

2.2 PAVEMENT MARKING PAINTS:

- A. Solvent based paint may be employed for yellow or white pavement markings and shall meet the requirements of MPI #32.
- B. 100% acrylic waterborne - paint shall be used for yellow or white pavement markings and shall meet requirements of MPI #70.

1. All products shall have performance requirements of Type I and II of Federal Standard TT-P-1952E.
 2. 100% acrylic waterborne paint for special color pavement markings (blue) shall meet requirements of Federal Specification TT-P-1952E. Special color marking materials shall be compatible with the yellow pavement markings where they are layered.
- C. Thermoplastic pavement markings are to be utilized for all fire lane delineation, traffic lane delineation, arrows and stop bars within the lanes of travel.

2.3 COLOR OF PAINT

- A. Paint color of all parking spaces shall be White. Traffic yellow, where shown on Contract Drawings or specified herein, shall match federal color chip No. 33538 commonly referred to as federal highway yellow. Color shall have daylight directional reflectance (without glass beads) of not less than 50% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.
- B. Paint color for blue accessible parking space pavement markings shall match federal color chip No. 35180. Color shall have daylight directional reflectance (without glass beads) of not less than 52% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.
- D. Striping shall not be placed until full cure of concrete slab and sealer. Concrete surfaces generally require 30 to 90 days @ 70°F or higher. Sealers (other than silane) generally require 14 days @ 70°F or higher. Silane sealers require 24 hrs @ 70°F or higher.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Do not paint or finish any surface that is wet or damp.

- C. Clean substrates of substances that could impair bond of paints, including dirt, dust, oil, grease, and incompatible paints and encapsulants.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Lay out all striping on each tier, using dimensions and details shown on Contract Drawings, before painting that tier. Report any discrepancies, interferences or changes in striping due to field conditions to Engineer/Architect prior to painting. Pavement Marking Contractor shall be required to remove paint, repair surface treatment and repaint stripes not applied in strict accordance with Contract Drawings.
- F. Work Areas:
 - 1. Store, mix and prepare paints only in areas designated by Contractor for that purpose.
 - 2. Provide clean cans and buckets required for mixing paints and for receiving rags and other waste materials associated with painting. Clean buckets regularly. At close of each day's Work, remove used rags and other waste materials associated with painting.
 - 3. Take precautions to prevent fire in or around painting materials. Provide and maintain appropriate hand fire extinguisher near paint storage and mixing area.
- G. Mixing:
 - 1. Do not intermix materials of different character or different manufacturer.
 - 2. Do not thin material except as recommended by manufacturer.
- H. Disposal:
 - 1. Contractor shall properly dispose of unused materials and containers in compliance with Federal Resource Conservation Recovery Act (RCRA) of 1976 as amended, and all other applicable laws and regulations.

3.3 APPLICATION

- A. Apply paint in 2-coat system; first coat shall be 50% of total 15 wet mil minimum thickness, not to exceed 8 mils. First coat shall be cured prior to installation of second coat. At Contractor's option, one coat may be applied before substantial completion, with a second coat delayed for 3-6 months until weather conditions are appropriate and the concrete has cured sufficiently for proper adhesion.
 - 1. Two coat system total wet mil thickness of 0.015 in (0.381 mm).
- B. Apply painting and finishing materials in accordance with manufacturer's directions. Use applications and techniques best suited for material and surfaces to which applied. Minimum air shall be used to prevent overspray. Temperature during application shall be minimum of 40° F and rising, unless manufacturer requires higher minimum temperature. Maximum relative humidity shall be as required by manufacturer.
- C. All lines shall be straight, true, and sharp without fuzzy edges, overspray or non-uniform application. Corners shall be at right angles, unless shown otherwise, with no overlaps. Line width shall be uniform (-0%, +5% from specified width). No excessive humping (more material in middle than at edges or vice versa).

END OF SECTION 099120

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

**SECTION 09 91 23
INTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Prime surfaces to receive wall coverings.
 - 2. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - d. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
 - 6. Marble, granite, slate, and other natural stones.
 - 7. Floors, unless specifically indicated.
 - 8. Ceramic and other tiles.
 - 9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 10. Glass.
 - 11. Concrete masonry units in utility, mechanical, and electrical spaces.
 - 12. Acoustical materials, unless specifically indicated.
 - 13. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 13 - Exterior Painting.

1.03 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
- B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating 2005 (Reapproved 2017).
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- E. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
- F. SSPC-SP 2 - Hand Tool Cleaning 2018.
- G. SSPC-SP 6 - Commercial Blast Cleaning 2007.
- H. SSPC-SP 13 - Surface Preparation of Concrete 1997 (Reaffirmed 2003).

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.
 - 3. Allow 30 days for approval process, after receipt of complete samples by Architect.
 - 4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F (3 degrees C) above the dew point; or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints:
 - 1. Sherwin-Williams Company: www.sherwin-williams.com.
- C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Colors: As indicated on drawings.
 - 1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - INTERIOR

- A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, plaster, uncoated steel, shop primed steel, galvanized steel, and aluminum.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
 - a. Products:
 - 1) Sherwin-Williams Pre-Catalyzed Waterbased Epoxy, Eg-Shel. (MPI #139)
- B. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, galvanized piping, and [_____].
 - 1. Shop primer by others.
 - 2. One top coat Dry Fall.
 - 3. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
 - a. Products:
 - 1) Sherwin-Williams Waterborne Acrylic Dryfall, Flat. (MPI #118)
 - 2) Substitutions: Section 01 60 00 - Product Requirements.
- C. Paint MI-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
 - 1. One coat of SW B66310 Series, ProCryl Universal Water Based Primer.
 - 2. Semi-gloss: Two coats of alkyd enamel; B531150 Series, WB Alkyd Urethane Enamel SemiGloss.
- D. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
 - 1. One coat of SW B66310 Series, ProCryl Universal Water Based Primer.
 - 2. Semi-gloss: Two coats of latex enamel; B531150 Series, WB Alkyd Urethane Enamel SemiGloss.
- E. Paint MI-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
 - 1. Touch-up with alkyd primer.
 - 2. Semi-gloss: Two coats of alkyd enamel; B531150 Series, WB Alkyd Urethane Enamel SemiGloss.
- F. Paint Mgl-OP-3L - Galvanized Metals, Latex, 3 Coat:
 - 1. One coat SW B66310 Series, ProCryl Universal Water Based Primer.
 - 2. Semi-gloss: Two coats of latex enamel; B66350 Series, SherCryl HPA SemiGloss.
- G. Paint GI-OP-3A - Gypsum Board/Plaster, Alkyd, 3 Coat:
 - 1. One coat of alkyd primer sealer.
B28W2600, ProMar 200 Zero VOC Interior Latex primer sealer

2. Eggshell: Two coats of alkyd enamel; B202600 Series, ProMar 200 Zero VOC Interior Latex EgShel.
- H. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
1. One coat of alkyd primer sealer.
B28W2600, ProMar 200 Zero VOC Interior Latex primer
 2. Semi-gloss: Two coats of latex enamel; [_____].
 3. Flat: Two coats of latex enamel; B302600 Series, ProMar 200 Zero VOC Interior Latex Flat.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 1. Gypsum Wallboard: 12 percent.
 2. Plaster and Stucco: 12 percent.
 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete:
 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi (10,350 to 27,580 kPa) at 6 to 12 inches (150 to 300 mm). Allow to dry.
 3. Clean concrete according to ASTM D4258. Allow to dry.
 4. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- G. Masonry:
 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 2. Prepare surface as recommended by top coat manufacturer.
 3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi (4,140 to 10,350 kPa) at 6 to 12 inches (150 to 300 mm). Allow to dry.
- H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

- I. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- J. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.
- K. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- L. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- M. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- N. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- O. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.
- P. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- Q. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Sand wood and metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

**SECTION 09 96 00
HIGH-PERFORMANCE COATINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. High performance coatings.
- B. Surface preparation.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 23 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

1.03 REFERENCE STANDARDS

- A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
- B. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
- C. SSPC-SP 2 - Hand Tool Cleaning 2018.
- D. SSPC-SP 6 - Commercial Blast Cleaning 2007.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Samples: Submit two samples 8 by 8 inch (203 by 203 mm) in size illustrating colors available for selection.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- D. Maintenance Data: Include cleaning procedures and repair and patching techniques.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Coating Materials: 1 gallon (4 liters) of each type and color.
 - 2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document that applies to application on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- C. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

- A. Do not install materials when temperature is below 55 degrees F (13 degrees C) or above 90 degrees F (32 degrees C).
- B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
- C. Restrict traffic from area where coating is being applied or is curing.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. High-Performance Coatings:
 - 1. Sherwin-Williams Company; [____]: www.protective.sherwin-williams.com/industries/#sle.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.

2.02 TOP COAT MATERIALS

- A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
- B. Shellac: Pure, white type.

2.03 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.
- C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- E. Proceed with coating application only after unacceptable conditions have been corrected.
 - 1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

- A. Clean surfaces of loose foreign matter.
- B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
- C. Remove finish hardware, fixture covers, and accessories and store.
- D. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- E. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.
- F. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

- A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

- A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in "MPI Architectural Painting and Specification Manual".
- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

- A. Protect finished work from damage.

END OF SECTION

SECTION 10 14 00
SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes following types of signs:
 - 1. Reflective vehicular directional and information signs (V- Signs).
 - 2. Retroreflective regulatory signs (R- Signs).
 - 3. Non-reflective pedestrian directional and informational signs (PP- Signs).
 - 4. PVC Pipe Clearance Signs (PVC- Signs).
 - 5. Vandal-resistant Signs (VR- Signs).
 - 6. Brailled ADA Compliant Identification Signs (A-Signs).

1.3 SUBMITTALS

- A. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.
- B. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, mounting heights, anchors, grounds, reinforcement, accessories, layout, spacing, dimensions and installation details.
 - 1. Provide message list, typestyles, graphic elements, including tactile characters and Braille as shown on drawings, and layout of lettering. Include large scale details of sign layout.
 - 2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
- C. Samples: Provide following samples of each sign component for verification of compliance with requirements indicated.
 - 1. Samples of each sign material type (V-, R-, PP-, VR-, etc), on not less than 6-in. squares of extrusion, sheet or plate, showing full range of colors to be provided.
 - 2. Dimensional characters and castings: Full size sample showing character, material, texture, finish, color, style and attachment method.
 - 3. Brailled Copy: Sample of ADA compliant sign showing raised image text, brailled copy and colors.
- D. Maintenance Data: For signage cleaning and maintenance requirements to be included in maintenance manual.

1.4 QUALITY ASSURANCE

- A. Qualifications: Manufacturers: Only pre-approved manufacturers as listed herein allowed. Sign manufacturer shall have completed a minimum of 3 projects in last 3 years with similar materials and methods of manufacture as required for this project.
- B. Where warranties are required, manufacturer and/or installers shall be authorized by the entity providing the warranty.
- C. All completed signs shall be free from defects in materials and workmanship and effectively present specified or permitted message under both day and night viewing conditions. Sign faces shall be reasonably smooth, shall exhibit uniform color and brightness over entire background surface and shall not appear mottled, streaked, or stained when viewed either in ordinary daylight or incidental beams of automobile headlamps.
- D. Regulatory Requirements:
 - 1. Comply with Americans with Disabilities Act (ADA) and state and local codes as adopted by authorities having jurisdiction. Signs affected, may include, but not be limited to:
 - a. Permanently Designated Rooms and Spaces: A- Signs.
 - b. Elevator Signs.
 - c. Stairway Identification.
 - 2. MUTCD:
 - a. Regulatory R- signs shall be fully compliant with all requirements of the Manual on Uniform Traffic Control Devices (MUTCD) except that sign size may be modified due to space constraints.
- E. Single-Source Responsibility: For each separate required type of sign as defined herein, obtain signs from a single firm specializing in this type of work so that there will be undivided responsibility for such work.
- F. Design Criteria: Drawings indicate sizes, profiles, and dimensional requirements of signs. Other signs with deviations from indicated dimensions and profiles may be considered, provided deviations do not change design concept. Burden of proof of equality is on proposer.
- G. Coordinate sign placement with structural configuration and lighting location. Before sign installation, arrange meeting with Engineer/Architect and lighting installer at site to review sign placement. Additional compensation not allowed for relocating signs after installation if relocation required due to conflicts with lighting or structure.
- H. Trade Names: Do not display manufacturer's name, trade name, trademarks, or similar markings on exterior or visible surfaces.
- I. Sign Quantity Count: Sign Fabricator shall be responsible for determining the final quantity count of all signs, as indicated on the Signage Schedule and Location Plans, prior to fabrication.
- J. Provide written 5 year full replacement warranty to Owner that all signage will be free of defects due to workmanship and materials including, but not limited to, fading, peeling, delamination, and installation. With no additional cost to Owner, repair all defects that develop during warranty period and all damage to other Work due to such defects.
- K. Finishes Warranty: Submit five-year written warranty, signed by the Contractor and Installer, warranting that the architectural signage finishes will not develop excessive fading or excessive

non-uniformity of color or shade and will not crack, peel, pit or corrode or otherwise fail as a result in defects, within the warranty period, make necessary repairs or replacement at the convenience of the owner or facility's management.

1. "Excessive Fading": A change in appearance which is perceptible and objectionable as determined by the Designer when visually compared with the original color range standards.
 2. "Excessive Non-Uniformity": Non-Uniform fading during the period of the guarantee, to the extent that adjacent panels have a color difference greater than the original acceptance range of color.
 3. "Will Not Pit or Otherwise Corrode": No Pitting or other type of corrosion discernible from a distance of 10'-0", resulting from the natural elements in the atmosphere at the project site.
- L. Replacement or Repairs: The owner or facilities management shall have the right to continue use of the defective part until such time that the part is replaced or repaired without loss or inconvenience to the owner or facility's management. Warranties shall also state that the replaced or repaired part shall have a warranty period equal to the remaining warranty period for the replaced or repaired part plus an additional one year.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting and mounting. Where sizes of signs may be affected by dimensions of surfaces on which they are installed, verify dimensions by field measurement. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1.6 COORDINATION

- A. For signs to be supported by or anchored to permanent construction, provide installers with specific requirements for anchorage devices. Furnish templates for installation.

1.7 MAINTENANCE

- A. Maintenance Instruction: Furnish maintenance manual to instruct the owner or facility's management personnel in procedures to be followed in cleaning and maintaining the signage. Provide manufacturer's brochures describing the actual materials used in the Work, including metal alloys and finishes.
1. Include a list of cleaning materials appropriate for continued cleaning of signs. Include written instructions for proper maintenance, service access, replacement procedures, etc. Include recommended methods for removal of residual adhesives from wall surfaces after removal of adhesive mounted signs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Product: Where named products are specified, subject to compliance with requirements specific to this project, provide either named product or an equivalent product by other manufacturers specified.
- B. Manufacturers: Subject to compliance with requirements specific to this project, accepted manufacturers listed in Part 2 are considered to have been prequalified in conformance with paragraph 1.4.A and B of this section. Acceptable manufacturers include, but are not limited to the following:
 - 1. Manufacturers of panel signs, including V-,R-, PP-, and VR- signs:
 - a. ABC Architectural Signing System, Division of Nelson-Harkins Industries.
 - b. Alcan Composites, Benton, KY.
 - c. Allenite, A Division of Allen Marking Products, Inc.
 - d. Andco Industries Corp.
 - e. APCO Graphics, Inc.
 - f. Architectural Graphics, Inc.
 - g. ASI Sign Systems, Inc.
 - h. Best Manufacturing Co.
 - i. Interstate Highway Sign Corp.
 - j. Henry Graphics.
 - k. Britten Studios.
 - l. Pannier Graphics.
 - m. Tapco.
 - n. Vomar.
 - o. Signs + Decal Corp., Brooklyn, NY
 - 2. Manufacturers of Brailled Signs (A-):
 - a. Supersine Company.
 - b. Jet Signs.
 - c. Britten Studios.
 - d. Signs + Decal Corp., Brooklyn, NY

2.2 MATERIALS

- A. Graphics:
 - 1. Graphics shall be highest quality with sharp lines and smooth curves. Images shall be uniform colors and free from streaks or spotting.
 - 2. Content and Style: Provide sign copy that complies with requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices. Notations contained within the comments section of the sign schedule indicate additional text required on sign such as street name, etc. Notations contained within parenthesis () in the sign schedule and instructions for logos or symbols that are to be included on the sign, as shown on the design drawings. Refer to the sign schedule for copy, description of signs, and reference to sign types.
 - 3. Pressure applied graphics:
 - a. Where pressure-applied graphics applied to a painted background are specified or permitted, the paint shall be flat, opaque acrylic polyurethane as recommended by manufacturer of substrate and graphic media.

- b. Where pressure-applied, reflective graphics on an opaque painted background are specified or permitted, letters shall be digitally produced, and cut by electronic cutting machines from 3M Scotchlite Electrocut Engineer Grade Sheeting Series 3260 material, colors as noted on drawings or equivalent. Edges shall be sealed per manufacturer recommendation.
 - c. Where pressure-applied, reflective graphics on a reflective background are specified or permitted, the sheeting material shall be 3930 Hi Intensity Prismatic or equivalent meeting US Department of Transportation Standard Specification for Construction of Roads and Bridges on Federal Highway Products, 1985 FP-85, Type IIIA, Section 718.01. The letters shall be digitally produced, and cut by electronic cutting machines from 3M Scotchlite Electronic Cutable Film Series 1170, colors as noted on drawings or equivalent.
 - d. Where pressure-applied, non-reflective graphics are specified, letters shall be digitally produced, and cut by computer-driven processes from 3M Scotchlite Electrocut 7725 film.
 - e. Where electronically cut letters and symbols are specified, the inside corners shall be rounded using the largest radius consistent with acceptable appearance. Minimum radius shall be 1/8 inch on a 3 inch letter. Use prespacing tape as recommended by manufacturer of sheeting as a carrier for letters, numerals and symbols.
4. All products specified to employ 3M sheeting, films, or other components shall be guaranteed and backed by 3M MCS Warranty or equivalent.

B. Paints:

1. All paints shall be a type made for surface material to which it is applied, and recommended by manufacturer. Exact identification shall be noted on shop drawings, with data describing application method, if other than air-drying. Prohibited: paint that will fade, discolor, or delaminate due to UV or heat exposure.
2. Paints: all materials best quality. Products of DuPont DeNemours & Company, Pittsburgh Plate Glass Company, Glidden, Matthews or Sherwin-Williams acceptable.
 - a. Opaque background for pressure applied graphics: Two part acrylic polyurethane, low gloss. Care shall be taken to provide proper curing so that outgassing does not occur after application of sheeting and/or graphics.
3. Applied paint color shall conform to color and accelerated weathering requirements of FP-79 and shall not be removable when tested by Film Adhesion Test and by Film Hardness Test.

C. Blank Panels: Comply with requirements indicated for materials, thickness, finish, color, design, shape, size, and details of construction.

1. General:
 - a. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 0.0625 in. measured diagonally.
 - b. The back side and edges of all panel signs shall be painted with acrylic polyurethane, color to match the specified background color.
 - c. Edge Condition: Square cut.
 - d. Corner Condition: Square cut for all signs except Regulatory signs. Regulatory sign corners shall be rounded per MUTCD.
2. Aluminum:

- a. Provide aluminum sheet of 6061-T6 or 5052-H38 alloys and temper recommended by aluminum producer or finisher for use type and finish indicated, and with not less than strength and durability properties specified in ASTM B209 for 5005-H15.
 - b. Aluminum extrusions shall be of alloy and temper recommended by aluminum producer for type of use and finish and with not less than strength and durability properties specified in ASTM B221 for 6063-T5.
 - c. Panels shall be etched, degreased, flat, and free of ragged edges. Radius corners by stamping. All signs of same size shall be totally uniform in size. Surface shall be completely clear of dust and dirt before finishes applied.
 - d. Panels to receive 3M sheeting and/or paint shall be treated with an anodizing conversion coating to provide resistance to corrosion and white rust formation. Conversion coating may be:
 - 1) Chromate, meeting ASTM B449 class 2. Coating weight should be 10 to 35 mg per sq ft with a median of 25 mg per square foot. Coating shall not be dusty and shall be tightly bonded within itself and to the aluminum substrate.
 - 2) Non-chromate coatings must meet the requirements for ASTM B449 class 1 chromate coatings. The non-chrome coating shall be adherent and non-powdery. Adhesion of air dried acrylic coating shall meet ASTM D 3359 or ASTM D 4541 and must be equivalent to that of the coating on chromate coated aluminum of the same alloy.
 - e. Fabricate aluminum signs with adequately sized, full-length stiffener members as indicated on Drawings.
- D. V- Signs: Vehicular signs with reflective graphics and retroreflective message on an opaque background.
1. Base materials:
 - a. Aluminum with pressure-applied retroreflective letters.
 2. Graphics and Copy: Any of the following methods of producing graphics and copy may be employed.
 - a. Pressure applied retroreflective white letters/symbols. Use 3M High Intensity Prismatic White Sheeting 3930.
- E. R- Regulatory vehicular signs with retroreflective graphics and message on a retroreflective background.
1. All regulatory signs to fully comply with MUTCD standards.
 2. Base material: Aluminum.
 3. R signs shall have retroreflective messages and retroreflective background using pressure applied retroreflective letters and symbols.
 4. Retroreflective colors determined by 23 CFR Appendix to Subpart F of Part 655, Alternate Method to Determining the Color of Retro-reflective Sign Materials and pavement marking materials.
 - a. Federal Highway Authority (FHWA) Reflective Sheeting Identification Guide using ASTM D 4956-04.
 - b. Sheeting Types I through IX.
 - c. The daytime color of non-fluorescent retroreflective materials may be measured in accordance with ASTM Method E 1349, Standard Test Method for Reflectance

Factor and Color by Spectrophotometry using Bi-directional Geometry of ASTM Test Method E 1347. Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry.

- d. The geometric conditions to be used in both test methods are 0/45 or 45/0 circumferential illumination or viewing. The CIE standard illuminant used in computing the colorimetric coordinates shall be D 65.
- e. For fluorescent retroreflective materials ASTM E991 may be used to determine the chromaticity provided that the D65 illumination meets the requirements for E 991.
- f. The following 3M Diamond Grade DG³ Reflective Sheeting materials meet the MUTCD retroreflective requirements:

- 1) White – DG³4090
- 2) Red - DG³ 4092
- 3) Blue – DG³ 4095
- 4) Yellow - DG³ 4091
- 5) Green – DG³ 4097
- 6) Brown – DG³ 4099
- 7) Fluorescent Yellow – DG³ 4081
- 8) Fluorescent Yellow Green – DG³ 4083
- 9) Fluorescent Orange - DG³ 4084

F. PP- Pedestrian Panel Wayfinding and Directional Signs.

1. Base materials:

- a. Aluminum with pressure-applied letters.

2. Graphics and Copy: Any of the following methods of producing graphics and copy may be employed:

- a. Pressure applied non-reflective letters/symbols.

G. PVC- Signs: PVC pipe clearance signs shall have pressure applied decals on black PVC pipe, rectangular retroreflective yellow base sticker 3M Diamond Grade yellow sheeting DG³ 4091 with black border, rounded corners, and black text. See drawings.

1. Electronically cut letters: 3M Scotchlite 3840 reflective sheeting.
2. 8 in. diameter, Schedule 40 PVC pipe, Corrosion Fluid Products Corporation, Addison, IL, or accepted equivalent. Color black.
3. If black PVC is not available, Paint: "Spraylat" Lacryl B No. 482 High Hiding Black. Meet Lacryl system specifications for painting on PVC.

H. VR- Signs: Vandal-resistant signs where specified, shall have copy and graphics on second surface.

1. Base material shall be the following:

- a. "Lexan" General Electric Co., or accepted equivalent. Permanently laminate face panels to backing sheets of material and thickness indicated using manufacturer's standard process. Except where digital art is required, signs shall be silk screened on second surface or single sheet.

2. Sign shall not be permanently defaced by steam, acids, aromatics, scratching, inks or paints and should be capable of being readily wiped clean with paint remover without affecting appearance or legibility of graphics. Sign shall retain legibility and finished

appearance when sprayed with a 10% solution of hydrochloric, nitric or sulfuric acid for one-half hour or when scrubbed by a brush of medium hardness using common commercial cleaning compounds such as ammonia, laundry soaps, detergents, carbon tetrachloride or petroleum based solvents.

3. Sign shall be translucent with a clear or matte finish, as indicated. The index of refraction shall ensure clarity of color, copy and graphics.
 4. Sign shall be router cut with sign edges not crazed or cracked and edge finish shall be smooth, neat and clean.
 5. Original art and/or multi-colored graphics shall be digitally produced, electronic media.
 6. Use colored coatings, including inks and paints for copy and background colors, recommended by manufacturer of sheet for optimum adherence to sheet surface and that are non-fading for application.
 7. Fasteners shall be mechanical, concealed and tamper proof.
- I. A- Signs: All signs required to be brailled in compliance with ADA requirements for designating permanent rooms and spaces shall comply with ADA Accessibility Guidelines (ADAAG) as published by the Architectural and Transportation Barriers Compliance Board and ICC/ANSI A117.1. latest editions.
1. Aluminum:
 - a. Text to be produced with Supersine process die-cut raised letters and brailled copy.
 2. Phenolic-Backed Photopolymer Sheet, "Jet-388 Phenolic Signage" by JetUSA or equivalent. Provide light sensitive, water-wash photopolymer face layer bonded to a phenolic base layer to produce composite sheet with overall thickness of 0.15 inches, and substrate thickness of 0.12 inches and a Type D Shore Durometer hardness of 95.
 3. Lettering and Grade II brailled to be raised 1/32". Lettering to be painted white matte finish. Grade II brailled to be painted out with matte finish background in color shown on drawings. Edges painted same as face.
 4. Produce precisely formed characters with square cut edges free from burrs and cut marks.
 5. Fasteners shall be mechanical, concealed and tamper proof.
- J. Fasteners and Supports:
1. Bolts, nylon insert lock nuts: ASTM A 320, Grade B stainless steel.
 2. Rivets for signs: ASTM B 316, Alloy 6063-T61 or equivalent. Aluminum alloy blind rivets of self-plugging variety may be substituted for solid aluminum alloy rivets, subject to acceptance by Engineer/Architect.
 3. Use concealed fasteners fabricated from metals not corrosive to sign material and mounting surface.
 4. Anchors and Inserts: Use nonferrous metal or hot dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled in place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
 5. Sign posts: ASTM A 499 Grade 60 or ASTM A 576, Grade 1080 and meeting mechanical properties specified in ASTM A 499 for Grade 60 steel.
 6. Posts shall be zinc coated per ASTM A 123. Posts shall be straight, with smooth, uniform finish, free from defects affecting strength, durability, or appearance. Punch bolt holes such that post face shall be smooth and even. All holes and ends shall be burr free. After all fabrication, flow coat posts with durable, exterior type, rust inhibiting paint. Paint color: black, unless otherwise indicated on Drawings.
 7. Adhesives, where used for wall mounted signs, shall be per the sign material manufacturer's recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Locate signs where shown using mounting methods of type described and in compliance with manufacturer's instructions. Install sign units level, plumb, and at height shown, with sign surfaces free from appearance defects.
- B. For drilled anchors in concrete, verify location of embedded reinforcing steel or pre-stressing cables prior to installation.
- C. Wall Mounted Panel Signs: Attach to wall surfaces with Hilti "Hit" anchors or ITW Ramset/Red Head Hammer Set anchors into concrete or masonry surfaces as shown on Drawings. DO NOT OVERDRIVE anchors, as overdriven anchors will damage sign faces and spall concrete.
- D. Bracket Mounted Units: Provide manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs which project at right angles from walls or ceilings. Attach brackets securely to walls or ceilings with concealed fasteners and anchors per manufacturer's directions.
- E. Installation of signs shall conform to requirements of Americans with Disabilities Act (ADA) and/or state or local accessibility standards.

3.2 CLEANING AND PROTECTION

- A. At completion of installation, clean soiled sign surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by Owner.
- B. Cleanup: During progress of Work, remove from site all discarded materials and rubbish at end of each day.

END OF SECTION 101400

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

**SECTION 10 14 00.01
BUILDING SIGNAGE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Room and door signs.
- B. Interior directional and informational signs.
- C. Building identification signs.
- D. Building signage

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Flat Signs:
 - 1. ASI Sign Systems.
 - 2. Turner Sign Systems
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Dimensional Letter Signs:
 - 1. A.R.K. Ramos Architectural Signage Systems; Cast Aluminum Letters: www.arkramos.com/#sle.
 - 2. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com/#sle.
 - 3. FASTSIGNS; [____]: www.fastsigns.com/#sle.
 - 4. Inpro; [____]: www.inprocorp.com/#sle.
 - 5. ASI Sign Systems.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 Texas Accessibility Standards, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
 - 1. Sign Type: Flat signs with engraved panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and Grade II braille.
 - 3. Character Height: [3/4] inch ([____] mm).
 - 4. Sign Height: [4 x 8] inches ([____] mm), unless otherwise indicated.
 - 5. Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
 - 6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings.
 - 7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
 - 8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.
- C. Interior Directional and Informational Signs:
 - 1. Sign Type: Same as room and door signs.
 - 2. Allow for 10 signs 4 inches high by 16 inches long.
 - 3. Where suspended, ceiling mounted, or projecting from wall signs are indicated, provide two-sided signs with same information on both sides.
- D. Building Identification Signs:
 - 1. Use individual metal letters.
 - 2. Mount on outside wall in location indicated on drawings.
 - 3. Font: To match county standards.

2.03 SIGN TYPES

- A. Flat Signs: Signage media without frame.
 - 1. Edges: Square.
 - 2. Corners: Square.
 - 3. Wall Mounting of One-Sided Signs: Tape adhesive.
 - 4. Wall and Ceiling Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.
 - 5. Suspended Mounting: Stainless steel suspension cables, cable clamps, and ceiling fastener suitable for attachment to ceiling construction indicated.
- B. Color and Font: Unless otherwise indicated:
 - 1. Character Font: Helvetica, Arial, or other sans serif font.
 - 2. Character Case: Upper case only.
 - 3. Background Color: To be selected by Architect..
 - 4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
 - 1. Total Thickness: 1/16 inch (1.6 mm).

- B. Applied Character Panels: Acrylic plastic base, with applied acrylic plastic letters and braille.
 - 1. Total Thickness: 1/8 inch (3 mm).
 - 2. Letter Thickness: 1/8 inch (3 mm).
 - 3. Letter Edges: Square.

2.05 DIMENSIONAL LETTERS

- A. Metal Letters:
 - 1. Metal: Aluminum sheet, fabricated reverse channel and Aluminum Casting as indicated on drawings.
 - 2. Metal Thickness: As indicated on drawings.
 - 3. Letter Height: As indicated on drawings.
 - 4. Finish: As selected by Architect from manufacturer's full range.
 - 5. Mounting: As indicated on drawings.

2.06 ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal at all building mounted signage.
- B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

**SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Solid plastic toilet compartments.

1.02 REFERENCE STANDARDS

- A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth 2019.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on panel construction, hardware, and accessories.
- C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- D. Samples: Submit two samples of partition panels, ____by____ inch (____by____ mm) in size illustrating panel finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Solid Plastic Toilet Compartments:
 - 1. Scranton Products; Hiny Hiders Partitions: www.scrantonproducts.com/#sle.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted unbraced.
 - 1. Doors:
 - a. Thickness: 1 inch (25 mm).
 - b. Width: 24 inch (610 mm).
 - c. Width for Handicapped Use: 36 inch (915 mm), out-swinging.
 - d. Height: 55 inch (1397 mm).
 - 2. Panels:
 - a. Thickness: 1 inch (25 mm).
 - b. Height: 55 inch (1397 mm).
 - c. Depth: As indicated on drawings.
 - 3. Pilasters:
 - a. Thickness: 1 inch (25 mm).
 - b. Width: As required to fit space; minimum 3 inch (76 mm).

2.03 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches (76 mm) high; concealing floor fastenings.
 - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile.
- C. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
- D. Hinges: Stainless steel, manufacturer's standard finish.
 - 1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
- E. Door Hardware: Stainless steel, manufacturer's standard finish.
 - 1. Door Latch: Slide type with exterior emergency access feature.

2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
 3. Provide door pull for outswinging doors.
- F. Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch (6 mm).
- B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).
- B. Adjust hinges to position doors in partial opening position when unlatched. Return outswinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

**SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Diaper changing stations.
- C. Utility room accessories.

1.02 REFERENCE STANDARDS

- A. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2017).
- B. ASTM C1036 - Standard Specification for Flat Glass 2021.
- C. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use 2004, with Editorial Revision (2016).

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. American Specialties, Inc; [____]: www.americanspecialties.com/#sle.
 - 2. KC In-Sight
 - 3. KC Professional
 - 4. Georgia-Pacific Professional; [____]: www.blue-connect.com/#sle.
 - 5. Bobrick; www.bobrick.com.
 - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Diaper Changing Stations:
 - 1. Koala Kare Products; [____]: www.koalabear.com/#sle.
 - 2. Substitutions: 01 60 00 - Product Requirements.

2.02 COMMERCIAL TOILET ACCESSORIES

- A. Grab Bars: Stainless steel, smooth surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
 - b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
 - c. Length and Configuration: As indicated on drawings.

2.03 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Stainless steel.
 - 2. Mounting: Surface.
 - 3. Minimum Rated Load: 250 pounds (113.4 kg).

2.04 UTILITY ROOM ACCESSORIES

- A. Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, hat-shaped channel.

1. Holders: Three spring-loaded rubber cam holders.
2. Length: 36 inches (900 mm).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.
- E. See Section Division 06 for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
 1. Grab Bars: As indicated on drawings.
 2. Other Accessories: As indicated on drawings.

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

**SECTION 10 44 00
FIRE PROTECTION SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 REFERENCE STANDARDS

- A. NFPA 10 - Standard for Portable Fire Extinguishers 2017, with Errata (2018).

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features.
- C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.04 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Ansul, a Tyco Business; [____]: www.ansul.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp; [____]: www.kidde.com/#sle.
 - 3. Nystrom, Inc; [____]: www.nystrom.com/#sle.
 - 4. Pyro-Chem, a Tyco Business; [____]: www.pyrochem.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Larsen's Manufacturing Co; Architectural Series:: www.larsensmfg.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: A:B:C type.
 - 2. Size: 10 pound (4.54 kg).
 - 3. Finish: Baked polyester powder coat, red color.
 - 4. Temperature range: Minus 40 degrees F (Minus 40 degrees C) to [____] degrees F ([____] degrees C).

2.03 FIRE EXTINGUISHER CABINETS

- A. Cabinet Construction: Non-fire rated.
 - 1. Formed primed steel sheet; 0.036 inch (0.9 mm) thick base metal.
- B. Cabinet Configuration: Semi-recessed type.
 - 1. Size to accommodate accessories.
 - 2. Trim: Flat square edge, with 1-1/4"[____] inch ([____] mm) wide face.
- C. Door: 0.036 inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.

- D. Door Glazing: Acrylic plastic, clear, 1/8 inch (3 mm) thick, flat shape and set in resilient channel glazing gasket. "Duo with Larsen Loc" by Larsen Manufacturing.
- E. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.
- F. Finish of Cabinet Interior: White colored enamel.
- G. Lock: Provide Larsen Loc by Larsen Manufacturing.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. Cabinet Signage: Die cut lettering, white..

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, [] inches ([] mm) from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.

END OF SECTION

**SECTION 10 56 17
WALL MOUNTED STANDARDS AND SHELVING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Steel shelf standards, brackets, and accessories.
- B. Aluminum shelf standards, brackets, and accessories.

1.02 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).
- B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.
- C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Shelving:
 - 1. Rakks/Rangine Corporation; Aluminum Shelving: www.rakks.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

- A. Aluminum Shelf Standards, Brackets, and Accessories:
 - 1. Aluminum Components: ASTM B221 (ASTM B221M), alloy 6063, temper as indicated, with anodized finish complying with to AAMA 611, or powder coating complying with AAMA 2603 or AAMA 2604 for select colors.
 - 2. Wall-Mounted Shelf Standards: Channel type extruded aluminum standards mounted on walls and designed to hold shelf support brackets inserted into channel ends or access slots and slid to desired position.
 - a. Material: Extruded aluminum, ASTM B221 6063-T6 alloy and temper.
 - b. Lengths: As required to support shelving indicated.
 - c. Finish: Black anodized.
 - d. Mounting: Surface.
- B. Fasteners: Screws as recommended by manufacturer for intended application or as otherwise required by project conditions. Finish of exposed to view fasteners to match finish of standards and other components.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mount standards to solid backing capable of supporting intended loads.
- C. Install brackets, shelving, and accessories.
- D. Provide double sided foam tape between adjoining sections of aluminum shelving to maintain alignment.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

**SECTION 10 73 10
PREFINISHED ALUMINUM CANOPIES AND SHADE STRUCTURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pre-engineered metal vertical fins.
- B. Pre-engineered metal canopy systems.

1.02 REFERENCE STANDARDS

- A. The Aluminum Association - Aluminum Design Manual 2010
- B. American Welding Society - AWS D1.2/D1.2M: 2008

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of canopies with concealed structural backing, structural foundations and electrical work to be concealed within the canopy framing.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's published manuals and literature..
- C. Shop Drawings: Indicate complete layout including sections and details specific to the application and bearing the seal of a registered structural engineer. Indicate routing of conduits, sprinkler system etc.
- D. Structural Information: Provide engineered column reactions for review prior to start of foundation work.
- E. Samples: Submit two 4x6 inch in size, illustrating system finish. Submit a 12" long section of the primary framing components indicating the proposed finish as well as a 16"x16" sample of the proposed shading infill panel indicating the proposed finish.
- F. Designer's Qualification Statement.
- G. Specimen Warranty.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 FIELD CONDITIONS

- A. Existing Conditions: See subsurface investigation report; see Section 00 31 00.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Finish Warranty: Provide manufacturer's two year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Avadek Walkway Covers and Canopies (www.avadek.com)
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DESIGN REQUIREMENTS

- A. Provide a complete drainage system including internal gutters and downspouts.
- B. Conceal fasteners and connections as much as possible.
- C. Where connecting to building, use a minimal tab penetration through exterior wall.
- D. Coordinate blocking requirements.
- E. Size primary support members such that electrical conduits can be concealed.

2.03 MATERIALS

- A. All components shall be 6063, 6061 or 6005 alloy extruded aluminum.
- B. Components shall be sized to comply with live load and wind load requirements of the project and shall not be less than the dimensions shown on the plan.
- C. The thickness of the aluminum deck panels shall be at least .080" thick.
- D. Sun shade vertical fins:
 - 1. Material: Aluminum
 - 2. Size: Each vertical fin to be sized to fit within shade structure framing.
 - 3. Profile: As indicated on drawings.
 - 4. Height: As indicated on drawings.
 - 5. Finish: Kynar
- E. Flashing shall be 0.40" thick.
- F. All bolts and fasteners shall be stainless steel or finished to match adjacent components and sized by canopy engineer.
- G. The Architect shall choose from manufacturer's full range of colors including fluoropolymer and anodized finishes.

PART 3 EXECUTION

3.01 FABRICATION

- A. All welding shall be in compliance with AWS 1.2. The certification of each welder shall be available to verify compliance.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Erect canopy after concrete and masonry within the vicinity is completed and washed down.
- C. Coordinate routing of conduit, sprinkler pipes such that they are concealed from view. Seek Architect's approval prior to installation.

3.03 CLEANING

- A. Clean canopy after installation..

3.04 PROTECTION

- A. Protect installed canopy from subsequent construction operations.

END OF SECTION

**SECTION 10 82 13
EXTERIOR GRILLES AND SCREENS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior aluminum grilles and screens attached to structure.
- B. Pre-formed painted metal panel for enclosing roof top mechanical equipment.
- C. Aluminum assembly framing for direct attachment of screening panels to mechanical equipment; no base or curb required unless shown otherwise on drawings.
- D. Sliding panels to permit easy access to mechanical equipment for servicing.

1.02 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Submit detailed shop drawings, indicating component profiles, sections, finishes, fastening details, special details, and manufacturer's technical and descriptive data.
- C. Samples: Submit samples for color verification, 10 inches (254 mm) by 10 inches (254 mm) minimum.
- D. Manufacturer's Qualification Statement.
- E. Installer's Qualification Statement.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's original, unopened packaging, with labels clearly identifying manufacturer and material.
- B. Store materials indoors, protected from moisture, humidity, and extreme temperature fluctuations.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a one year period after Date of Substantial Completion.
- C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Exterior Aluminum Grilles and Screens:
 - 1. Basis of Design: Envisor Screening System by CityScapes Incorporated; www.cityscapesinc.com
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SCREENS

- A. Aluminum Screens: Provide shop fabricated, shop finished screens assembled into panels.
 - 1. Panel Size and Configuration: Size to fit and screen each RTU

2. Frame/Support: Extruded aluminum tube or flat aluminum bar.

2.03 MATERIALS

- A. Painted Metal Panels: Fabricated from rigid aluminum panels in multiple thicknesses.
 1. Minimum thickness: 0.063
- B. Aluminum Extrusions: ASTM B221 (ASTM B221M) alloy 6063, temper T5, 1/8 inch (3 mm) minimum wall thickness.
- C. Concealed Structural Supports: Aluminum, or steel coated for corrosion resistance and dissimilar metal isolation.

2.04 FABRICATION

- A. Provide factory-formed panel systems with continuous interlocking panel connections and indicated or necessary components: Form all components true to shape, accurate in size, square and free from distortion or defects. Cut panels to precise lengths indicated on approved shop drawings.
- B. Fabricate all panels to slide horizontally to allow access to unit access panels behind.
- C. Panel Design, Style, Trim:
 1. Panel Style: Vertical
 2. Panel Design: 7.2 Rib Vertical Solid
 3. Decorative Top Trim Profile: Lineal Band
- D. Trim and Closures: Fabricated from 24 gage metal, and finished with the manufacturers standard coating system, unless shown otherwise on drawings.
- E. Framing: Fabricate and assemble components in largest practical sizes, for delivery to the site.
 1. Construct corner assemblies to required shape with joints tightly fitted.
 2. Supply components required for anchorage of framing. Fabricate anchors and related components of material and finish as required, or as specifically noted.

2.05 FINISHES

- A. Aluminum Framing: Mill finish.
- B. Finish Color: Shadow Gray.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that painting, roofing, masonry work, and other adjacent work that might damage grille finish have been completed prior to start of installation.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's written installation instructions.
- B. Fasten structural supports to HVAC units without damaging operation of the unit.
 1. Provide corner and mid-span assemblies as required by approved shop drawings so that the panels are supported uniformly.
 2. Fastening bottom rail using bolts to permit ease of access to HVAC units.
- C. Metal Separation: Where aluminum materials would contact dissimilar materials, insert rubber grommets at attachment points, thus eliminating where dissimilar metals would otherwise be in contact.
- D. Set grilles level, plumb, with uniform joints, and in alignment with adjacent work as indicated.
- E. Mechanically secure grilles to supporting structure.
- F. Do not cut or trim aluminum members without approval of manufacturer; do not install damaged members.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch (3 mm).
- B. Maximum Offset From True Alignment: 1/8 inch (3 mm).

3.04 CLEANING

- A. Remove temporary protective covering as grilles are installed.
- B. Clean finished surfaces as recommended by manufacturer and maintain clean condition until Date of Substantial Completion.
- C. Touch-up damaged finish coating using material provided by manufacturer to match original coating.
- D. Replace grilles that have been damaged beyond touch-up repair.

3.05 PROTECTION

- A. Protect installed grilles to ensure grilles are without damage until Date of Substantial Completion.

END OF SECTION

SECTION 11 12 26.03
CONTROL GATES & VEHICLE DETECTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Automatic Barrier Gates.
 - 2. Vehicle Detectors.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Spare Parts
 - 1. Furnish the following spare components, complete and ready to use, prior to commencement of operational testing and maintain inventory of spare components at this level as components are used during warranty period. After expiration of warranty period, Owner will pay for replacement of parts used from this inventory and not covered by warranty.
 - a. One complete vehicle detector.
 - b. One Lane Controller unit.
 - c. One set of V-Belts (if gate is belt driven)
 - d. Two gate arms
 - e. Five Shear Bolts/Pins

PART 2 - PRODUCTS

- A. Basis of Design: Designa by Nextgen Parking 4401 S. Pinemont Dr., Suite 200, Houston, TX 77041. Tel: 713.776.8324. www.nextgenparking.net or approved equal.

2.2 EQUIPMENT PERFORMANCE SPECIFICATIONS

- A. Automatic Barrier Gates - Gate system shall have safe guards to ensure that gates do not continue to lower upon contact with any vehicle or person regardless of size. Gates shall provide method of rising upon contact with anything under gate arm without causing any damage or injury. Control gates, shall meet the following requirements independently and in concert with FMS.

1. Operational Description for Gated Entry and Exit Lanes: As a vehicle pulls into a lane, it is detected by dual loops and a directional vehicle detector. A vehicle shall first be detected by loop A, then by loop B, and then by loops A and B simultaneously, for any revenue transaction (ticket issue, exit validation or fee collection) to be processed. Upon satisfactory completion of each transaction, gate shall automatically open. After vehicle has passed over detector loop C, gate shall automatically close. Circuitry shall be such that gate has closed after preceding transaction before system shall accept transaction of another vehicle in same lane.
 2. Gates shall provide an effective one-way barrier to vehicles in entrance and exit lanes. Barrier arms shall retract quickly in a vertical plane on command signal and return to lower position upon signal from detector beyond gate location. Gate shall have a 10 foot long barrier arm, employing breakaway design that can be easily and inexpensively replaced when broken. Height of gate arm shall be approximately 3 feet from drive level when in DOWN position. Articulating arms shall be provided in areas of limited headroom.
 3. Gate shall incorporate in one housing all necessary components for functioning of unit. Gate motor and other components shall be designed for heavy-duty use and shall be circuit breaker protected. Gate controller shall prevent damage when gate motion is blocked in any position. Gate shall not be able to be raised or lowered by force applied to gate arm. Stops or mechanism shall allow adjustment of gate arm travel. All parts shall be suitably treated to inhibit corrosion.
 4. Controller for gate shall have the following features:
 - a. Gate controller shall be microprocessor controlled and provide over-the-network activation and communication for gate status and functions from FMS.
 - b. Separate momentary contact closures for each of the following counts: ACS patrons, RCS patrons, vehicle entries, and vehicle exits.
 - c. Directional logic with electronic outputs to alarms, counters and to report atypical lane activity to FMS.
 - d. Capabilities to store at least three vend inputs and sequentially process each vend. In this case, gate arm shall remain up until stored vend input vehicles have cleared lane. This feature shall be selectable on/off from FMS.
 - e. Ability to test gate operability and controller programming on-site without the use of special diagnostic equipment.
 - f. "AUTO-MANUAL" switch, and "ON-OFF" switch for gate. Gate control unit shall contain power supplies, dust-proof relays, and other circuit components to control gate as well as manual control switches.
 - g. Remote Gate Arm Activation: Provide manual control whereby parking operator may open gate with a vend signal from the parking/security office.
- B. Barrier Gate Usage Restrictions:
1. Gate Barrier arm shall be provided with signage on both sides of arm clearly warning pedestrians not to pass through a gated lane. Signage shall incorporate both text and graphics to convey the hazards of not meeting this restriction.
- C. Vehicle Detectors: Where required herein, vehicle detectors shall incorporate directional logic to differentiate direction of traffic flow, and in concert with FMS detect and record when a vehicle backs out of lane. Detectors shall incorporate microprocessor logic and shall:
1. Automatically maintain peak sensitivity regardless of temperature, rain or other environmental conditions. Different sensitivity settings shall be provided to allow tailgating vehicles of varying height and size to be optimally detected.

2. Fit within entry and exit controllers, or gate housings, or in remote lane/ramp controller cabinet. Units can also be combined sensors/detectors utilizing ultra-sonic technology with mounting design for ceiling or walls.
3. Have a light on front panel to indicate presence of vehicle.
4. Modular plug-in construction or built in, and easily serviced.
5. Be self-tuning and self-compensating, and tune to its inductive loop environment.
6. Require no special tools or meters for adjustment following initial installation. Operation of unit shall be completely automatic except for initial settings. Analog detectors that require periodic manual tuning are not acceptable.
7. Units tied to inductive loops shall provide multiple loop tuning to prevent crosstalk or interference between loops in close proximity of each other.

D. Inductive Loops: Shall be cut-in to paving surface:

1. Be formed by three to four turns of 14-gauge THWN single-conductor wire.
2. Shall not contain splices.
3. Have loop leads which are:
 - a. Limited to a length of 100 feet.
 - b. Have a four-twist minimum per foot and located at a minimum of 18 inches from electrical power lines.
 - c. Be contained in separate conduit to prevent interference from electrical signals.
4. Cut-in loops shall be placed in sawcuts 0.25 inch wide and 1.5 inches deep into paving surface and filled with manufacturer's approved sealant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install parking control equipment as required for a complete and integrated installation.
 1. Rough-in electrical connections according to requirements specified in Division 26 Sections.
- B. Automatic Barrier Gates: Anchor cabinets to concrete bases with anchor bolts or expansion anchors and mount barrier gate arms.
 1. Install barrier gates according to UL 325.
- C. Vehicle Loop Detectors: Cut grooves in pavement and bury and seal wire loop at locations indicated on Drawings according to manufacturer's written instructions. Connect to parking control equipment operated by detector.
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- E. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.2 ADJUSTING

- A. Adjust parking control equipment to function smoothly and lubricate as recommended by manufacturer.
- B. Confirm that locks engage accurately and securely without forcing or binding.
- C. After completing installation of exposed, factory-finished parking control equipment, inspect exposed finishes and repair damaged finishes.

3.3 PROTECTION

- A. Remove barrier gate arms during the construction period to prevent damage, and install them immediately before Substantial Completion.

END OF SECTION 111226.03

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

**SECTION 12 24 00
WINDOW SHADES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior manual roller shades.

1.02 REFERENCE STANDARDS

- A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films 2019.
- B. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.
- B. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
- D. Selection Samples: Include fabric samples in full range of available colors and patterns.
- E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.
- G. Maintenance contracts.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this type with minimum three years of documented experience with shading systems of similar size and type.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.07 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 - 1. Shade Hardware: One year.
 - 2. Fabric: One year.
 - 3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interior Manually Operated Roller Shades:
 - 1. Lutron Electronics Co., Inc; [____]: www.lutron.com/#sle.
 - 2. MechoShade Systems LLC; Mecho/5 System: www.mechoshade.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ROLLER SHADES

- A. General:
 - 1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
 - 2. Provide shade system that operates smoothly when shades are raised or lowered.
- B. Roller Shades Type [____]:
 - 1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
 - a. Drop Position: Regular roll.
 - b. Roll Direction: Roll down, closed position is at window sill.
 - c. Mounting: Window jamb mounted- inside, between jambs.
 - d. Fabric: [____]
 - 1) Translucent Shades: 3% openness. Soften the light and reveal only shadow like outlines to the outside; substantial privacy.
 - 2) Flammability: Pass NFPA 701 large and small tests.
 - 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 - 3. Roller Tubes: As required for type of shade operation.
 - a. Material: Extruded aluminum, dark bronze anodized finish..
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
 - 4. Hembars: Designed to maintain bottom of shade straight and flat.
 - 5. Manual Operation for Interior Shades:
 - a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
 - b. Drive Chain: Continuous loop beaded ball chain, 95 pounds (43 kg) minimum breaking strength. Provide upper and lower limit stops.

2.03 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
 - 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.
 - 2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.
- C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.
- C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.
- D. Training: Train Owner's personnel on operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours training by manufacturer's authorized personnel at location designated by the Owner.

3.06 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.07 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

**SECTION 12 36 00
COUNTERTOPS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Wall-hung counters and vanity tops.

1.02 RELATED REQUIREMENTS

- A. Section 06 41 00 - Architectural Wood Casework.

1.03 REFERENCE STANDARDS

- A. ISFA 2-01 - Classification and Standards for Solid Surfacing Material 2013.
- B. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material 2013.
- C. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII 2016.
- D. NEMA LD 3 - High-Pressure Decorative Laminates 2005.
- E. PS 1 - Structural Plywood 2009 (Revised 2019).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Installation Instructions: Manufacturer's installation instructions and recommendations.
- G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
 - 1. Laminate Sheet, Type []: NEMA LD 3, Grade HGS, 0.048 inch (1.2 mm) nominal thickness.
 - a. Manufacturers:
 - 1) Wilsonart; []: www.wilsonart.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.

- b. Finish: Matte or suede, gloss rating of 5 to 20.
 - c. Surface Color and Pattern: As indicated on drawings.
 2. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inch (32 mm) thick; covered with matching laminate.
 3. Back and End Splashes: Same material, same construction.
- B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 1. Flat Sheet Thickness: 1/2 inch (12 mm), minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Silestone.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern: As indicated on drawings.
 3. Other Components Thickness: 1/2 inch (12 mm), minimum.
 4. Exposed Edge Treatment: Built up to minimum 2 inch ([] mm) thick; square edge; use marine edge at sinks.
 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.

2.02 MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; joint lengths using metal splines.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 1. Join lengths of tops using best method recommended by manufacturer.
 2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 2. Height: 4 inches (102 mm), unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
- D. Wall-Mounted Counters: Provide skirts and aprons as indicated on drawings, finished to match. Provide brackets and braces as required for support.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch (16 mm).
- C. Attach epoxy resin countertops using compatible adhesive.
- D. Seal joint between back/end splashes and vertical surfaces.
- E. Provide grommets where indicated, or as directed by owner. Plan for no less than one grommet per 8 linear feet.

3.04 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.
- B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.
- C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.05 CLEANING

- A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

**SECTION 14 24 00
HYDRAULIC ELEVATORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Complete hydraulic elevator systems.
 - 1. Passenger type.
- B. Elevator Maintenance Contract.

1.02 RELATED REQUIREMENTS

- A. Section 09 65 00 - Resilient Flooring: Floor finish in car.
- B. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler heads in hoistway.
- C. Section 26 05 33.13 - Conduit for Electrical Systems:
- D. Section 26 05 83 - Wiring Connections:

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. AISC 360 - Specification for Structural Steel Buildings 2016 (Revised 2021).
- D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- E. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices 2019, with Errata (2021).
- F. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, Inclined Elevators, Limited-Use/Limited-Application Elevators, Private Residence Elevators, Escalators, Moving Walks, and Dumbwaiters 2020.
- G. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017.
- H. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- L. ITS (DIR) - Directory of Listed Products current edition.
- M. NFPA 13 - Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.
- P. UL (DIR) - Online Certifications Directory Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate work with other installers to provide conduits necessary for installation of wiring including but not limited to:
 - a. Elevator equipment devices remote from elevator machine room or hoistway.
 - b. Elevator pit for lighting, sump pump, and [_____].
 - 2. Coordinate work with other installers for equipment provisions necessary for proper elevator operation, including but not limited to, the following:

- a. Shunt trip devices for automatic disconnection of elevator power prior to fire suppression system activation.
 - b. Overcurrent protection devices selected to achieve required selective coordination.
- B. Preinstallation Meeting: Convene meeting at least one week prior to start of this work.
1. Review schedule of installation, proper procedures and conditions, and coordination with related work.
- C. Construction Use of Elevator: Provide designated elevator for transport of construction personnel and materials in compliance with ASME A17.1.
1. Make elevator available for construction use on or before [_____].
 2. Enclose car with protective plywood on floor, walls, and ceiling.
 3. Provide temporary lighting.
 4. Provide control panel with manual and emergency operation.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on following items:
1. Signal and operating fixtures, operating panels, and indicators.
 2. Car design, dimensions, layout, and components.
 3. Car and hoistway door and frame details.
 4. Electrical characteristics and connection requirements.
- C. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
 2. Hoistway Components: Size and location of car guide rails, buffers, jack unit and other components.
 3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
 4. Clearances and over-travel of car.
 5. Locations in hoistway and machine room of traveling cables and connections for car lighting, telephone, and [_____].
 6. Location and sizes of hoistway and car doors and frames.
 7. Electrical characteristics and connection requirements.
 8. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.
- D. Samples: Submit samples illustrating car interior finishes, car and hoistway door and frame finishes, handrail material and finish, and [_____] in the form of cut sheets, finish color selection brochures, or [_____].
- E. Testing Agency's Qualification Statement.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Initial Maintenance Contract.
- H. Maintenance Contract: Submit proposal to Owner for standard one year continuing maintenance contract agreement in accordance with ASME A17.1 and requirements as indicated, starting on date initial maintenance contract is scheduled to expire.
1. Indicate in proposal the services, obligations, conditions, and terms for agreement period and for renewal options.
- I. Operation and Maintenance Data:
1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
 2. Operation and maintenance manual.
 3. Schematic drawings of equipment and hydraulic piping, and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on machine room and hoistway apparatus.

1.06 QUALITY ASSURANCE

- A. Maintain one copy of each quality standard document on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and approved by elevator equipment manufacturer.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.
- E. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
- F. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design - Hydraulic Elevators: Thyssen Krupp; Endura MRL 3500.; [____].
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 HYDRAULIC ELEVATORS

- A. Hydraulic Passenger Elevator:
 - 1. Service Control Type:
 - a. Standard service control only.
 - 2. Interior Car Height: 88 inch ([____] mm).
 - 3. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
 - 4. Rated Net Capacity: 3500 pounds (1590 kgs).
 - 5. Rated Speed: 200 feet per minute (1.0 m per second).
 - 6. Hoistway Size: As indicated on drawings.
 - 7. Interior Car Platform Size: As indicated on drawings.
 - 8. Elevator Pit Depth: [____] inch ([____] mm).
 - 9. Overhead Clearance at Top Floor: 155 inch ([____] mm).
 - 10. Travel Distance: As indicated on drawings.
 - 11. Number of Stops: As indicated on drawings.
 - 12. Hydraulic Equipment Location: As indicated on drawings

2.03 COMPONENTS

- A. Elevator Equipment:
 - 1. Motors, Hydraulic Equipment, Controllers, Controls, Buttons, Wiring, Devices, and Indicators: Comply with NFPA 70. Refer to Section 26 05 83
 - 2. Guide Rails, Cables, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.
 - 3. Buffers:
 - a. Spring type for elevators with speed less than or equal to 200 feet per minute (1 m per second).
 - b. Oil type for elevators with speed greater than 200 feet per minute (1 m per second).
 - 4. Lubrication Equipment:
 - a. Provide grease fittings for periodic lubrication of bearings.

2.04 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
- B. Accessibility Requirements: Comply with ADA Standards.
- C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.
- D. Comply with seismic design requirements in accordance with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).

1. Complying with Elevator Safety Requirements for Seismic Risk Zone in accordance with ASME A17.1, ASCE 7 and other related requirements.
 2. Provide earthquake emergency operations in accordance with ASME A17.1 requirements.
- E. Perform welding of steel in accordance with AWS D1.1/D1.1M.
 - F. Fabricate and install door and frame assemblies in accordance with NFPA 80 and in compliance with requirements of authorities having jurisdiction.
 - G. Perform electrical work in accordance with NFPA 70.
 - H. Comply with venting or pressurization of hoistway design in accordance with HVAC system requirements and authorities having jurisdiction (AHJ).
 - I. Comply with fire protection sprinkler system of hoistway design in accordance with NFPA 13 requirements and authorities having jurisdiction (AHJ). Refer to Section 21 13 00.

2.05 OPERATION CONTROLS

- A. Elevator Controls: Provide landing operating panels and landing indicator panels.
 1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
 2. Landing Indicator Panels: Illuminating.
 3. Comply with ADA Standards for elevator controls.
- B. Interconnect elevator control system with building security, fire alarm, card access, smoke alarm, and building management control systems.
- C. Door Operation Controls:
 1. Program door control to open doors automatically when car arrives at floor landing.
 2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
 3. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equipped with photo-electric light rays.

2.06 EMERGENCY POWER

- A. Set-up elevator operation to run with building emergency power supply when the normal building power supply fails, and in compliance with ASME A17.1 requirements.
- B. Building Emergency Power Supply: Supplied by backup generator; provide elevator system components as required for emergency power characteristics with phase rotation the same as for normal power.
 1. Provide transfer switches and auxiliary contacts.
 2. Install connections to power feeders.
- C. Emergency Lighting: Comply with ASME A17.1 elevator lighting requirements.
- D. Provide operational control circuitry for adapting the change from normal to emergency power.
- E. Upon transfer to emergency power, advance one elevator at a time to a pre-selected landing, stop car, open doors, disable operating circuits, and hold in standby condition.

2.07 MATERIALS

- A. Stainless Steel Sheet: ASTM A666, Type 304; No. 4 Brushed finish unless otherwise indicated.
- B. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.
- C. Extruded Aluminum: ASTM B221 (ASTM B221M), natural anodized finish unless otherwise indicated.
- D. Resilient Flooring: Vinyl tile flooring, as specified in Section 09 65 00, Type VT1.

2.08 CAR AND HOISTWAY ENTRANCES

- A. Elevator, []:
 1. Car and Hoistway Entrances, Main Elevator Lobby:
 - a. Framed Opening Finish and Material: Brushed stainless steel.
 - b. Car Door Material: To match hoistway entrance doors, with rigid sandwich panel construction.

- c. Hoistway Door Material: Stainless steel, with rigid sandwich panel construction.

2.09 CAR EQUIPMENT AND MATERIALS

- A. Elevator Car:
 - 1. Car Operating Panel: Provide main and auxiliary; flush-mounted applied face plate, with illuminated call buttons corresponding to floors served with "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, alarm button, and [____].
 - a. Panel Material: Integral with front return; one per car.
 - b. Car Floor Position Indicator: Above door with illuminating position indicators.
 - c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch (1.372 m) above car finished floor.
 - 2. Flooring: Resilient vinyl tile.
 - 3. Front Return Panel: Match material of car door.
 - 4. Door Wall: Stainless steel.
 - 5. Side Walls: Stainless steel.
 - 6. Rear Wall: Stainless steel.
 - 7. Hand Rail: Aluminum, at all three sides. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
 - a. Flat Bar Stock, Solid: [____] inch thick by [____] inch high ([____] mm thick by [____] mm high).
 - b. Aluminum Finish: Clear anodized.
 - 8. Ceiling:
 - a. Canopy Ceiling: Stainless steel.
 - b. Lighting: As selected from manufacturer's standard line.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting this work.
- B. Verify that hoistway, pit, and machine room are ready for work of this section.
- C. Verify hoistway shaft and openings are of correct size and within tolerance.
- D. Verify location and size of machine foundation and position of machine foundation bolts.
- E. Verify that electrical power is available and of correct characteristics.

3.02 PREPARATION

- A. Arrange for temporary electrical power for installation work and testing of elevator components, and comply with requirements of Section 01 50 00 - Temporary Facilities and Controls.
- B. Maintain elevator pit excavation free of water.

3.03 INSTALLATION

- A. Coordinate this work with installation of hoistway wall construction.
- B. Install system components, and connect equipment to building utilities.
- C. Provide conduit, electrical boxes, wiring, and accessories. Refer to Sections 26 05 33.13 and 26 05 83.
- D. Install hydraulic piping between cylinder and pump unit.
- E. Mount machines, motors, and pumps on vibration and acoustic isolators.
 - 1. Place on structural supports and bearing plates.
 - 2. Securely fasten to building supports.
 - 3. Prevent lateral displacement.
- F. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.
- G. Install guide rails to allow for thermal expansion and contraction movement of guide rails.
- H. Accurately machine and align guide rails, forming smooth joints with machined splice plates.
- I. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.

- J. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.
- K. Wood Surfaces not Exposed to Public View: Finish with one coat primer; one coat enamel.
- L. Adjust equipment for smooth and quiet operation.

3.04 TOLERANCES

- A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.
- B. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Perform testing and inspection in accordance with requirements.
- C. Operational Tests:
 - 1. Perform operational tests in the presence of Owner and Architect.
 - 2. At an agreed time, and the building occupied with normal building traffic, conduct tests to verify performance.
 - a. Furnish event recording of each landing call registrations, time initiated, and response time throughout entire working day.
 - 3. Set period of time elevator takes to travel between typical floor landings at not more than [] seconds.
 - a. Measure time from moment doors start to close until car has stopped level at next floor landing and doors are opening.

3.06 ADJUSTING

- A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.
- B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch (6.4 mm) maximum from flush with sill.

3.07 CLEANING

- A. Remove protective coverings from finished surfaces.
- B. Clean surfaces and components in accordance with manufacturers written instructions.

3.08 CLOSEOUT ACTIVITIES

- A. Demonstrate proper operation of equipment to Owner's designated representative.
- B. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.

3.09 PROTECTION

- A. Do not permit construction traffic within car after cleaning.
- B. Protect installed products until Date of Substantial Completion.
- C. Touch-up, repair, or replace damaged products and materials prior to Date of Substantial Completion.

3.10 MAINTENANCE

- A. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for 3 months from Date of Substantial Completion.
- B. Perform maintenance contract services using competent and qualified personnel under the supervision and direct employ of the elevator manufacturer or original installer.
- C. Maintenance contract services shall not be assigned or transferred to any agent or other entity without prior written consent of Owner.
- D. Examine system components periodically.
- E. Include systematic examination, adjustment, and lubrication of elevator equipment.

- F. Maintain and repair or replace parts, whenever required, using parts produced by original equipment manufacturer.
- G. Perform work without removing cars from use during peak traffic periods.
- H. Provide emergency call back service during regular working hours throughout period of this maintenance contract.
- I. Maintain an adequate stock of parts for replacement or emergency purposes, and have personnel available to ensure the fulfillment of this maintenance contract without unreasonable loss of time.

END OF SECTION

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Above ground piping.
- B. Escutcheons.
- C. Mechanical couplings.
- D. Pipe hangers and supports.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 21 0523 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- C. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.
- D. Section 21 1300 - Fire-Suppression Sprinkler Systems.

1.03 REFERENCE STANDARDS

- A. ASME A112.18.1 - Plumbing Supply Fittings; 2012.
- B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.
- D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.
- E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2011.
- F. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).
- G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- H. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2009 (Reapproved 2014).
- I. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.
- J. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
- K. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2013.

- L. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.
- M. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.
- N. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2009.
- O. AWWA C606 - Grooved and Shouldered Joints; 2011.
- P. FM (AG) - FM Approval Guide; current edition.
- Q. ITS (DIR) - Directory of Listed Products; current edition.
- R. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.
- S. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- T. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- U. UL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate installation, layout, weights, mounting and support details, and piping connections.
- C. Project Record Documents: Record actual locations of components and tag numbering.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
 - 1. Minimum three years experience.
- C. Conform to FM (AG), UL (DIR), and ITS (DIR) or Warnock Hersey requirements.
- D. Valves: Bear UL, FM, and Warnock Hersey product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- B. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 ABOVE GROUND PIPING

- A. Interior Piping-Steel Pipe: ASTM A795 Schedule 10, ASTM A53 Schedule 40, ASTM A135/A135M Schedule 10, or ASTM A795 Schedule 40, black.
 - 1. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
 - 2. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
 - 3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 4. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring packed and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.
- B. Ductile Iron Pipe: AWWA C151/A21.51.
 - 1. Fittings: AWWA C110/A21.10, standard thickness.
 - 2. Joints: AWWA C111/A21.11, SBR or vulcanized styrene-butadiene rubber gasket.
 - 3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.03 ESCUTCHEONS

- A. Manufacturers:
 - 1. Fire Protection Products, Inc: www.fppi.com
 - 2. Tyco Fire Protection Products: www.tyco-fire.com
 - 3. Viking Group Inc: www.vikinggroupinc.com
- B. Material:
 - 1. Fabricate from nonferrous metal.
 - 2. Grade TP304, seamless tube, ASTM A269/A269M stainless steel.
 - 3. Metals and Finish: Comply with ASME A112.18.1.
- C. Construction:
 - 1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
 - 2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.04 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
- E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
- F. Vertical Support: Steel riser clamp.
- G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.05 MECHANICAL COUPLINGS

- A. Manufacturers:
 - 1. Victaulic, Company: <<http://www.victaulic.com/en/>>
 - 2. Anvil International: <<http://www.anvilintl.com/>>
 - 3. Tyco Fire Products: <<http://www.tyco-fire.com/>>
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Rigid Mechanical Couplings for Grooved Joints:
 - 1. Dimensions and Testing: Comply with AWWA C606.
 - 2. Minimum Working Pressure: 300 psig.
 - 3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
 - 4. Housing Coating: Factory applied orange enamel.
 - 5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
 - 6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.
 - 7. Provide stops for direct stab installation without field assembly.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Group piping whenever practical at common elevations.

- D. Sleeve pipes passing through partitions, walls, and floors.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports:
 - 1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 2. Place hangers within 12 inches of each horizontal elbow.
 - 3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- I. Do not penetrate building structural members unless indicated.
- J. Escutcheons:
 - 1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
 - 2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
 - 3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.
- K. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.
- L. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.
- M. Provide drain valves at main shut-off valves, low points of piping and apparatus.

3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 21 05 23

GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Two-piece ball valves with indicators.
- B. Bronze butterfly valves with indicators.
- C. Iron butterfly valves with indicators.
- D. Check valves.
- E. Bronze OS&Y gate valves.
- F. Iron OS&Y gate valves.
- G. NRS gate valves.
- H. Indicator posts.
- I. Trim and drain valves.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 21 0500 - Common Work Results for Fire Suppression: Pipe and fittings.
- C. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.
- D. Section 21 1300 - Fire-Suppression Sprinkler Systems.

1.03 ABBREVIATIONS AND ACRONYMS

- A. EPDM: Ethylene-propylene diene monomer.
- B. NRS: Non-rising stem.
- C. OS&Y: Outside screw and yoke.
- D. PTFE: Polytetrafluoroethylene.

1.04 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.
- C. ASME B31.9 - Building Services Piping; 2014.

- D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.
- E. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; 2015.
- F. AWWA C606 - Grooved and Shouldered Joints; 2011.
- G. FM (AG) - FM Approval Guide; current edition.
- H. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.
- I. NFPA 13R - Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies; 2016.
- J. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- K. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- L. UL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- M. UL 789 - Indicator Posts for Fire-Protection Service; Current Edition, Including All Revisions.
- N. UL 1091 - Standard for Butterfly Valves for Fire-Protection Service; Current Edition, Including All Revisions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Obtain valves for each valve type from single manufacturer.
 - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Where listed products are specified, provide products listed, classified, and labeled by FM (AG), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- D. Installer and Maintenance Contractor Qualifications:
 - 1. Company specializing in performing the work of this section with minimum five years documented experience.
 - 2. Trained and approved by manufacturer to design, install, test and maintain the equipment specified herein.
 - 3. Complies with manufacturer's certification requirements.
 - 4. Complies with manufacturer's insurance requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, and weld ends.
 - 3. Set valves open to minimize exposure of functional surfaces.

- B. Use the following precautions during storage:
1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.
 2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors and maintain at higher than ambient dew point temperature.
 - b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.
- C. Use the following precautions for handling:
1. Use sling to handle large valves, rigged to avoid damage to exposed parts.
 2. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:
1. Main Level: HAMV - Fire Main Equipment.
 - a. Level 1: HCBZ - Indicator Posts, Gate Valve.
 - b. Level 1: HLOT - Valves.
 - c. Level 3: HLUG - Ball Valves, System Control.
 - d. Level 3: HLXS - Butterfly Valves.
 - e. Level 3: HMER - Check Valves.
 - f. Level 3: HMRZ - Gate Valves.
 2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
 - a. Level 1: VQGU - Valves, Trim, and Drain.
- B. FM Global Approved: Provide valves listed in FM (AG) Approval Guide under the following headings:
1. Automated Sprinkler Systems:
 - a. Indicator posts.
 - b. Valves:
 - 1) Gate valves.
 - 2) Single check valves.
 - 3) Miscellaneous valves.
- C. ASME Compliance:
1. ASME B16.1 for flanges on iron valves.
 2. ASME B1.20.1 for threads on threaded-end valves.
 3. ASME B31.9 for building services piping valves.
- D. Comply with AWWA C606 for grooved-end connections.
- E. Comply with NFPA 13 and NFPA 14 for valves.

- F. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.
- G. Valve Sizes: Same as upstream piping unless otherwise indicated.

2.02 TWO-PIECE BALL VALVES WITH INDICATORS

- A. UL 1091, except with ball instead of disc and FM (AG) standard listing for indicating valves (butterfly or ball type), Class Number 1112.
- B. Description:
 - 1. Minimum Pressure Rating: 175 psig.
 - 2. Body Design: Two piece.
 - 3. Body Material: Forged brass or bronze.
 - 4. Port Size: Full or standard.
 - 5. Seat: PTFE.
 - 6. Stem: Bronze or stainless steel.
 - 7. Ball: Chrome-plated brass.
 - 8. Actuator: Worm gear or traveling nut.
 - 9. Supervisory Switch: Internal or external.

2.03 BRONZE BUTTERFLY VALVES WITH INDICATORS

- A. UL 1091 and FM (AG) standard listing for indicating valves, (butterfly or ball type), Class Number 1112.
- B. Minimum Pressure Rating: 175 psig.
- C. Body Material: Bronze.
- D. Seat: EPDM.
- E. Stem: Bronze or stainless steel.
- F. Disc: Bronze with EPDM coating.
- G. Actuator: Worm gear or traveling nut.
- H. Supervisory Switch: Internal or external.

2.04 IRON BUTTERFLY VALVES WITH INDICATORS

- A. UL 1091 and FM (AG) standard listing for indicating valves (butterfly or ball type), Class Number 112.
- B. Minimum Pressure Rating: 175 psig.
- C. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.
- D. Seat: EPDM.
- E. Stem: Stainless steel.
- F. Disc: Ductile iron, nickel plated.

- G. Actuator: Worm gear or traveling nut.
- H. Supervisory Switch: Internal or external.
- I. Body Design: Grooved-end connections.

2.05 CHECK VALVES

- A. UL 312 and FM (AG) standard listing for check valves, Class Number 1045.
- B. Minimum Pressure Rating: 175 psig.
- C. Type: Center guided check valve.
- D. Body Material: Cast iron, ductile iron.
- E. Center guided check with elastomeric seal.
- F. Hinge Spring: Stainless steel.
- G. End Connections: Flanged, grooved, or threaded.

2.06 BRONZE OS&Y GATE VALVES

- A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).
- B. Minimum Pressure Rating: 175 psig.
- C. Body and Bonnet Material: Bronze or brass.
- D. Wedge: One-piece bronze or brass.
- E. Wedge Seat: Bronze.
- F. Stem: Bronze or brass.
- G. Packing: Non-asbestos PTFE.
- H. Supervisory Switch: External.
- I. End Connections: Threaded.

2.07 IRON OS&Y GATE VALVES

- A. Listed and Body Marked: AWWA C509, FM (AG), and UL 262.
- B. Maximum Working Pressure: 175 psi.
- C. Body and Bonnet Material: Cast or ductile iron.
- D. Wedge: Cast or ductile iron, or bronze with elastomeric coating.

- E. Stem: Brass, bronze, or stainless steel.
- F. Packing: Non-asbestos PTFE.
- G. Supervisory Switch: External.

2.08 NRS GATE VALVES

- A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).
- B. Minimum Pressure Rating: 175 psig.
- C. Body and Bonnet Material: Cast or ductile iron.
- D. Wedge: Cast or ductile iron with elastomeric coating.
- E. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
- F. Stem: Brass or bronze.
- G. Packing: Non-asbestos PTFE.
- H. Supervisory Switch: External.
- I. End Connections: Flanged.

2.09 INDICATOR POSTS

- A. UL 789 and FM (AG) standard listing for indicator posts.
- B. Type: Underground.
- C. Base Barrel Material: Cast or ductile iron.
- D. Extension Barrel for Adjustable Length Indicator Posts: Cast or ductile iron.
- E. Cap: Cast or ductile iron.
- F. Operation: Wrench.

2.10 TRIM AND DRAIN VALVES

- A. Ball Valves:
 - 1. Description:
 - a. Pressure Rating: 175 psig.
 - b. Body Design: Two piece.
 - c. Body Material: Forged brass or bronze.
 - d. Port Size: Full or standard.
 - e. Seat: PTFE.
 - f. Stem: Bronze or stainless steel.
 - g. Ball: Chrome-plated brass.
 - h. Actuator: Hand-lever.

B. Angle Valves:

1. Description:
 - a. Pressure Rating: 175 psig.
 - b. Body Material: Brass or bronze.
 - c. Ends: Threaded.
 - d. Stem: Bronze.
 - e. Disc: Bronze.
 - f. Packing: Asbestos free.
 - g. Handwheel: Malleable iron, bronze, or aluminum.

C. Globe Valves:

1. Description:
 - a. Pressure Rating: 175 psig.
 - b. Body Material: Bronze with integral seat and screw-in bonnet.
 - c. Ends: Threaded.
 - d. Stem: Bronze.
 - e. Disc Holder and Nut: Bronze.
 - f. Disc Seat: Nitrile.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Confirm valve interior to be free of foreign matter and corrosion.
- B. Remove packing materials.
- C. Examine guides and seats by operating valves from the fully open position to the fully closed position.
- D. Examine valve threads and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage.
 1. Check bolting for proper size, length, and material.
 2. Verify gasket for size, defects, damage, and suitable material composition for service.
 3. Replace all defective valves with new valves.

3.02 INSTALLATION

- A. Comply with specific valve installation requirements and application in the following Sections:
 1. Section 21 1300 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.
- B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.

1. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in water supply connections and backflow preventer at potable water supply connections.
- D. Valves with threaded connections to have unions at equipment arranged for easy access, service, maintenance, and equipment removal without system shutdown.
- E. Valves in horizontal piping installed with stem at or above the pipe center.
- F. Position valves to allow full stem movement.
- G. Install valve tags. Comply with Section 21 0553 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

END OF SECTION

SECTION 21 05 53

IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Automatic Controls: Tags.
- B. Control Panels: Nameplates.
- C. Instrumentation: Tags.
- D. Major Control Components: Nameplates.
- E. Piping: Pipe markers.
- F. Relays: Tags.
- G. Small-sized Equipment: Tags.
- H. Valves: Tags.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com.
 - 2. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
 - 3. Seton Identification Products, a Tricor Direct Company: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.

3. Background Color: Black.
4. Thickness: 1/8 inch.
5. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com.
2. Brady Corporation: www.bradycorp.com.
3. Brimar Industries, Inc: www.pipemarker.com.
4. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
5. Seton Identification Products, a Tricor Direct Company: www.seton.com.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.
2. Brimar Industries, Inc: www.pipemarker.com.
3. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
4. Seton Identification Products, a Tricor Company: www.seton.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Color: Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

F. Color code as follows:

1. Fire Quenching Fluids: Red with white letters.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Utilize the Owner's color schemes.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

END OF SECTION

SECTION 21 12 00
FIRE-SUPPRESSION STANDPIPES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire hose cabinets.
- B. Valves.
- C. Fire department connections.

1.02 RELATED REQUIREMENTS

- A. Section 01 4100 - Regulatory Requirements.
- B. Section 21 0500 - Common Work Results for Fire Suppression: Fire protection piping.
- C. Section 21 0523 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- D. Section 21 1300 - Fire-Suppression Sprinkler Systems.

1.03 REFERENCE STANDARDS

- A. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2013.
- B. UL 405 - Fire Department Connection Devices; Current Edition; Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. Shop Drawings: Indicate supports, components, accessories, and sizes.
 - 1. Submit shop drawings and product data to Owner's insurance underwriter for approval.
 - 2. Submit proof of approval to Architect.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with NFPA 14. Maintain one copy on site.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in shipping packaging until installation.

PART 2 PRODUCTS

2.01 FIRE HOSE CABINETS

- A. Cabinet:
 - 1. Style: Recessed mounted.
 - 2. Door: 12 gauge, 0.1046 inch thick steel, flush, glazed with 1/4 inch (6.35 mm) thick wired glass full panel; hinged, positive latch device.
 - 3. Finish: Prime coated.
- B. Hose Rack: Steel with polished chrome finish; swivel type with pins and water stop.
- C. Hose: 1 inch diameter, 50 feet long, of linen hose; mildew and rot-resistant.
- D. Nozzle: Chrome plated brass; combination fog, straight stream, and adjustable shut-off.

2.02 VALVES

- A. General Duty Valves: See Section 21 0523.
- B. Specialty Valves:
 - 1. In-line or Angle Hose Valves:
 - a. Cast bronze, 2-1/2 inch, NPS handwheel operated globe valve with grooved or threaded end connections, rated for 400 psi inlet pressure with outlet discharge field-set to hose inlet pressure.
 - 2. In-line or Angle Floor Control Valves:
 - a. Cast bronze, 2-1/2 inch, NPS handwheel operated globe valve with grooved or threaded end connections, rated for 400 psi maximum inlet pressure with outlet discharge field-set to system inlet pressure. Provide integral normally-open supervisory switch, cap, and chain.

2.03 FIRE DEPARTMENT CONNECTIONS

- A. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.
 - 1. Configuration: Horizontal.
 - 2. Signage: Raised or engraved lettering 1 inch minimum indicating system type.
 - 3. Provide independant fire department connections for both standpipe system and wet sprinkler systems, with signage.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 14.
- C. Locate and secure cabinets plumb and level. Establish top of cabinet (inside horizontal) surface 66 inches above finished floor.
- D. Locate hose station valve in cabinet at 60 inches above finished floor.

- E. Connect standpipe system to water source ahead of domestic water connection.
- F. Provide two way fire department outlet connection on roof.
- G. Flush entire system of foreign matter.

3.02 FIELD QUALITY CONTROL

- A. Perform field inspection and testing (Field Acceptance Test) in accordance with Section 01 4000.
- B. Test entire system in accordance with NFPA 14.
- C. Test shall be witnessed by Fire Marshal.

END OF SECTION

SECTION 21 13 00

FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. Dry-pipe sprinkler system.
- C. System design, installation, and certification.
- D. Fire department connections.

1.02 RELATED REQUIREMENTS

- A. Section 21 0500 - Common Work Results for Fire Suppression: Pipe and fittings.
- B. Section 21 0523 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- C. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.
- D. Section 21 3000 - Fire Pumps.

1.03 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide; current edition.
- B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.
- C. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.
- D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.
- E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.
- F. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.
- G. UL 405 - Fire Department Connection Devices; Current Edition; Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements: For submittal procedures.
- B. Shop Drawings:

1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
2. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

1.06 QUALITY ASSURANCE

- A. Comply with FM (AG) requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sprinklers, Valves, and Equipment:
 1. Tyco Fire Protection Products, a Tyco Business: www.tyco-fire.com.
 2. Viking Corporation: www.vikinggroupinc.com.
 3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Hazard categories as noted on the plans.
- C. Water Supply: Determine volume and pressure from water flow test data.
 1. Revise design when test data available prior to submittals.
- D. Interface system with building control system.
- E. Provide fire department connections where indicated.
- F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.
- G. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
 6. Other Types: As required.

2.03 SPRINKLERS

- A. Suspended Ceiling Type: Concealed pendant type with matching push on cover plate.
 1. Response Type: Quick.
 2. Coverage Type: Standard.

3. Cover Plate Finish: Enamel, color as selected.
 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- B. Exposed Area Type: Pendant type with guard.
1. Response Type: Quick.
 2. Coverage Type: Standard.
 3. Finish: Brass.
 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
1. Response Type: Quick.
 2. Coverage Type: Standard.
 3. Finish: Brass.
 4. Escutcheon Plate Finish: Brass.
 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- D. Dry Sprinklers: Concealed pendant type with matching push on escutcheon plate.
1. Response Type: Quick.
 2. Coverage Type: Standard.
 3. Finish: Brass.
 4. Cover Plate Finish: Brass.
 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- E. Storage Sprinklers: Pendant type with guard.
1. Response Type: Standard.
 2. Coverage Type: Standard.
 3. Finish: Chrome plated.
 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- F. Guards: Finish to match sprinkler finish.
- G. Spray Nozzles: Brass with solid cone discharge, 30 degrees of arc with blow-off dust cap.
1. Finish: Brass.
- H. Flexible Drop System: Stainless steel, multiple use, open gate type.
1. Application: Use to properly locate sprinkler heads.
 2. Include all supports and bracing.
 3. Provide braided type tube as required for the application.
 4. Manufacturers:
 - a. FlexHead Industries, a brand of Anvil International: www.anvilintl.com/#sle.
 - b. Victaulic Company: www.victaulic.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
 - 1. Activate electric alarm.
 - 2. Test and drain valve.
 - 3. Replaceable internal components without removing valve from installed position.
 - 4. Manufacturers:
 - a. Victaulic Company; Series 751 with Series 760 motor alarm: www.victaulic.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

- B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
 - 1. Activate electric alarm.
 - 2. Test and drain valve.
 - 3. Externally resettable.
 - 4. Replaceable internal components without removing valve from installed position.
 - 5. Manufacturers:
 - a. Victaulic Company; Series 768 - NXT: www.victaulic.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

- C. Backflow Preventer: Reduced Principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

- D. Test Connections:
 - 1. Backflow Preventer Test Connection:
 - a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch National Standard male hose threads with cap and chain.

- E. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.

- F. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.

- G. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

- H. Fire Department Connections:
 - 1. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.
 - a. Configuration: Horizontal.
 - b. Outlet: With pipe threads, 4 NPS.
 - 1) Location: Back.
 - c. Rated Working Pressure: 175 psi.
 - d. Finish: Chrome.
 - e. Sleeve: Brass, 18 inches height.
 - f. Signage: Raised or engraved lettering 1 inch minimum indicating system type.

2.05 NITROGEN GENERATOR

- A. Manufacturers:
 - 1. Potter Electric Signal Company, LLC: www.pottersignal.com/#sle.
- B. Nitrogen Generator:
 - 1. Provide FM (AG) approved system and accessories.
- C. Minimum Nitrogen Purity: 98 percent.
- D. Provide piping and accessories to connect to dry and preaction fire suppression systems.
- E. Accessories:
 - 1. Provide control panel or remote annunciator panel.
 - 2. Provide air maintenance device.
 - 3. Provide nitrogen storage tank sized to comply with NFPA 13.
 - 4. Provide purge valves to remove oxygen from the system.
 - 5. Provide nitrogen analyzer to determine the nitrogen purity.
 - 6. Provide system with replaceable filters.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Install buried shut-off valves in valve box. Provide post indicator.
- D. Provide approved backflow preventer assembly at sprinkler system water source connection.
- E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- F. Locate outside alarm gong on building wall as indicated.
- G. Place pipe runs to minimize obstruction to other work.
- H. Place piping in concealed spaces above finished ceilings.
- I. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- J. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- K. Install and connect to fire pump system in accordance with Section 21 3000.

20011 Gregg County Parking Garage and Office

- L. Flush entire piping system of foreign matter.
- M. Install guards on sprinklers where indicated.
- N. Hydrostatically test entire system.
- O. Require test be witnessed by Fire Marshal.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 22 05 00

PLUMBING SCOPE OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Plumbing Scope of Work.

1.02 RELATED REQUIREMENTS

- A. Section 22 0519 - Meters and Gages for Plumbing Piping
- B. Section 22 0553 - Identification for Plumbing Piping and Equipment
- C. Section 22 0719 - Plumbing Piping Insulation
- D. Section 22 1005 - Plumbing Piping
- E. Section 22 1006 - Plumbing Piping Specialties
- F. Section 22 3000 - Plumbing Equipment
- G. Section 22 4000 - Plumbing Fixtures

PART 2 PRODUCTS- NOT USED

PART 3 EXECUTION

3.01 PLUMBING SCOPE OF WORK

- A. Supply all labor, materials, equipment, and supervision to furnish and install a complete Plumbing system in accordance the contract documents and specifications and the following clarifications:
 - 1. Remove all of the existing plumbing systems including plumbing lines, fixtures, equipment, etc. and other accessories as shown on the plans that are not to be re-used or that do not serve other areas of the building.
 - 2. All connections of plumbing work under this subcontract to the existing utilities.
 - 3. All sleeves or perform core drilling required for any piping, which penetrates the concrete or masonry work of the Project.
 - 4. All testing required by the Contract Documents and/or local regulatory agencies and all cost associated with same.
 - 5. All access doors required for the Work of this Subcontract.
 - 6. Hook-up all domestic appliances requiring plumbing connections
 - 7. All plumbing components required to be built into the roof systems.
 - 8. All required plumbing licenses, permits, and fees.
 - 9. Furnishing and installation of gas lines, valves, fittings and all necessary fittings and accessories to all equipment requiring same, including, but not limited to:
 - a. Make-up air unit.
 - b. Air Handling Units.
 - c. Unit heaters.
 - d. Owner provided equipment.

10. Furnishing and installation of domestic water lines, insulation, valves, fittings and all necessary accessories to all equipment requiring same, including, but not limited to:
 - a. Plumbing fixtures.
 - b. Owner provided equipment.
11. Furnishing and installation of sanitary sewer lines and vents, fittings and all necessary accessories to all equipment requiring same, including, but not limited to:
 - a. Plumbing fixtures.
 - b. Floor drains.
 - c. Owner furnished and installed equipment.

END OF SECTION

SECTION 22 05 01

COMMON WORK RESULTS FOR GARAGE AREA PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this and other Sections of Division 22.
- B. References:
 - 1. American National Standards Institute (ANSI):
 - 2. National Standard Plumbing Code (NAPHCC):
 - 3. American Society for Testing and Materials (ASTM):
 - a. ASTM A74, "Specification for Cast Iron Soil Pipe and Fittings".
 - b. ASTM A120, "Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Use".
 - c. ASTM A234, "Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures".
 - d. ASTM B88, "Specification for Seamless Copper Water Tube".
 - e. ASTM C76, "Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe".
 - f. ASTM C700, "Specification for Extra Strength and Standard Strength Clay Pipe and Perforated Clay Pipe".
 - g. ASTM D3034, "Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings".

1.2 SUMMARY

- A. This Section includes general administrative and procedural requirements for mechanical installations. Following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 01:
 - 1. Submittals.
 - 2. Coordination/Scheduling/Quality Assurance.
 - 3. Record documents.
 - 4. Maintenance manuals.
 - 5. Rough-ins.
 - 6. Mechanical installations.
 - 7. Cutting and patching.
 - 8. Testing/Guarantee
 - 9. Piping materials and installation common to most piping systems.
 - 10. Fittings and Joints.
 - 11. Floor and Trench Drains
 - 12. Back water valves.
 - 13. Cleanouts.
 - 14. Expansion joints for Rain Water Collectors.
 - 15. Valves.

16. Requirements for Equipment Installations.
17. Labeling & Identifying.
18. Touch up painting and finishing.
19. Cutting and patching.

B. Related Sections: Following Sections contain requirements that relate to this Section:

1. The remainder of Division 22, plus general related specifications including:
 - a. Access to mechanical installations.
 - b. Excavation for mechanical installations within the building boundaries, and from building to utilities connections.

C. Definitions:

1. Term "Contractor" used throughout Division 22 shall mean Mechanical Subcontractor.
2. Term "provide" shall mean to furnish all necessary labor, materials, equipment, accessories, transportation, services, installation and adjustment under Contract amount, including Contractor's profit, overhead and payment of all taxes and fees.

1.3 SUBMITTALS

A. General: Follow the procedures specified in Division 01 Section "Submittal Procedures" and as specified in this Section.

B. Shop Drawings and Catalog Sheets. Include:

1. Plumbing line layout.
2. Floor drains.
3. Cleanouts.
4. Expansion joints for plumbing lines.
5. Plumbing fixtures.
6. Back flow preventers.
7. Standpipe fire line layout and components.
8. Support material and hardware.

C. Substitutions:

1. Products are referenced in Specification and on Drawings to establish standard of quality, style, design, and function of materials, equipment, apparatus, or product.
2. There are often several satisfactory substitutes for standardized utilitarian items which satisfy design objectives.
3. Since it is impractical to name all possible brands that might be furnished, substitutes may be proposed unless specifically stated otherwise.
4. Submit substitutions in accordance with Division 01 and General Conditions of Specification and as follows:
 - a. Submit proposed substitute material or equipment to be considered for approval as equivalent to Engineer/Architect at least 7 days before time set for receiving Bids.
 - b. Contractor assumes all engineering and construction costs necessary for revision in Work due to substitute material or equipment.

D. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.

- E. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

1.4 COORDINATION

1. Visit site before Bidding to note apparent features which may affect Work. No subsequent allowance will be made because of failure to make this examination before Bidding.
2. Verify all dimensions in field before ordering any material or doing any Work.
3. Verify ceiling heights or other architectural and structural details before installing any piping.
4. No extra compensation will be allowed because of differences between actual measurements and dimensions and those indicated on Drawings.
5. Notify Engineer/Architect in writing of any difference which may be found before proceeding with Work.

1.5 SEQUENCING AND SCHEDULING

1. Coordinate mechanical equipment installation with other building components.
2. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
3. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
4. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
5. Coordinate connection of electrical services.
6. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
7. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames".
8. Schedule Work so as to coordinate with other Contractors.
9. Before starting Work, prepare and submit to Prime Contractor schedule of operations outlining proposed order of procedure, giving dates of execution and estimated time required for completion of each step.
10. After schedule has been accepted by Prime Contractor and Engineer/Architect, do not deviate from schedule without written consent of Prime Contractor.
11. No subsequent extras will be allowed for materials and labor not included by Bidder for Mechanical Work due to lack of familiarity with Contract Documents as they relate to Work of all other trades required for Project.
12. Before construction starts, cut off and plug any abandoned existing services at property line. Coordinate with local utility company and civil engineer.
13. Coordinate service connection to meter with local water department and civil engineer.

1.6 QUALITY ASSURANCE

- A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code--Steel".

- B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
 - 1. Comply with provisions of ASME B31 Series "Code for Pressure Piping".
 - 2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.
- C. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- D. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

1.7 CODES AND STANDARDS

- 1. Comply with:
 - a. American Welding Society (AWS).
 - b. American Society of Mechanical Engineers (ASME).
 - c. American National Standards Institute (ANSI).
 - d. American Society for Testing and Materials (ASTM).
 - e. American Insurance Association (A.I.A.).
 - f. National Fire Protection Association (NFPA).
 - g. Underwriters' Laboratories, Inc. (UL).
 - h. Manufacturer's Standardization Society of the Valve & Fittings Industry, Inc. (MSS).
 - i. Factory Mutual Research Corp. (FM).
 - j. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - k. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
- 2. All local, state, and federal rules and regulations.
 - a. 2012 International Building Code (IBC):
 - 1) 2012 IBC International Building Code.
 - 2) 2012 IBC International Mechanical Code.
 - 3) 2012 IBC International Plumbing Code.
 - 4) 2012 IBC International Fire Prevention Code.
- 3. Should any change in Drawings and Specifications be required to comply with local regulations, notify Engineer/Architect at least 7 days before time set for receiving Bids. After entering into contract, Contractor will be held to complete all Work necessary to meet local requirements without extra expense to Owner.
- 4. Maintain a competent superintendent at Project throughout progress of Work and until Work is completed.

1.8 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 01 Section "Closeout Procedures". In addition to the requirements specified in Division 01, indicate the following installed conditions:
 - 1. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Indicate actual inverts and horizontal locations of underground piping.
 - 2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 - 3. Approved substitutions, contract modifications, and actual equipment and materials installed.
 - 4. Contract modifications, actual equipment and materials installed.
- B. Engage the services of a Land Surveyor or Professional Engineer registered in the state in which the project is located as specified in Division 01 Section "Execution Requirements" to record the locations and invert elevations of underground installations.

1.9 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 01 Section "Closeout Procedures" In addition to the requirements specified in Division 01, include the following information for equipment items:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Deliver materials to Project in good condition. Store materials off ground and protected from elements.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 02 through 33 for rough-in requirements.
- C. Drawings are generally diagrammatic and indicative of Work to be installed.
- D. Do not scale Drawings for rough-in Work.

3.2 MECHANICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate mechanical systems, equipment, and materials installation with other building components so as not to delay Contractors.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
 - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 - 5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 - 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 - 7. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 - 8. Install systems, materials, and equipment to conform with approved submittal data to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer/Architect.
 - 9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
 - 10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
 - 11. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames" and this section.
 - 12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
 - 13. Install piping to occupy minimum of space. Install parallel and close to walls, ceiling, columns or other members providing proper space for covering or removal of pipes.
 - 14. Coordinate Work to avoid interferences with other trades.
 - 15. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings or valves which may be required. Investigate structural and finish conditions affecting this Work. Plan accordingly, furnishing such offsets, fittings and valves as may be required.
 - 16. Where possible, locate all plumbing lines in areas which are out of public view.
 - 17. Review plumbing layout with Engineer/Architect before construction.

18. In case of conflict between riser diagram and floor plan, greater quantity or better quality prevails, subject to approval of Engineer/Architect.
19. Coordinate all Work specified in this Division with Work of all other trades required for Project.
20. Check Structural Drawings for location of drains, vents and other Mechanical Work. In case of conflict between Structural Drawings and Mechanical Drawings, Structural Drawings take precedence.
21. Notify Engineer/Architect immediately and confirm in writing of any conflict between Mechanical and Structural Drawings.
22. Finish painting will be done by others.
23. Any galvanized equipment, material, or hardware that is cut, scratched, field threaded or grooved shall be coated with a Zinc Rich Coating (ZRC or approved equivalent).
24. Trench and backfill in accordance with Division 31 Section "Earth Moving."
25. In case interferences between Work develop, Engineer/Architect will decide which Work is to be relocated regardless of which was first installed.
26. Cleanup:
 - a. At completion of Work under this contract, remove from site and dispose of all rubbish and discarded materials and restore disturbed facilities and surfaces.
 - b. Provide entire installation thoroughly free from all oil and grease after successfully completing all tests and before Work is turned over to Owner.

3.3 PIPING SYSTEMS-COMMON REQUIREMENTS

- A. General: Install piping as described below, except where system Sections specify otherwise.
- B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated.
- C. Install all piping parallel to building walls and column lines at such height for proper drainage and so not to interfere with doorways, stairway or traffic.
- D. Install suspended pipes as close to ceiling as possible and at uniform grade.
- E. Where interferences develop in field, offset or reroute piping as required to clear such interferences. Use proper fittings, no bent pipe is permitted.
- F. Install full-time water lines in areas not subject to freezing within building and below frost line and minimum of 36 in. below grade outside building.
- G. Install water meter and backflow preventor in protected area not subject to freezing.
- H. Use small amount of prepared, pipe thread lubricant on outside threads.
- I. Work pipe into place without springing
- J. Install all piping such that it will drain and vent as shown or required.
- K. Provide uniform grade to all horizontal pipes and provide drains at all low points in water piping system.

- L. Cast-in-Place Insert Installation: Before placement of concrete, furnish, locate and set on forms, cast-in-place inserts which support Mechanical Work.
- M. Furnish hot dipped galvanized steel pipe sleeves extended one inch above finished floor line for all pipe running through floors.
- N. Install piping at indicated slope.
- O. Install components having pressure rating equal to or greater than system operating pressure.
- P. Install piping free of sags and bends and neat in appearance.
- Q. Install couplings according to manufacturer's printed instructions.
- R. Below Grade, Exterior Wall, Pipe Penetrations: Install cast-iron wall pipes for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-in. (25mm) annular clear space between pipe and sleeve for installation of mechanical seals.
- S. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping sealant material. Firestopping materials are specified in Division 07 Section "Penetration Firestopping".
- T. Verify final equipment locations for roughing in.
- U. Refer to equipment specifications in other Sections for roughing-in requirements.
- V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.
 - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - 3. Soldered Joints: Construct joints according to AWS "Soldering Manual", Chapter 22 "The Soldering of Pipe and Tube".
 - 4. Brazed Joints: Construct joints according to AWS "Brazing Manual" in the "Pipe and Tube" Chapter.
 - 5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:
 - a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- W. All piping routed over finished areas must be insulated.

3.4 EQUIPMENT INSTALLATION--COMMON REQUIREMENTS

- A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Engineer/Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.
- D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location. Provide unions to facilitate equipment replacement.
- E. Install equipment giving right-of-way to piping systems installed at a required slope.
- F. Provide 4 inch high concrete housekeeping pad with rounded edges under all floor mounted equipment where clearance allows.
- G. Fasteners and Anchors: Hot dipped galvanized or stainless steel, type, grade, and class as required. Mounting holes for all fasteners must be drilled. The use of powder, gas, or other types of power propelled fasteners is prohibited.

3.5 HANGER AND SUPPORT INSTALLATION:

- A. Support piping in building on standard clevis type (MSS SP-69, No. 1) hangers, with adjustable rods.
- B. Properly support all piping installed on suitable pipe hangers and supports. Permanent hangers, supports, and anchors shall be fabricated from durable materials, hot dipped galvanized or stainless steel, suitable for service conditions in accordance with details on Drawings.
- C. Base required strength of all supporting equipment on combined weight of piping filled with water, plus any insulating covering.
- D. Install hangers for horizontal piping with following minimum rod sizes:

| <u>Nominal Pipe Size</u> | <u>Minimum Rod Size</u> |
|--------------------------|-------------------------|
| 0.75 in. to 2 in. pipe | 0.375 in. |
| 2.5 in. to 3.5 in. pipe | 0.5 in. |
| 4 in. to 5 in. pipe | 0.625 in. |
| 6 in. pipe | 0.75 in. |
| 8 in. to 12 in. pipe | 0.875 in. |

- E. Provide and install anchors in piping system to fix direction of expansion and contraction. Fabricate and assemble anchors to secure desired points of piping in relatively fixed positions. Hangers shall permit line to take up expansion and contraction freely in opposite directions away from anchored point and shall be so arranged as to be structurally suitable for particular location, line, and loading conditions in question.
- F. Use expansion anchors to anchor pipe hanger and supports where inserts have been improperly located, or where necessary to support piping from existing concrete construction. Provide expansion anchors equal to Ackerman-Johnson, Paine, Phillips, Hilti, ITW Ramset/Red

Head, or Rawl. Expansion anchor locations must have approval of Engineer/Architect before installation. Coordinate location with structural.

- G. Support parallel pipe lines at same level on approved trapeze or saddle type hangers.
- H. Use steel rods to attach ring or trapeze hangers to building structure. Space hangers at sufficiently close intervals to support piping and its contents, 12 ft on center maximum for threaded pipes.
- I. Support copper piping with copper clevis hangers, or clevis hanger with copper supporting loop.
- J. Provide sheet metal collar at each pipe hanger for insulated pipe with vapor barrier.
- K. Any support hardware or material that is cut, scratched or threaded shall be coated with a zinc rich coating (ZRC or equivalent) at these locations.

3.6 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01 Section "Execution". In addition to the requirements specified in Division 01, the following requirements apply:
 - 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
 - 2. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
 - a. Uncover Work to provide for installation of improperly scheduled Work.
 - b. Remove and replace defective Work.
 - c. Remove and replace Work not conforming to requirements of the Contract Documents.
 - d. Remove samples of installed Work as specified for testing.
 - e. Install equipment and materials in structures.
 - f. Upon written instructions from the Engineer/Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- B. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, and trim, and other mechanical items made obsolete by the new Work.
 - 1. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
 - 2. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
 - 3. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
 - a. Refer to Division 01 Section "Reference Standards and Definitions" for definition of "experienced Installer".
 - 4. Respective trades will provide openings in floors, walls, and other members as required for installation of piping and equipment, provided that necessary information regarding such openings is furnished by contractor in timely manner.

5. If contractor fails to provide information regarding required openings, cutting and repairing of completed Work will be performed by respective trades at expense of contractor.
6. Seal all such openings in accordance with Division 07 Section "Concrete Joint Sealants."
7. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations only with written approval of Engineer/Architect. Perform cutting by skilled mechanics of the trades involved.
8. Repair cut surfaces to match adjacent surfaces.

3.7 LABELING AND IDENTIFYING

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 1. Stenciled Markers: Complying with ASME A13.1.
 2. Locate pipe markers wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums), and exposed exterior locations as follows:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
 - c. Near locations where pipes pass through walls, floors, ceilings, or enter inaccessible enclosures.
 - d. At access doors, manholes, and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
 - f. Spaced at a maximum of 50 ft (15m) intervals along each run. Reduce intervals to 25 ft (7.6 m) in congested areas of piping and equipment.
- B. Adjusting: Relocate identifying devices which become visually blocked by work of this Division or other Divisions.

3.8 PAINTING AND FINISHING

- A. Refer to Division 09 – Finishes for field painting requirements.
- B. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.9 CONCRETE BASES

- A. Construct concrete equipment bases of dimensions indicated, but not less than 4 in. (101 mm) larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi (20.70MPa), 28-day compressive strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete".

3.10 TESTING AND GUARANTEE

- A. Testing:

1. Take out all necessary permits, arrange for all required inspections, and pay all fees and expenses associated with performing Mechanical Work.
2. Test all piping systems at full operating pressure under normal conditions of use in accordance with requirements of Water Department, Board of Health, Fire Department, and all other authorities having jurisdiction. As a minimum, the water supply system shall be tested at 125 psi for 4 hrs, the sewer system at 5 psi for 15 minutes, natural gas at 100 psi for 2 hours, and the standpipe system at 225 psi for 2 hrs.
3. Provide all instruments for making tests.
4. Perform tests on following systems:
 - a. Water Supply System.
 - b. Sewer System.
 - c. Natural Gas Supply System.
 - d. Standpipe System.
5. Test all parts of system in presence of Contractor, Engineer/Architect, Owner and Authority having jurisdiction for sufficient period of time to permit complete examination and inspection.
6. Successfully test all concealed piping before its being permanently covered up.
7. Remedy all defects in materials or workmanship which appear during test or retest of system.

B. Guarantee:

1. In addition to any specific guarantee called for by Specifications, furnish to Owner written guarantee against defects in materials, workmanship for all apparatus and materials furnished, and for entire workmanship of installation for period of 1 yr from date of acceptance of Work.
2. During guarantee period and without expense to Owner, repair all defects in workmanship or material provided under this Section.

END OF SECTION 22 05 01

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Consultants.

SECTION 22 05 19

METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Thermometers.

1.02 REFERENCE STANDARDS

- A. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.
- B. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014.
- C. ANSI/NSF Standard 61 Drinking Water System Components - Health Effects

PART 2 PRODUCTS

2.01 GENERAL

- A. NSF/ANSI 61, 0.25% low lead shall be required and enforced on all potable water system components. Individual components shall bear labeling of compliance.

2.02 THERMOMETERS

- A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
2. Moeller Instrument Company, Inc: www.moellerinstrument.com/#sle.
3. Watts Water Technologies, Inc: www.watts.com/#sle.
4. Weiss Instruments, LLC: www.weissinstruments.com/#sle.
5. Weksler Glass Thermometer Corp: www.wekslerglass.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

- B. General:

1. Product Compliance: ASTM E1.
2. Lens: Clear glass, except where stated.
3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.
4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.

- C. Thermometers - Straight: 5 inch v-shape lead-free brass case with clear glass window scale, 2 inch NPT stem, 3-1/4 inch NPT thermowell, and red or blue non-toxic organic liquid filled glass tube.

- D. Thermometers - Adjustable Angle: 7 inch v-shape aluminum case with clear glass window scale, 6 inch NPT stem, red or blue organic non-toxic liquid filled glass tube, and adjustable joint with positive locking device allowing 360 degrees in horizontal plane or 180 degrees in vertical plane adjustments.

- E. Thermometers - Dial Type:

1. Fixed: 5 inch diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch NPT stem.
2. Adjustable Angle: 5 inch diameter dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed lens, recalibrating screw, and 2-1/2 inch NPT stem.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install metering products in accordance with manufacturer's instructions for intended fluid type and service.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

- A. Nameplates:
 - 1. Heat exchangers, water heaters, and other heat transfer products.
- B. Tags:
 - 1. Piping: 3/4 inch diameter and smaller.
 - 2. Manual operated and automated control valves.
- C. Pipe Markers: 3/4 inch diameter and higher.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Laminated piece with up to three lines of text.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.
 - 3. Background Color: Black.

2.03 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
 - 2. Brady Corporation: www.bradycorp.com.

3. Brimar Industries, Inc.: www.pipemarker.com.
 4. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 5. Seton Identification Products: www.seton.com.
 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch in diameter.
- C. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

- A. Manufacturers:
1. Brady Corporation: www.bradycorp.com.
 2. Brimar Industries, Inc: www.pipemarker.com.
 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
 4. Seton Identification Products: www.seton.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Comply with ASME A13.1.
- C. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.
- D. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
- E. Identification Scheme, ASME A13.1:
1. Primary: External Pipe Diameter, Uninsulated or Insulated.
 2. Secondary: Color scheme per fluid service.
 - a. Water- Potable, Cooling, Boiler Feed, and Other: White text on green background.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

- A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags in clear view and align with axis of piping
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flexible elastomeric cellular insulation.
- B. Glass fiber insulation.
- C. Flexible elastomeric insulation.
- D. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 09 9123 - Interior Painting: Painting insulation jacket.

1.03 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).
- C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).
- D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.
- E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.
- F. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

- A. Manufacturers:
 - 1. Basis of Design: Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com.
 - 3. Johns Manville Corporation: www.jm.com.
 - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K Value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 850 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. K Value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 650 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm inch.
- E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- F. Vapor Barrier Lap Adhesive: Compatible with insulation.
- G. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- H. Fibrous Glass Fabric:

1. Cloth: Untreated; 9 oz/sq yd weight.
2. Blanket: 1.0 pcf density.
3. Weave: 5 by 5.

I. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd weight.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

J. Insulating Cement: ASTM C449.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Armacell LLC; AP Armaflex: www.armacell.us/#sl.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. 'K' value: ASTM C177, 0.25 at 75 degrees F.
2. Minimum Service Temperature: Minus 40 degrees F.
3. Maximum Service Temperature: 220 degrees F.
4. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.04 JACKETING AND ACCESSORIES

A. PVC Plastic.

1. Manufacturers:
 - a. Johns Manville Corporation: www.jm.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil, 0.010 inch.
 - e. Connections: Brush on welding adhesive.
3. Covering Adhesive Mastic: Compatible with insulation.

B. Aluminum Jacket:

1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Inserts and Shields:
 - 1. Application: Piping 1.1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert Location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.

3.03 SCHEDULES

A. Plumbing Systems:

1. Domestic Hot Water (Copper Piping, 105°F-140°F):
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: <1.1/2 inch.
 - 2) Thickness: 1 inch.
2. Domestic Hot Water Recirculation (Copper Piping 105-140 degree):
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: <1 1/2 inch.
 - 2) Thickness: 1 inch.
3. Domestic Hot Water Supply (PEX Piping, 105°F-140°F):
 - a. Flexible Elastomeric Insulation:
 - 1) Pipe Size Range: <1.1/2 inch.
 - 2) Thickness: 1 inch.
4. Domestic Hot Water Recirculation (PEX Piping, 105-140 degree):
 - a. Flexible Elastomeric Insulation:
 - 1) Pipe Size Range: 3/8-1.1/2 inch.
 - 2) Thickness: 1.1/2 inch.
5. Domestic Cold Water (Copper Piping):
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: <4 inch.
 - 2) Thickness: 1 inch.
6. Domestic Cold Water (PEX Piping):
 - a. Flexible Elastomeric Insulation:
 - 1) Pipe Size Range: <4 inch.
 - 2) Thickness: 1 inch.

END OF SECTION

SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sanitary waste piping, buried within 5 feet of building.
- B. Sanitary waste piping, above grade.
- C. Domestic water piping, buried within 5 feet of building.
- D. Domestic water piping, above grade.
- E. Pipe, pipe fittings, valves, regulators, and connections for piping systems.
 - 1. Natural gas piping, buried within 5 feet of building.
 - 2. Pipe flanges, unions, and couplings.
 - 3. Pipe hangers and supports.
 - 4. Pipe sleeve-seal systems.
 - 5. Ball valves.
 - 6. Butterfly valves.

1.02 RELATED REQUIREMENTS

- A. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- B. Section 22 0719 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- C. ASME B31.9 - Building Services Piping; 2014.
- D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.
- E. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2015.
- F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- G. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- H. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
- I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

- J. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2010.
- K. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2002 (Reapproved 2010).
- L. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.
- M. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
- N. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.
- O. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
- P. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).
- Q. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.
- R. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- S. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.
- T. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2009.
- U. AWWA C651 - Disinfecting Water Mains; 2005.
- V. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2009.
- W. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2011.
- X. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.
- Y. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.
- Z. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.
- AA. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.
- AB. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- AC. MSS SP-67 - Butterfly Valves; 2011.

- AD. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- AE. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- AF. NSF 372 - Drinking Water System Components - Lead Content; 2011.
- AG. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.06 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
- C. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
 - 3. Foam core piping not allowed.

2.03 SANITARY WASTE PIPING, ABOVE GRADE (NOT IN RETURN AIR PLENUMS)

- A. Cast Iron Pipe: ASTM A74, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. PVC Pipe: ASTM D2729.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
 - 3. Foam core piping not allowed.

2.04 SANITARY WASTE PIPING, ABOVE GRADE (IN RETURN AIR PLENUMS)

- A. Cast Iron Pipe: ASTM A74, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.05 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. PEX Piping: Crosslinked polyethylene (PEX) manufactured by PEX-a or Engel method. PEX piping, fittings, manifolds, and accessories shall be by a single manufacturer and shall be warranted as a system.

1. Minimum Bend Radius (cold bending): No less than six times the outside diameter. Use a bend support as supplied by the PEX tubing manufacturer for tubing with a bend radius less than stated.
2. Nominal Inside Diameter: Provide tubing with nominal inside diameter, in accordance with ASTM F876 as indicated: 3/8 inch, 1/2 inch, 3/4 inch, 1 inch, 1 1/4 inch, 1 1/2 inch, 2 inch.
3. Fittings: PEX-a cold expansion fitting; assembly consists of the appropriate PEX insert with a corresponding PEX Ring.
4. Manifolds: Type L copper body with UNS 3600 series brass PEX outlet connections or Engineered Plastic (EP) body with PEX outlet connections.
5. Accessories:
 - a. Angle stops and straight stops that are compatible with PEX tubing are supplied by the PEX tubing manufacturer.
 - b. Bend supports designed for maintaining tight radius bends are supplied by the PEX tubing manufacturer.
 - c. ProPEX expander tool to install the ASTM F1960 compatible fittings are supplied by the PEX tubing manufacturer.
 - d. The tubing manufacturer provides clips and/or PEX rails for supporting tubing runs.
 - e. All horizontal tubing hangers and riser clamps are epoxy-coated material.

B. Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: Ductile or gray iron, standard thickness.
2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch diameter rods.

2.06 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.
 - a. Manufacturers:
 - 1) Grinnell Products, a Tyco Business: www.grinnell.com.
 - 2) Viega LLC: www.viega.com.
 - 3) Substitutions: Not permitted.

B. PEX Piping:

1. PEX piping only permitted where specifically shown on the drawings.
2. Material:
 - a. Tubing Standard: PEX High-Density Cross-linked polyethylene tubing shall be manufactured to the requirements of ASTM F876 and meet the standard grade hydrostatic pressure ratings from Plastic Pipe Institute in accordance with TR-4/03. The following three standard grade ratings are required.
 - 1) Temperature/pressure:
 - (a) 200 degrees F at 80 psig.
 - (b) 180 degrees F at 100 psig.
 - (c) 73.4 degrees F at 160 psig.
 - 2) Chlorine testing: According to ASTM F876 shall meet or exceed the following end use condition.

- (a) End use conditions of : 100% @ 140°F o Per PEX 5306 (CL5)
- 3) UV testing: According to ASTM F876 PEX tubing products shall meet or exceed the following exposure limits: 6 months
- 3. Fittings:
 - a. Fitting Standard: Fittings shall be manufactured from UNS, C87700, C87710 Bronze or Radel R® polymer, meeting the requirements of ASTM F877 tested as a system with PEX tubing. The sleeve shall be manufactured out of a 304 grade or better stainless steel and have three view holes (attached sleeve) to ensure proper PEX tubing insertion. The attached sleeve fitting will incorporate a tool locator ring that shall be in place while making a proper press connection. The connection shall be made with a supplied ratcheting hand tool or power tool.
 - b. Fitting Standard: Crimp fittings for use with copper crimp rings shall be manufactured from UNS C69300 or C87850 Brass / Eco Brass® meeting the requirements of ASTM F1807 and or PolyAlloy polymer meeting the requirements of ASTM F2159. The crimp connection shall be made by use of a full circle crimp tool designed to crimp F1807 copper crimp rings.
 - c. Manifolds: Acceptable manifolds shall include:
 - 1) Copper Manifolds: Shall be copper material having a male or female solder.
 - 2) Polymer Manifolds: Shall be plastic material having a male NPSM thread, PureFlow Press or PureFlow Crimp inlets. All outlets shall be PureFlow Press, PureFlow Crimp, or PureFlow compression connections provided by the PEX system manufacturer.
 - d. Adapter Fittings: PEX adapter fittings shall conform to one of the following ASTM standards; F877, F1807, F2159, or ASME B1.20.1 and be listed to the CSA B137.5. The adapter fittings shall mate to NPT threads, copper tubing, copper fittings or fittings.

2.07 CONDENSATE PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.
 - 3. Mechanical Press Sealed Fittings: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.
 - a. Manufacturers:
 - 1) Grinnell Products, a Tyco Business: www.grinnell.com.
 - 2) Viega LLC: www.viega.com.
 - 3) Substitutions: Not permitted.

2.08 PIPE FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 inch and Under:
 - 1. Ferrous Pipe: Class 150 malleable iron threaded unions.
 - 2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Sizes Over 1 inch:
 - 1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 - 2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.09 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - a. Cold and Hot Pipe Sizes 6 inch and Larger: Double hangers.
 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 4. Vertical Pipe Support: Steel riser clamp.
 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
 6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
 - a. Bases: High-density polypropylene.
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.
 - e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.
 - f. Manufacturers:
 - 1) PHP Systems/Design: www.phpsd.com.
 - 2) Miro, Inc.: www.miroind.com.
 - 3) Substitutions: See Section 01 6000 - Product Requirements.
- B. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
 2. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
 3. Wall Support for Pipe Sizes to 3 inch: Cast iron hook.
 4. Wall Support for Pipe Sizes 4 inch and Over: Welded steel bracket and wrought steel clamp.
 5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
 2. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
 3. Hangers for Hot Pipe Sizes 2 to 4 inch: Carbon steel, adjustable, clevis.
 4. Hangers for Hot Pipe Sizes 6 inch and Larger: Adjustable steel yoke, cast iron pipe roll, double hanger.
 5. Wall Support for Pipe Sizes Up to 3 inch: Cast iron hook.
 6. Wall Support for Pipe Sizes 4 inch and Larger: Welded steel bracket and wrought steel clamp.
 7. Wall Support for Hot Pipe Sizes 6 inch and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.

8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 9. Floor Support for Hot Pipe Sizes to 4 inch: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
 10. Floor Support for Hot Pipe Sizes 6 inch and Larger: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
 11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
 2. Masonry Wedge Expansion Anchors: Comply with ICC-ES AC01.
 3. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
 4. Masonry Screw Type Anchors: Comply with ICC-ES AC106.
 5. Concrete Adhesive Type Anchors: Comply with ICC-ES AC308.
 6. Other Types: As required.
 7. Manufacturers:
 - a. Powers Fasteners, Inc.: www.powers.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.10 PIPE SLEEVE-SEAL SYSTEMS

- A. Manufacturers:
1. The Metraflex Company; MetraSeal: www.metraflex.com/#sle.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Modular Mechanical Seals:
1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
 2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
 3. Size and select seal component materials in accordance to service requirements.
 4. Glass reinforced plastic pressure end plates.

2.11 BALL VALVES

- A. Manufacturers:
1. Anvil International: www.anvilintl.com/#sle.
 2. Apollo Valves: www.apollovalves.com/#sle.
 3. Grinnell Products, a Tyco Business: www.grinnell.com.
 4. Nibco, Inc: www.nibco.com.
 5. Uponor, Inc: www.uponorengineering.com/sle.
 6. Viega LLC: www.viega.us/#sle.
 7. Apollo Valves: www.apollovalves.com.
 8. Watts, Inc.: www.watts.com.
 9. Crane Energy: www.craneenergy.com.
- B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union.

2.12 BUTTERFLY VALVES

- A. Manufacturers:
 - 1. Anvil International: www.anvilintl.com/#sle.
 - 2. Apollo Valves: www.apollovalves.com/#sle.
 - 3. Crane Company: www.cranecpe.com.
 - 4. Grinnell Products; B302: www.grinnell.com/#sle.
 - 5. Apollo Valves: www.apollovalves.com
 - 6. Watts, Inc.: www.watts.com.
 - 7. Crane Energy: www.craneenergy.com.
 - 8. Substitutions: See Section 01 6000 - Product Requirements.
- B. Construction 1-1/2 inch and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- C. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed.

- H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- I. Provide support for utility meters in accordance with requirements of utility companies.
- J. Install bell and spigot pipe with bell end upstream.
- K. Install water piping to ASME B31.9.
- L. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- M. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- N. Sleeve pipes passing through partitions, walls, and floors.
- O. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- P. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping.
 - 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - 10. Support cast iron drainage piping at every joint.
- Q. Pipe Sleeve-Seal Systems:
 - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 - 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 - 3. Locate piping in center of sleeve or penetration.
 - 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.

5. Tighten bolting for a watertight seal.
6. Install in accordance with manufacturer's recommendations.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed, and clean.
- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SCHEDULES

- A. Pipe Hanger Spacing:
 1. Metal Piping:
 - a. Pipe Size: 1/2 inch to 1-1/4 inch:
 - 1) Maximum Hanger Spacing: 6.5 ft.
 - 2) Hanger Rod Diameter: 3/8 inches.
 - b. Pipe Size: 1-1/2 inch to 2 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.
 - c. Pipe Size: 2-1/2 inch to 3 inch:
 - 1) Maximum Hanger Spacing: 10 ft.

- 2) Hanger Rod Diameter: 1/2 inch.
- d. Pipe Size: 4 inch to 6 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 5/8 inch.
- 2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum Hanger Spacing: 6 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION

SECTION 22 10 06

PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Drains.
- B. Trap seal protection.
- C. Cleanouts.
- D. Hose bibbs.
- E. Hydrants.
- F. Backwater valves.
- G. Backflow preventers.
- H. Water hammer arrestors.
- I. Mixing valves.
- J. Air admittance valves
- K. Vacuum relief valves

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping.
- B. Section 22 4000 - Plumbing Fixtures.
- C. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ASME A112.6.3 - Floor and Trench Drains; 2001 (R2007).
- B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2003.
- C. ASSE 1011 - Hose Connection Vacuum Breakers; 2004.
- D. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011.
- E. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011.
- F. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

G. NSF 372 - Drinking Water System Components - Lead Content; 2011.

H. PDI-WH 201 - Water Hammer Arresters; 2010.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Josam Company: www.josam.com.
3. MIFAB, Inc.: www.mifab.com.
4. Wade, Inc.: www.wadedrains.com.
5. Watts, Inc.: www.watts.com.
6. Noble Company; FreeStyle Linear Drain: www.noblecompany.com/#sle.
7. Zurn Industries, LLC: www.zurn.com.
8. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Drains:

1. Assembly: ASME A112.6.4.
2. Body: Lacquered cast iron with sump.
3. Strainer: Removable polyethylene dome with vandal proof screws.
4. Accessories: Coordinate with roofing type:
 - a. Membrane flange and membrane clamp with integral gravel stop.
 - b. Adjustable under deck clamp.
 - c. Roof sump receiver.
 - d. Waterproofing flange.
 - e. Controlled flow weir.
 - f. Leveling frame.
 - g. Adjustable extension sleeve for roof insulation.

C. Roof Overflow Drains:

1. Lacquered cast iron body and clamp collar and bottom clamp ring; pipe extended to two inches above flood elevation.
- D. Downspout Nozzles:
1. Downspout Cover, round fabricated stainless steel frame with fabricated secured perforated stainless steel hinged strainer.
- E. Floor Drain (FD-1):
1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.
- F. Floor Sink (FS-1):
1. 12" x 12" x 8" deep Square lacquered cast iron body with integral seepage pan, epoxy coated interior, aluminum dome strainer, clamp collar, full grate.

2.03 TRAP SEAL PROTECTION

A. Trap Primers

1. Manufacturers:
 - a. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 - b. Watts Regulator Company: www.wattsregulator.com.
 - c. Sioux Chief: www.soiuxchief.com
 - d. MIFAB, Inc: www.mifab.com.
 - e. Precision Plumbing Products, Inc.: www.pppinc.net.
2. Pressure drop activated brass trap seal primer, with inlet opening of ½" (13) male N.P.T. and outlet opening of female ½" (13) N.P.T. Complete with four view holes and removable filter screen. Serves up to 3 floor drain traps and requires no adjustments and no air pre-charge.

B. Trap Seal Protection Device

1. Manufacturers:
 - a. Sure Seal: www.thesureseal.com.
 - b. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Local authority having jurisdiction approved trap protection device.
 - a. Standard: ASSE 1072-2007.
 - b. Body: ABS Plastic
 - c. Diaphragm & Sealing Gasket: Neoprene Rubber
 - d. Size: 2 inch (50 mm), 3 inch (75 mm), 3-1/2 inch (89 mm), or 4 inch (100 mm).
 - e. Gravity Drain Outlet Connection: Compression fit sealing gasket 80 durometer.

2.04 CLEANOUTS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Josam Company: www.josam.com.

3. MIFAB, Inc.: www.mifab.com
4. Wade, Inc.: www.wadedrains.com.
5. Watts, Inc.: www.watts.com
6. Zurn Industries, LLC: www.zurn.com.

B. Cleanouts at Exterior Surfaced Areas (CO-1):

1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Exterior Unsurfaced Areas (CO-2):

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

D. Cleanouts at Interior Finished Floor Areas (CO-3):

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

E. Cleanouts at Interior Finished Wall Areas (CO-4):

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.05 HOSE BIBBS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Watts Regulator Company: www.wattsregulator.com.
3. Zurn Industries, LLC: www.zurn.com.
4. Woodford Manufacturing, Inc.: www.woodfordmfg.com.

B. Interior Hose Bibbs:

1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome-plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.

C. Interior Mixing Type Hose Bibbs:

1. Bronze or brass, wall mounted, double service faucet with hose thread spout, integral stops, chrome-plated where exposed with handwheels, and vacuum breaker in compliance with ASSE 1011.

2.06 HYDRANTS

A. Manufacturers:

1. Arrowhead Brass & Plumbing, LLC: www.arrowheadbrass.com.
2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
3. Zurn Industries, LLC: www.zurn.com.
4. Woodford Manufacturing, Inc.: www.woodfordmfg.com.
5. Wade, Inc.: www.wadedrains.com.

B. Wall Hydrants:

1. ASSE 1019; freeze resistant, self-draining type with chrome-plated wall plate hose thread spout, handwheel, and integral vacuum breaker.

C. Floor Hydrants:

1. ASSE 1019; chrome-plated lockable recessed box, hose thread spout, lockshield and removable key, and vacuum breaker.

2.07 BACKWATER VALVES

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Savko Plastic Pipe & Fittings, Inc: www.savko.com.
3. Zurn Industries, LLC: www.zurn.com.
4. Wade, Inc.: www.wadedrains.com.

B. Cast Iron Backwater Valves: ASME A112.6.4; lacquered cast iron body and cover, brass valve, extension sleeve, and access cover.

C. Plastic Backwater Valves: ABS body and valve, extension sleeve, and access cover.

2.08 BACKFLOW PREVENTERS

A. Manufacturers:

1. Conbraco Industries, Inc: www.apollovalves.com.
2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.
3. Zurn Industries, LLC: www.zurn.com.
4. Ames Fire & Waterworks: www.amesfirewater.com.
5. Febco Backflow Prevention products, Inc.: www.febcoonline.com.

B. Reduced Pressure Backflow Preventer Assembly:

1. ASSE 1013; cast bronze body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.

2.09 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.
3. Zurn Industries, LLC: www.zurn.com.

B. Water Hammer Arrestors:

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.
2. All water hammer arrestors to be ASSE 1010 Certified and approved with corresponding label.
3. PDI size AA is not acceptable for commercial installation.
4. Provide a square wall access panel and frame for each water hammer arrestor installed in a wall. Panel is to have a smooth, stainless steel panel secured to nickel bronze frame, set flush to finished wall plane, complete with securing lugs.

2.10 MIXING VALVES

A. Thermostatic Mixing Valves:

1. Manufacturers:
 - a. Honeywell International Inc: yourhome.honeywell.com.
 - b. Apollo Valves: www.apollovalves.com.
 - c. Powers Controls, Inc.: www.powerscontrols.com.
 - d. Zurn, Inc.: www.zurn.com.
2. Valve: Chrome-plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
3. Accessories:
 - a. Check valve on inlets.
 - b. Volume control shut-off valve on outlet.
 - c. Stem thermometer on outlet.
 - d. Strainer stop checks on inlets.

B. Pressure Balanced Mixing Valves:

1. Manufacturers:
 - a. Delta Faucet Company: www.deltafaucet.com.
 - b. Leonard Valve Company: www.leonardvalve.com.
 - c. Honeywell Water Controls: <http://yourhome.honeywell.com>.
 - d. Apollo Valves: www.apollovalves.com.
 - e. Powers Controls, Inc.: www.powerscontrols.com.
 - f. Zurn, Inc.: www.zurn.com.
2. Valve: Chrome-plated cast brass body, stainless steel cylinder, integral temperature adjustment.
3. Accessories:
 - a. Volume control shut-off valve on outlet.
 - b. Stem thermometer on outlet.
 - c. Strainer stop checks on inlets.

2.11 AIR ADMITTANCE VALVES

A. Manufacturers:

1. Studor: www.studor.net
2. Oatey: www.oatey.com

- ### **B. The purpose of an Air Admittance Valve is to provide a method of allowing air to enter the plumbing drainage system without the use of a vent extended to open air and to prevent sewer gases from escaping into a building. An Air Admittance Valve is a one way valve designed to allow air to enter the plumbing drainage system when negative pressures develop in the piping**

system. The device shall close by gravity and seal the vent terminal at zero differential pressure (no flow conditions) and under positive internal pressures.

1. Opens at -0.01 psi and seals at 0 psi and above.
2. Screening on air inlets to guard the seal.
3. Protective rubber sleeve provides grip for installation and keeps valve free from debris.
4. 100% functionally tested at ¼" H₂O and 30" H₂O ensuring trouble free performance.
5. Tension Membrane - Neoprene.
6. Adapter - 1-½" x 2" PVC or ABS.
7. Limited Lifetime Warranty.
8. Listings:
 - a. ASSE 1050 & 1051
 - b. ICC ESR-1664
 - c. NSF Standard 14
 - d. IAPMO - Classified Mark
 - e. ASTM D 2665/D 2661
9. Code Approvals:
 - a. International Plumbing Code (IPC) 2003
 - b. International Residential Code (IRC) 2003

2.12 VACUUM RELIEF VALVES

A. Manufacturers:

1. Zurn Industries, Inc: www.zurn.com.
2. Watts, Inc.: www.watts.com

- ### **B.**
- Lead free water service vacuum relief valve consists of a lead free brass body construction with NPT male inlet connection, and a protective cap, low profile design, is tested and rated to ANSI Z21.22, and is CSA certified. Suitable for low pressure steam and water service, domestic water heaters and supply tanks, table top heaters, jacketed steam kettles, unit heaters, low pressure steam systems, and steam coil heaters. Maximum Working Pressure: 200psi (13.8 bar), Maximum Steam Pressure: 15psi (103 kPa).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or washing machine outlets.
- H. Pressure test sanitary sewer piping prior to the installation of air admittance valves.

END OF SECTION

SECTION 22 11 17

GARAGE DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. In accordance with Contract Documents, furnish all labor equipment, and materials to install domestic water, and storm sewer plumbing facility.
- B. This Section includes plumbing piping systems as indicated on the Drawings. Systems include the following:
 - 1. Potable domestic water system.
- C. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 22 Section "Common Work Results for Plumbing".

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:
 - 1. Water Distribution Systems, Below Ground: 150 psig.
 - 2. Water Distribution Systems, Above Ground: 125 psig.

1.4 SUBMITTALS

- A. General: Submit the information specified in the submittals Section of "Basic Mechanical Requirements" in accordance with Conditions of Contract and Division 01 Specifications Section.
- B. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
- C. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

PART 2 - PRODUCTS

2.1 GENERAL

- A. See Division 22 Section "Common Work Results for Plumbing" for acceptable products and manufacturers.

2.2 MATERIALS

A. General:

- 1. Provide new materials of the best grade and quality.

B. Pipe:

1. Water

a. Copper

- 1) Above Ground - Type L hard drawn copper: ASTM B88.
- 2) Underground - Type K hard drawn copper: ASTM B88.

C. Fittings and Joints:

- 1. Make all connections between steel or iron pipe and copper pipe with approved insulating coupling.
- 2. Nipples: Same material as pipe on which they are used. Avoid use of close nipples if possible.
- 3. Fittings for copper water piping: Forged copper fittings sweat soldered using lead-free solder. Do not use cast copper.
- 4. Adapters for unions and valves: Solder to IPS.

D. Valves:

- 1. Globe valves: Provide bronze or iron bodies, with brass rings and renewable composition discs equivalent to Crane No. 1, 351, or 1310.
- 2. Check valves: Provide swing type, with bronze bodies, equivalent to Crane No. 37, 372, or 1342.
- 3. Gate valves 3 in. and smaller: Provide bronze or iron body gate valves, with non-rising stem with wedge disc, equivalent to Crane No. 440. Elsewhere, provide iron body gate valves, equivalent to Crane No. 460.
- 4. Angle valves 3 in. and smaller: Provide bronze body, RS Class 125, threaded. Two (2) in. and larger: Provide cast iron body, OS & Y, Flanged.
- 5. Approved manufacturers of valves furnished and installed are Crane, Lunkenheimer, Powell, or approved equivalent.
- 6. Provide gate and globe valves of type permitting repacking while valve is under pressure.
- 7. Packing shall be fiberglass graphite composition with Inconel were insert or approved equivalent.
- 8. Furnish and install valve TAGS for each valve provided under Contract. Tags may be of following:
 - a. Two (2) in. x 1.5 in. rectangular anodized aluminum tags, 0.0625 in. thick with 0.375 in. thick stamped letters.

- E. Clamps, rods and all support material and hardware shall be hot dipped galvanized or stainless steel.

2.3 REDUCED PRESSURE BACKFLOW PREVENTERS

- A. General: ASSE Standard, backflow preventers, of size indicated for maximum flow rate indicated and maximum pressure loss indicated.
 - 1. Working Pressure: 150 psig minimum except where indicated otherwise.
 - 2. 2 in. and Smaller: Bronze body with threaded ends.
 - 3. Interior Components: Corrosion-resistant materials.
 - 4. Strainer on inlet.

2.4 WALL FAUCETS

- A. Provide valves/faucets as noted on plans.
 - 1. $\frac{3}{4}$ " Woodford Model 24C or approved equivalent. Brass finish with loose tee handle and vacuum breaker backflow preventer.
 - 2. $1\frac{1}{2}$ " – Potter Roemer 4060 with $1\frac{1}{2}$ " to $\frac{3}{4}$ " reducer and Woodford 34HD vacuum breaker.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Domestic Water System:
 - 1. Furnish and install complete system of water supply piping. All water piping shall be Type K copper pipe below grade and Type L copper pipe above grade. Arrange for water service with local utility company and civil engineer. Provide water meter connection and extend service from water meter installed by local utility company. All charges of utility company for service, water meter, and related Work shall be paid by this contractor.
 - 2. Water supply shall be connected to each fixture requiring water. All water supply piping shall be pitched to relieve air.
 - 3. Provide water hammer arrester at terminals of all water supply risers and pipes of ample capacity to prevent water hammer.
 - 4. All branches shall be valved so that any supply line may be controlled.
 - 5. Wall faucets shall be provided and installed where located on Drawings.
 - 6. System shall be flushed, chlorinated for 24 hrs, and tested.

3.2 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.3 DEMONSTRATION

- A. Train Owner's maintenance personnel on procedures related to startup and servicing of interceptors.

3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION 22 11 17

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Consultants.

SECTION 22 14 13
GARAGE DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. In accordance with Contract Documents, furnish all labor equipment, and materials to install domestic water, and storm sewer plumbing facility.
- B. This Section includes plumbing piping systems as indicated on the Drawings. Systems include the following:
 - 1. Drainage and vent systems.
- C. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 22 Section "Common Work Results for Plumbing".

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:
 - 1. Storm Drainage Systems: 10-ft head of water.

1.4 SUBMITTALS

- A. General: Submit the information specified in the submittals Section of "Basic Mechanical Requirements" in accordance with Conditions of Contract and Division 01 Specifications Section.
- B. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
- C. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

PART 2 - PRODUCTS

2.1 GENERAL

- A. See Division 22 Section "Common Work Results for Plumbing" for acceptable products and manufacturers.

2.2 MATERIALS

- A. General:
 - 1. Provide new materials of the best grade and quality.
- B. Pipe:
- C. Pipe:
 - 1. Drainage and vent:
 - a. Schedule 40 PVC - DWV:
 - 1) Buried underground inside and to point 5 ft outside building: Schedule 40 PVC - DWV with cemented connections.
 - 2) Above ground: Schedule 80 PVC with solvent cemented joints connections.
- D. Fittings and Joints:
 - 1. Nipples: Same material as pipe on which they are used. Avoid use of close nipples if possible.
 - 2. Fittings solvent cemented joints ASTM D2564 - 12
 - 3. Fittings for copper drainage piping: Cast copper fittings, ASA B16.23. Sweat solder joints with lead-free solder.
 - 4. Apply purple primer before PVC joints are cemented
- E. Floor and Trench Drains: Heavy duty cast-iron with coated, heavy duty, vandal-proof grate and sediment buckets. Size, connection type and additional options are as specified on Drawings.
 - 1. Acceptable Manufacturers:
 - a. Josam
 - b. Smith.
 - c. Wade.
 - d. Zurn.
 - e. Ancon.
- F. Backwater Valves: Coated cast iron backwater valve, plastic ball float, elastomer seat, bronze cage and threaded or spigot outlet connection:
 - 1. Acceptable Manufacturers:
 - a. Josam 1000 Series.
 - b. Smith 7000 Series.
 - c. Zurn Z-1099 Series.
 - d. Ancon BV 230-R.
- G. Cleanouts:
 - 1. In conductor risers: PVC tee with hub and spigot connections and with internal gasket seal for installation in unfinished areas. Where finished appearance in wall installation is required, use in conjunction with access cover or box:
 - a. Acceptable manufacturers:

- 1) Josam.
 - 2) Smith
 - 3) Wade
 - 4) Zurn
 - 5) Ancon
2. In floors in structure: Coated cast iron, adjustable housing, floor cleanout, spigot or no-hub connection with internal gasketed cleanout plug and adjustable housing with heavy duty, secured (vandalproof) scoriated round cast iron tractor cover for heavy traffic for installation flush with finished floor:
- a. Acceptable manufacturers:
 - 1) Josam 56060 Series.
 - 2) Smith 4240 Series.
 - 3) Wade W-6000-Z and W-7000-Z Series.
 - 4) Zurn Z-1420-25.
 - 5) Ancon C-200-RX.
3. In floors and walls in finished areas: Provide with flush brass ring and covers, chrome plates, screwed to plug and set level and flush with floor or wall.
- H. Expansion Joints for Rain Water Collectors: Vertical expansion joint
1. Acceptable manufacturers:
 - a.
- I. Clamps, rods and all support material and hardware shall be hot dipped galvanized or stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Sewer Systems:
1. Provide piping, floor drains and accessories, backwater valve, catch basins, manholes, covers, pumps, or any other required components complete to existing storm, sanitary or combined sewer on site.
 2. Pitch all horizontal lines 0.125 in. per ft minimum.
 - a. Cleanouts shall be provided in horizontal drainage lines and spaced at intervals, based on developed length of pipe, not exceeding the following values:
 - 1) 75 feet for 4" pipe and smaller
 - 2) 100 feet for larger than 4" pipe
 - 3.
 4. Install backwater valves wherever shown on Drawings.
 5. All pipe buried in ground shall have firm bearing along entire length of undisturbed earth, or on compacted sand. Pipe on fill or loose soil shall be supported on brick or concrete piers, and then firmly embedded in earth. At foot of each stack, block concrete foundation shall be provided for stack, block concrete foundation shall be provided for stack to rest on.

6. Waste piping passing through foundation wall or under footing shall be provided with iron pipe sleeve built into masonry or concrete. Sleeve shall be 2 pipe sizes greater than pipe passing through.
7. Provide and set cleanouts for all drains inside building at ends of all horizontal branches, at base of all stacks, and all points where so indicated, called for, or necessary to clear line of obstructions.
8. Provide Y-branch with cleanout at side in locations where cleanout will not be readily accessible due to interference of wall or other member.
9. Provide plugs for cleanouts.
10. Provide Owner with wrench to use for countersunk nuts on cleanout plugs.
11. Vent piping from main sanitary waste and fixture vents shall be extended as shown, 1 ft 9 in. above roof and flashed. Flashing to have 18 in. x 18 in. 4-pound lead base and extended up to top of stack and turned down to stack.

3.2 COMMISSIONING

- A. Preparation: Perform following checks before start-up:
 1. Systems tests are complete.
 2. Damaged and defective specialties and accessories have been replaced or repaired.
 3. There is clear space for servicing of specialties.
- B. Before operating systems, perform these steps:
 1. Close drain valves, hydrants, and hose bibbs.
 2. Open valves to full open position.
 3. Remove and clean strainers.
 4. Verify drainage and vent piping are clear of obstructions. Flush with water until clear.
- C. Test and certify systems in accordance with Division 22 Section "Common Work Results for Plumbing".

3.3 ADJUSTING

- A. Adjust operation and correct deficiencies discovered during commissioning.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel on procedures related to startup and servicing of interceptors.

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION 22 14 13

20011 Gregg County Parking Garage and Office

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Consultants.

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water heaters.
- B. Diaphragm-type compression tanks.
- C. In-line circulator pumps.

1.02 REFERENCE STANDARDS

- A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.
- B. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- C. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.
- B. Product Data:
 - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - 2. Indicate pump type, capacity, power requirements.
 - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
 - 4. Provide electrical characteristics and connection requirements.
- C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Certifications:
 - 1. Water Heaters: NSF approved.
 - 2. Gas Water Heaters: Certified by CSA International to ANSI Z21.10.1, as applicable, in addition to requirements specified elsewhere.
 - 3. Electric Water Heaters: UL listed and labeled to UL 174.
 - 4. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
- B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

- C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATERS

A. Manufacturers:

1. A.O. Smith Water Products Co: www.hotwater.com/#sle.
2. Bradford White: www.bradfordwhite.com
3. Lochinvar: www.lochinvar.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Residential Electric:

1. Type: Automatic, electric, vertical storage.
2. Tank: Glass lined welded steel, thermally insulated with one inch thick glass fiber; encased in corrosion-resistant steel jacket; baked-on enamel finish.
3. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F, flanged or screw-in nichrome elements, enclosed controls and electrical junction box and operating light. Wire double element units so elements do not operate simultaneously.
4. Accessories:
 - a. Water Connections: Brass.
 - b. Dip Tube: Brass.
 - c. Drain valve.
 - d. Anode: Magnesium.
 - e. Temperature and Pressure Relief Valve: ASME labeled.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Manufacturers:

1. Amtrol Inc: www.amtrol.com.
2. ITT Bell & Gossett: www.bellgossett.com.
3. Taco, Inc: www.taco-hvac.com.
4. Wessels Company: www.westank.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

- C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

2.03 IN-LINE CIRCULATOR PUMPS

- A. Manufacturers:

1. Armstrong Pumps Inc: www.armstrongpumps.com.
2. ITT Bell & Gossett: www.bellgossett.com.
3. Grundfos: www.grundfos.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

- B. All internal surfaces with contact to domestic hot water shall be constructed of bronze, stainless steel, phenolic, polypropylene, or other non-ferrous materials.

- C. Drive: Flexible coupling.

2.04 ELECTRICAL WORK

- A. Provide electrical motor driven equipment specified complete with motors, motor starters, controls, and wiring.
- B. Electrical characteristics to be as specified or indicated.
- C. Furnish motor starters complete with thermal overload protection and other appurtenances necessary for the motor control specified.
- D. Supply manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices not shown.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.
- C. Domestic Water Storage Tanks:
 1. Provide steel pipe support, independent of building structural framing members.
 2. Clean and flush prior to delivery to site. Seal until pipe connections are made.
- D. Pumps:
 1. Provide air cock and drain connection on horizontal pump casings.
 2. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
 3. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

4. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
5. Align and verify alignment of base mounted pumps prior to start-up.
6. Provide electrical interlocking from cooling condensate pump safety switch to associated HVAC unit(s) furnished under other Sections.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush valve water closets.
- B. Wall hung urinals.
- C. Lavatories.
- D. Sinks.
- E. Under-lavatory pipe supply covers.
- F. Electric water coolers.
- G. Service sinks.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between fixtures and walls and floors.
- B. Section 22 1005 - Plumbing Piping.
- C. Section 22 1006 - Plumbing Piping Specialties.
- D. Section 22 3000 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008.
- C. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2002).
- D. ASME A112.18.1 - Plumbing Supply Fittings; 2012.
- E. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011.
- F. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2013.
- G. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2013.
- H. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2004.

- I. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.
- J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- K. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- L. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

- A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted or wall hung. See drawing for location, siphon jet flush action, china bolt caps.
 - 1. Bowl: ASME A112.19.2; 16.5 inches high with elongated rim.
 - 2. Flush Valve: Exposed (top spud).
 - 3. Flush Operation: Sensor operated.
 - 4. Handle Height: 44 inches or less.
 - 5. Inlet Size: 1-1/2 inches.
 - 6. Trapway Outlet: 4 inch.
 - 7. Color: White.
 - 8. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com.

- b. Kohler Company: www.kohler.com/#sle.
- c. Zurn Industries, LLC; www.zurn.com/#sle.
- d. Substitutions: See Section 01 6000 - Product Requirements.

B. Flush Valves:

- 1. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com.
 - b. Delany Products: www.delanyproducts.com/#sle.
 - c. Sloan Valve Company: www.sloanvalve.com/#sle.
 - d. Zurn Industries, LLC; ZEMS Series: www.zurn.com/#sle.
 - e. Substitutions: See Section 01 6000 - Product Requirements.

C. Toilet Seats:

- 1. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com.
 - b. Bemis Manufacturing Company: www.bemismfg.com.
 - c. Church Seat Company: www.churchseats.com.
 - d. Zurn Industries, Inc: www.zurn.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- 2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, with cover.

D. Water Closet Carriers:

- 1. Manufacturers:
 - a. JOSAM Company: www.josam.com.
 - b. Zurn Industries, Inc: www.zurn.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
- 2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.03 WALL HUNG URINALS

A. Manufacturers:

- 1. American Standard, Inc: www.americanstandard-us.com.
- 2. Kohler Company: www.kohler.com.
- 3. Zurn Industries, LLC; www.zurn.com/#sle.
- 4. Substitutions: See Section 01 6000 - Product Requirements.

B. Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.

- 1. Consumption Volume: 1.0 gal per flush, maximum.
- 2. Flush Style: Washout.
- 3. Flush Valve: Exposed (top spud).
- 4. Flush Operation: Sensor operated.
- 5. Trapway Outlet: Integral.
- 6. Removable stainless steel strainer.
- 7. Supply Size: 3/4 inch.

8. Outlet Size and Location: 2 inches, bottom side.

C. Flush Valves:

1. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com.
 - b. Delany Products: www.delaneyvalve.com.
 - c. Sloan Valve Company: www.sloanvalve.com.
 - d. Zurn Industries, Inc: www.zurn.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.

D. Urinal Carriers:

1. Manufacturers:
 - a. JOSAM Company: www.josam.com.
 - b. Zurn Industries, Inc: www.zurn.com.
 - c. Watts: www.watts.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.04 LAVATORIES

A. Manufacturers:

1. Powers: www.powerscontrols.com.
2. American Standard, Inc: www.americanstandard-us.com.
3. Kohler Company: www.kohler.com.
4. Zurn Industries, Inc: www.zurn.com.

- B. Sensor Operated Faucet: Cast brass, chrome plated, deck mounted with sensor located on neck of spout.

C. Thermostatic Mixing Valve:

1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.

D. Accessories:

1. White PVC P-trap with clean-out plug and arm with escutcheon.
2. Provide barrier free fixtures with trap and supply vinyl insulation cover systems.
3. Provide barrier free fixtures with an ASSE 1070 water tempering valve.
4. Flexible Supplies:
 - a. High-quality rubber cone washer with large pliable sealing surface ensures a long-lasting water-tight connection. Braided polymer-coated fibers bend freely, without kinking or crimping. Hand-tighten wing nuts offer quicker connections to faucets, while the long nut ensures dependable thread engagement. Hose assembly consists of tough polymer-coated fibers tightly braided around a strong, reinforced PVC inner hose. Assemblies are IAPMO and CSA listed, and meets ASME A112.18.6.

2.05 SINKS

A. Manufacturers:

1. American Standard, Inc: www.americanstandard-us.com.
 2. Kohler Company: www.kohler.com.
 3. Elkay: www.elkayusa.com
 4. Just Manufacturing: www.justsinks.com.
- B. Single Compartment Bowl: ASME A112.19.3; 18 gage, .050 inch thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
- C. Double Compartment Bowl: ASME A112.19.3; 18 gage, .050 inch thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
- D. Accessories:
1. White PVC P-trap with clean-out plug and arm with escutcheon.
 2. Offset waste with perforated open strainer.
 3. Provide barrier free fixtures with trap and supply vinyl insulation cover systems.
 4. Provide barrier free fixtures with an ASSE 1070 water tempering valve.
 5. Wheel handle stops, one-piece mechanism provides years of smooth, 1/4-turn operation. Made from machined brass rod for strength, durability, and lasting appearance. 100% leak tested to ensure reliable, leak-free operation. IAPMO and CSA Approved.
 6. Flexible Supplies:
 - a. High-quality rubber cone washer with large pliable sealing surface ensures a long-lasting water-tight connection. Braided polymer-coated fibers bend freely, without kinking or crimping. Hand-tighten wing nuts offer quicker connections to faucets, while the long nut ensures dependable thread engagement. Hose assembly consists of tough polymer-coated fibers tightly braided around a strong, reinforced PVC inner hose. Assemblies are IAPMO and CSA listed, and meets ASME A112.18.6.

2.06 UNDER-LAVATORY PIPE SUPPLY COVERS

- A. Manufacturers:
1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Basis of Design: Plumberex Specialty Products, Inc; www.plumberex.com/#sle.
1. Under-Lavatory Covers with Snap-Lock Fasteners (Molded): Plumberex Pro-Extreme.
- C. General:
1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
 2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
 - a. Comply with ASTM C1822 Type III for covers on accessible lavatory piping.
 - b. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
 - c. Comply with ICC A117.1.
 3. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.07 ELECTRIC WATER COOLERS

A. Manufacturers:

1. Elkay Manufacturing Company: www.elkay.com/#sle.
2. Halsey Taylor: www.halseytaylor.com.
3. Haws Corporation: www.hawscor.com/#sle.
4. Substitutions: Not permitted.

B. Water Cooler: Electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.

1. Capacity: 8 gph of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
2. Electrical: 115 VAC, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

2.08 SERVICE SINKS

A. Manufacturers:

1. American Standard, Inc: www.americanstandard-us.com.
2. Commercial Enameling Company: www.cecosinks.com.
3. Elkay Manufacturing Company: www.elkay.com.
4. Just Manufacturing Company: www.justmfg.com.
5. Zurn Industries, Inc: www.zurn.com.
6. Fiat Plumbing Fixtures: www.fiat.ca
7. Substitutions: See Section 01 6000 - Product Requirements.

B. Bowl: ASME A112.19.1; 22 by 18 by 12 inch deep, porcelain enamelled (inside only) cast iron roll-rim sink, with 12 inch high back, concealed hanger, chrome-plated strainer, stainless steel rim guard, cast iron P-trap with adjustable floor flange.

C. Bowl: 36 by 24 by 10 inch high white molded stone, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.

D. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

E. Accessories:

1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
2. Hose clamp hanger.
3. Mop hanger.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.

- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 9005, color to match fixture.
- F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Adhesive-backed duct markers.
- D. Pipe markers.

1.02 RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Automatic Controls: Tags. Key to control schematic.
- C. Control Panels: Nameplates.
- D. Ductwork: Adhesive Backed Duct Markers.
- E. Instrumentation: Tags.
- F. Piping: Pipe markers.
- G. Small-sized Equipment: Tags.
- H. Valves: Tags.

2.02 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Champion America, Inc: www.Champion-America.com.
- C. Seton Identification Products: www.seton.com/aec.
- D. Substitutions: See Section 01 6000 - Product Requirements.

2.03 NAMEPLATES

A. Manufacturers:

1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com.
2. Brimar Industries, Inc: www.pipemarker.com/#sle.
3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
4. Seton Identification Products, a Tricor Direct Company: www.seton.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.
4. Plastic: Comply with ASTM D709.

2.04 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
2. Brady Corporation: www.bradycorp.com.
3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
4. Seton Identification Products, a Tricor Company: www.seton.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

2.05 ADHESIVE-BACKED DUCT MARKERS

A. Manufacturers:

1. Brimar Industries, Inc: www.pipemarker.com.
2. Craftmark Pipe Markers: www.craftmarkid.com/#sle.

B. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch; printed with UV and chemical resistant inks.

C. Style: Individual Label.

D. Color: Yellow/Black.

2.06 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. Seton Identification Products, a Tricor Company: www.seton.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 9123 for stencil painting.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Use tags on piping 3/4 inch diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify valves in main and branch piping with tags.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.02 RELATED REQUIREMENTS

- A. Section 01 9113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.
- B. Section 23 0800 - Commissioning of HVAC.

1.03 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, Eighth Edition.
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 5. Units of Measure: Report data in I-P (inch-pound) units only.

1.05 QUALITY ASSURANCE

- A. To avoid conflicts, the Testing and Balancing subcontractor is not to be the the controls subcontractor engaged in this project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work.

3.03 PREPARATION

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
 - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.
- C. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 5 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 5 percent of design.

3.05 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.

- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

3.07 COMMISSIONING

- A. See Sections 01 9113 - General Commissioning Requirements and 23 0800 for additional requirements.
- B. Perform prerequisites prior to starting commissioning activities.
- C. Fill out Prefunctional Checklists for:
 - 1. Air side systems.

- D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.
- E. In the presence of the Commissioning Authority, verify that:
 - 1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
 - 2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
 - 3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

3.08 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Fire Pumps.
 - 2. Sprinkler Air Compressor.
 - 3. Electric Water Coolers.
 - 4. Plumbing Pumps.
 - 5. Packaged Roof Top Heating/Cooling Units.
 - 6. Split System Air Conditioning Units.
 - 7. Fans.
 - 8. Air Inlets and Outlets.

3.09 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. HP/BHP.
 - 4. Phase, voltage, amperage; nameplate, actual, no load.
 - 5. RPM.
 - 6. Service factor.
 - 7. Starter size, rating, heater elements.
 - 8. Sheave Make/Size/Bore.
- B. V-Belt Drives:
 - 1. Identification/location.
 - 2. Required driven RPM.
 - 3. Driven sheave, diameter and RPM.
 - 4. Belt, size and quantity.
 - 5. Motor sheave diameter and RPM.
 - 6. Center to center distance, maximum, minimum, and actual.

C. Pumps:

1. Identification/number.
2. Manufacturer.
3. Size/model.
4. Impeller.
5. Service.
6. Design flow rate, pressure drop, BHP.
7. Actual flow rate, pressure drop, BHP.
8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.
11. Shut off, discharge and suction pressures.
12. Shut off, total head pressure.

D. Air Cooled Condensers:

1. Identification/number.
2. Location.
3. Manufacturer.
4. Model number.
5. Serial number.
6. Entering DB air temperature, design and actual.
7. Leaving DB air temperature, design and actual.
8. Number of compressors.

E. Cooling Coils:

1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Water flow, design and actual.
11. Water pressure drop, design and actual.
12. Entering water temperature, design and actual.
13. Leaving water temperature, design and actual.
14. Saturated suction temperature, design and actual.
15. Air pressure drop, design and actual.

F. Return Air/Outside Air:

1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.

6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.
12. Design outside/return air ratio.
13. Actual outside/return air ratio.

G. Supply and Exhaust Fans:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Sheave Make/Size/Bore.
10. Number of Belts/Make/Size.
11. Fan RPM.

H. Duct Traverses:

1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air correction factor.

I. Duct Leak Tests:

1. Description of ductwork under test.
2. Duct design operating pressure.
3. Duct design test static pressure.
4. Duct capacity, air flow.
5. Maximum allowable leakage duct capacity times leak factor.
6. Test apparatus:
 - a. Blower.
 - b. Orifice, tube size.
 - c. Orifice size.
 - d. Calibrated.
7. Test static pressure.
8. Test orifice differential pressure.
9. Leakage.

J. Air Distribution Tests:

1. Air terminal number.

2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

END OF SECTION

SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 23 0553 - Identification for HVAC Piping and Equipment.
- C. Section 23 3100 - HVAC Ducts and Casings

1.03 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.
- C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.
- D. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2014.
- E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2012.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Basis of Design: Knauf Insulation; Atmosphere Duct Wrap: www.knaufinsulation.com.
 - 3. Johns Manville: www.jm.com.
 - 4. Owens Corning Corporation: www.ocbuildingspec.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. K-value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 1,200 degrees F.
 - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure-sensitive tape.
- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film with pressure-sensitive rubber-based adhesive.

2.03 DUCT LINER

- A. Manufacturers:
 - 1. Armacell LLC: www.armacell.us.

2. CertainTeed Corporation: www.certainteed.com/#sle.
 3. Ductmate Industries, Inc, a DMI Company: www.ductmate.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
1. Minimum Service Temperature: Minus 40 degrees F.
 2. Maximum Service Temperature: 180 degrees F.
 3. Fungal Resistance: No growth when tested according to ASTM G21.
 4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F.
 5. Minimum Noise Reduction Coefficients:
 - a. 1/2 inch Thickness: 0.30.
 - b. 1 inch Thickness: 0.40.
 - c. 1-1/2 inches Thickness: 0.50.
 - d. 2 inch Thickness: 0.60.
 6. Erosion Resistance: Does not show evidence of breaking away, flaking off, or delamination at velocities of 10,000 fpm when tested in accordance with ASTM C1071.
 7. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation. Comply with ASTM C916.
- D. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated Ducts Conveying Air Below Ambient Temperature:
 1. Provide insulation with vapor barrier jackets.
 2. Finish with tape and vapor barrier jacket.
 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Insulated Ducts Conveying Air Above Ambient Temperature:
 1. Provide with or without standard vapor barrier jacket.
 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

3. External Duct Insulation Application:
 - a. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - b. Secure insulation without vapor barrier with staples, tape, or wires.
 - c. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - d. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - e. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3.03 SCHEDULES

- A. Interior Supply Air Ductwork, (units with cooling):
 1. Flexible Glass Fiber Duct insulation: 1.1/2 inch thick.
- B. Interior Return Air Ductwork, (units with cooling):
 1. Flexible Glass Fiber Duct insulation: 1.1/2 inch thick.
- C. Exhaust Ductwork:
 1. Not Insulated.
- D. All Transfer Air Ductwork;
 1. Duct Liner: 1 inch thick flexible elastomeric.

END OF SECTION

SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 09 9123 - Interior Painting: Painting insulation jacket.

1.03 REFERENCE STANDARDS

- A. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- C. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 5 years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
 - 1. Aeroflex USA, Inc: www.aeroflexusa.com.
 - 2. Armacell LLC: www.armacell.us.
 - 3. K-Flex USA LLC: www.kflexusa.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. K-Value: 0.28 at 75 degrees F.
 - 2. Minimum Service Temperature: Minus 40 degrees F.
 - 3. Maximum Service Temperature: 180 degrees F.
 - 4. Connection: Waterproof vapor barrier adhesive.

- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install in accordance with NAIMA National Insulation Standards.

- C. Exposed Piping: Locate insulation and cover seams in least visible locations.

- D. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

- E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.

3.03 SCHEDULE

- A. Cooling Systems:
 - 1. Condensate Drains from Cooling Coils:
 - a. Flexible Elastomeric Cellular Insulation:
 - 1) Pipe Size Range: 1/2-6 inch.
 - 2) Thickness: 1 inch.
 - 2. Refrigerant Suction:
 - a. Flexible Elastomeric Cellular Insulation:
 - 1) Pipe Size Range: 1/2-3 inch.
 - 2) Thickness: 1 inch.

3. Refrigerant Hot Gas:
 - a. Flexible Elastomeric Cellular Insulation:
 - 1) Pipe Size Range: 1/2-3 inch.
 - 2) Thickness: 1 inch.

END OF SECTION

SECTION 23 08 00

COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. See Section 01 9113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 01 9113.
- B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.
- D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:
 - 1. Control system.
 - 2. Major and minor equipment items.
 - 3. Piping systems and equipment.
 - 4. Ductwork and accessories.
 - 5. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
- E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 7800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.
- B. Section 01 9113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

1.03 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1 - The HVAC Commissioning Process; 2012.

1.04 SUBMITTALS

- A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.
- B. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.01 PREPARATION

- A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.
- B. Furnish additional information requested by the Commissioning Authority.
- C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.
- D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.
- E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.
- F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.
- G. Provide temperature and pressure taps in accordance with Contract Documents.

3.02 INSPECTING AND TESTING - GENERAL

- A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.
- B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.
- C. Provide two-way radios for use during the testing.
- D. Valve/Damper Stroke Setup and Check:
 - 1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.

2. Set pump/fan to normal operating mode.
 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 4. Command valve/damper open; verify position is full open and adjust output signal as required.
 5. Command valve/damper to a few intermediate positions.
 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- E. Isolation Valve or System Valve Leak Check: For valves not by coils.
1. With full pressure in the system, command valve closed.
 2. Use an ultra-sonic flow meter to detect flow or leakage.
- F. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.03 TAB COORDINATION

- A. TAB: Testing, adjusting, and balancing of HVAC.
- B. Coordinate commissioning schedule with TAB schedule.
- C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.
- D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.
- E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.
- F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.04 CONTROL SYSTEM FUNCTIONAL TESTING

- A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.
- B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.
- C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.
- D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.

1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
 2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.
- E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.
- F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.
1. Setpoint changing features and functions.
 2. Sensor calibrations.
- G. Demonstrate to the Commissioning Authority:
1. That all specified functions and features are set up, debugged and fully operable.
 2. That scheduling features are fully functional and setup, including holidays.
 3. That all graphic screens and value readouts are completed.
 4. Correct date and time setting in central computer.
 5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no additional cost to Owner.
 6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no additional cost to Owner.
 7. Power failure and battery backup and power-up restart functions.
 8. Global commands features.
 9. Security and access codes.
 10. Occupant over-rides (manual, telephone, key, keypad, etc.).
 11. O&M schedules and alarms.
 12. Occupancy sensors and controls.
 13. All control strategies and sequences not tested during controlled equipment testing.
- H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.05 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01 7800 for additional requirements.
- B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

3.06 DEMONSTRATION AND TRAINING

- A. See Section 01 7900 for additional requirements.
- B. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.
- C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.
- D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:
- E. TAB Review: Instruct Owner's personnel after completion of TAB on the following:
- F. HVAC Control System Training: Perform training in at least three phases:
 - 1. Phase 1 - Basic Control System: Provide minimum of 2 hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
 - a. This training may be held on-site or at the manufacturer's facility.
 - b. If held off-site, the training may occur prior to final completion of the system installation.
 - c. For off-site training, Contractor shall pay expenses of up to two attendees.
 - 2. Phase 2 - Integrating with HVAC Systems: Provide minimum of 2 hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:
 - a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
 - b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
 - c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
 - d. Every display screen, allowing time for questions.
 - e. Point database entry and modifications.
 - 3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of 2 hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.
- G. Provide the services of manufacturer representatives to assist instructors where necessary.

- H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 23 09 93

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
 - 1. Split systems.
 - 2. Exhaust fans
 - 3. Vehicle exhaust sensor system
 - 4. Smoke detector operation

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
 - 1. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in Contract Documents.
 - 2. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
 - 3. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.
 - 4. Include schedules, if known.
- C. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SINGLE ZONE FAN COIL UNITS AND SPLIT SYSTEM CONDENSING UNITS (HP-1/FCU-1, HP-2/FCU-2, HP-3/FCU-3, HP-4/FCU-4, HP-5/FCU-5, HP-6/FCU-6, HP-7/FCU-7).

- A. General: These units are split system fan coil units with electric resistance heat and split system air cooled outdoor direct expansion heat pump units.
- B. Utilize the package control systems provided with these units. Install, wire and calibrate in accordance with the manufacturer's instructions.

- C. These evaporator fans on these units are intended to operate continuously during occupied hours and intermittently during unoccupied hours with space temperature control.
- D. Electric resistance heat and split system air cooled direct expansion heat pump units shall cycle to heat the space.
- E. The split system air cooled direct expansion heat pump units shall cycle to cool the space.
- F. Each unit has an outside air duct. Provide a motorized tight shut off (ASHRAE 90.1 compliant) motorized damper; connect to the evaporator fan cycle to open when the evaporator fan is energized.

3.02 EXHAUST FAN (EF-1)

- A. This unit is a constant volume exhaust fan with backdraft damper that serves the parking areas.
- B. This unit is intended to be operated continuously.
- C. There are open louvers and intakes that allow untempered outside air into the space.

3.03 EXHAUST FANS (EF-4, EF-5)

- A. These units are constant volume exhaust fans with a gravity backdraft dampers that serve the office area toilets and utility rooms.
- B. These units are intended to operate during occupied periods via a 7 day programmable time clock.

3.04 EXHAUST FAN (EF-6)

- A. This unit is a constant volume exhaust fan with a gravity backdraft dampers that serve the elevator shaft.
- B. This unit is intended to be operated continuously.

3.05 EXHAUST FAN (EF-2, EF-3)

- A. These units are a constant volume exhaust fan with backdraft damper that serves the parking areas.
- B. These units are intended to be controlled by CO/NO2 sensor system.
- C. There are open louvers and intakes that allow untempered outside air into the space.

3.06 SPLIT SYSTEMS (AC-1/CU-3, AC-2/CU-2, AC-160/CU-160, AC-260/CU-260, AC-360/CU-360, AC-460/CU-460)

- A. These units are indoor heat pumps with a DX cooling/heating coils with an air-cooled condensing units.
- B. These supply fans are intended to operate intermittently with space temperature control.
- C. These units are provided with package controls; install, wire and calibrate the units to operate per the factory requirements.

3.07 VEHICLE EXHAUST SENSOR SYSTEM (CO/NO2)

- A. Furnish, install and wire a vehicle exhaust sensor system as shown on the mechanical plans.
 - 1. Provide approved fume detection system by approved manufacturers: Basis Of Design - Toxalert International/Toxcontrol, approved equivalent system: Acme Engineering Products. Inc./Acme CEL4 Series, MSA/MSA Z-Guard Combo. See plans for sensor locations.
 - 2. Provide necessary low voltage wiring, power supplies to controller, and transformers to supply power to the remote sensors as required by manufacturer.
 - 3. Install fume detection system in accordance to manufacturer's specifications.
 - a. First alarm set point: system shall enable 100% of the exhaust fan(s). makeup air unit' inlet motorized damper shall open and fan shall turn on to 100% capacity. refer to sequence of operation below for additional requirements.
 - b. Second alarm set point: after a 1 minute delay, activate audible alarm for personnel evacuation. fans to continue to operate.
 - c. Alarm reset: alarm shall reset when button is pushed or the level has dropped down to first alarm level.
 - 4. Place gas detection panel with readout and reset in a location that is accessible during an evacuation.
 - 5. CO/NO2 concentration setpoint shall be:
 - a. CO First Alarm Setpoint: 9 PPM (adjustable).
 - b. CO Second Alarm Setpoint: 72 PPM (adjustable).
 - c. Sensor Cell location: 5' above finish floor.
 - d. Radius of coverage: approximately 50'.
 - e. NO2 First Alarm Setpoint: 0.7 PPM (adjustable).
 - f. NO2 Second Alarm Setpoint: 2 PPM (adjustable).
 - g. Sensor Cell location: 5' above finish floor.
 - h. Radius of coverage: approximately 50'.
- B. Refer to the plans for the number and location of sensors and the control panel location.
- C. In addition to the alarms integral to this system, control the following equipment in the following manners:
 - 1. The garage door shall open upon alarm activation.
 - 2. CO fume purge exhaust fan EF-4 shall be energized to exhaust the space upon the activation of the vehicle exhaust sensor system alarm.
 - 3. The supply fans on the 100% make-up air unit shall be energized to supply make-up air to the space upon the activation of the vehicle exhaust sensor system alarm.
- D. Should a high gas concentration occur (above user-adjustable alarm level), an alarm signal from any sensor unit starts a 30 second delay. Should the concentration persist through the delay period, the "alarm" clock is activated. The "on" time of this clock, is user-adjustable in discrete settings from 5 to 55 minutes. Upon activation of the "alarm" clock, the "fan-on" relay energizes and remains energized until the "alarm" clock" times out. Should the high concentration still be above the alarm level, the "fan-on" relay will remain ON and the "alarm" relay will energize. This condition is maintained until the high concentration drops.

3.08 DOMESTIC WATER HEATER AND DOMESTIC HOT WATER RECIRCULATION PUMP

- A. The domestic water heaters have integral controls to be utilized for domestic hot water temperature control.
- B. Domestic hot water recirculation pump shall be controlled by a return line aquastat to cycle the hot water recirculation pump to maintain domestic hot water temperature.

END OF SECTION

SECTION 23 23 00
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Filter-driers.

1.02 REFERENCE STANDARDS

- A. AHRI 710 - Performance Rating of Liquid-Line Driers; 2009.
- B. AHRI 730 - Flow Capacity Rating and Application of Suction-Line Filters and Suction-Line Filter-Driers; 2005.
- C. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2013.

1.03 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Liquid Indicators:
 - 1. Use line size liquid indicators in main liquid line leaving condenser.
 - 2. If receiver is provided, install in liquid line leaving receiver.
 - 3. Use line size on leaving side of liquid solenoid valves.
- C. Valves:
 - 1. Use service valves on suction and discharge of compressors.
 - 2. Use gauge taps at compressor inlet and outlet.
 - 3. Use gauge taps at hot gas bypass regulators, inlet and outlet.
 - 4. Use check valves on compressor discharge.
 - 5. Use check valves on condenser liquid lines on multiple condenser systems.
- D. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.
- E. Strainers:

1. Use line size strainer upstream of each automatic valve.
 2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
 3. On steel piping systems, use strainer in suction line.
 4. Use shut-off valve on each side of strainer.
- F. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.
- G. Filter-Driers:
1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
 2. Use a filter-drier on suction line just ahead of compressor.
 3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.
 4. Use sealed filter-driers in low temperature systems.
 5. Use sealed filter-driers in systems utilizing hermetic compressors.
 6. Use replaceable core filter-driers in lines of 1/2 inch outside diameter or greater.
 7. Use replaceable core liquid-line filter-driers in systems utilizing receivers.
 8. Use filter-driers for each solenoid valve.
- H. Solenoid Valves:
1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
 2. Use in liquid line of single or multiple evaporator systems.
 3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.
- I. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store piping and specialties in shipping containers with labeling in place.
- B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 PIPING

- A. Copper Tube:
1. Refrigerant Piping: For piping up to 4 inch use copper refrigerant tube, ASTM B280, cleaned, dehydrated and sealed, marked ACR on hard temper straight lengths. Coils shall be tagged ASTM B280 by the manufacturer.
 2. Fittings, Valves and Accessories:
 - a. Copper fittings: Wrought copper fittings, ASME B16.22.
 - 1) Braze Joints, refrigerant tubing: Cadmium free, AWS A5.8/A5.8M, 45 percent silver brazing alloy, Class BAg-5.
 - 2) Solder Joints, water and drain: 95-5 tin-antimony, ASTM B32 (95TA).

B. Pipe Supports and Anchors:

1. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
5. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
6. Vertical Support: Steel riser clamp.
7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
9. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
10. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.02 REFRIGERANT

- A. Refrigerant: R-134a, tetrafluoroethane as defined in ASHRAE Std 34.
- B. Refrigerant: R-410.

2.03 MOISTURE AND LIQUID INDICATORS

A. Manufacturers:

1. Henry Technologies: www.henrytech.com.
2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com.
3. Sporlan, a Division of Parker Hannifin: www.parker.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

- B. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.04 VALVES

A. Manufacturers:

1. Henry Technologies: www.henrytech.com.
2. Alco
3. Sporlan
4. Mueller Brass
5. Superior Valves
6. Substitutions: See Section 01 6000 - Product Requirements.

2.05 FILTER-DRIERS

A. Performance:

1. Flow Capacity - Liquid Line: As indicated in schedule, minimum, rated in accordance with AHRI 710.
 2. Flow Capacity - Suction Line: As indicated in schedule, minimum, rated in accordance with AHRI 730.
 3. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
 4. Design Working Pressure: 350 psi, minimum.
- B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
- C. Construction: UL listed.
1. Replaceable Core Type: Steel shell with removable cap.
 2. Sealed Type: Copper shell.
 3. Connections: As specified for applicable pipe type.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

3.03 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
 1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
- B. Hanger Spacing for Steel Piping.
 1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
 2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.

5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.

END OF SECTION

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.
- B. Casings and plenums.
- C. Duct cleaning.

1.02 RELATED REQUIREMENTS

- A. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
- B. Section 23 0713 - Duct Insulation: External insulation and duct liner.
- C. Section 23 3300 - Air Duct Accessories.
- D. Section 23 3700 - Air Outlets and Inlets.

1.03 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2013.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- E. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.
- F. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.
- G. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.
- H. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.
- I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- J. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.04 PERFORMANCE REQUIREMENTS

- A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum five years of documented experience.

1.06 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
- C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
 - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
 - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
 - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
 - 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
- E. Insulated Flexible Ducts:
 - 1. Two ply vinyl film supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
 - a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 - b. Maximum Velocity: 4000 fpm.
 - c. Temperature Range: -10 degrees F to 160 degrees F.
- F. Ducts: Galvanized steel, unless otherwise indicated.

- G. Construct ducts and plenums to Seal Class A.
- H. Low Pressure Supply (Heating Systems): 1/2 inch wg pressure class, galvanized steel.
- I. Low Pressure Supply (System with Cooling Coils): 1/2 inch wg pressure class, galvanized steel.
- J. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. Construct of 16 gauge, 0.0598 inch sheet steel using continuous external welded joints in rectangular sections.
 - 3. VOC Content: Not more than 250 g/L, excluding water.
- K. Outside Air Intake: 1/2 inch wg pressure class, galvanized steel.
- L. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.
- C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- E. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
- F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).
- H. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- I. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.04 DUCT MANUFACTURERS

- A. SEMCO Incorporated: www.semcoinc.com.
- B. United McGill Corporation: www.unitedmcgill.com.
- C. Eastern Sheet Metal:www.easternsheetmetal.com
- D. Universal Spiral Air:<http://www.usaduct.com/>
- E. Advanced Sheet metal: www.advancedsheetmetal.us/home.html
- F. Substitutions: See Section 01 6000 - Product Requirements.

2.05 MANUFACTURED DUCTWORK AND FITTINGS

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Flexible Ducts: Two-ply vinyl film supported by helically wound spring steel wire.
 - 1. Insulation: Fiberglass insulation with polyethylene vapor barrier core.
 - 2. Pressure Rating: 10 inches wg positive and 1.0 inches wg negative.
 - 3. Maximum Velocity: 4000 fpm.
 - 4. Temperature Range: Minus 10 degrees F to 160 degrees F.

2.06 CASINGS AND PLENUMS

- A. Fabricate casings in accordance with SMACNA (DCS) and construct for operating pressures indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Flexible Ducts: Connect to metal ducts with mechanical fastener.
- E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- F. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

- I. Use double nuts and lock washers on threaded rod supports.
- J. Connect flexible ducts to metal ducts with adhesive and sheet metal screws.
- K. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- L. Where ductwork has sidewall diffuser or grille mounted on duct, it shall be installed such that it does not reduce duct free area.

3.02 CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct access doors.
- B. Fire dampers.
- C. Flexible duct connectors.

1.02 RELATED REQUIREMENTS

- A. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.
- C. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- D. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
- E. UL 555C - Standard for Safety Ceiling Dampers; 2014.
- F. ANSI/AMCA 500-D - Laboratory methods of testing dampers for rating.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Acudor Products Inc: www.acudor.com.
 - 2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com.
 - 3. Lloyd Industries, Inc.: www.firedamper.com.

4. Nailor Industries Inc: www.nailor.com.
5. Ruskin Company: www.ruskin.com.
6. SEMCO Incorporated: www.semcohv.com.
7. Louvers and Dampers, Inc.
8. Greenheck

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.02 FIRE DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc: www.louvers-dampers.com.
2. Nailor Industries Inc: www.nailor.com.
3. Ruskin Company: www.ruskin.com.
4. Ward Industries by Commercial Products Group of Hart & Cooley, Inc: www.wardind.com.
5. Greenheck: www.greenheck.com

B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

C. All fire dampers shall have dynamic ratings.

D. Ceiling (Radiation) Dampers: Galvanized steel, 22 gauge, 0.0299 inch frame and 16 gauge, 0.0598 inch flap, two layers 0.125 inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.

1. Box Fitting: Factory-provided 26 gauge, 0.0179 inch with field-provided collar.
2. Rated for three hour service in compliance with UL 555C.

E. Horizontal Dampers: Galvanized steel, 22 gauge, 0.0299 inch frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

F. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

G. Multiple Blade Dampers: 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

H. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.03 FLEXIBLE DUCT CONNECTORS

A. Manufacturers:

1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: www.carlislehv.com.
2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com.
3. Elgen Manufacturing: www.elgenmfg.com.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
 - a. Net Fabric Width: Approximately 6 inches wide.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 3100 for duct construction and pressure class.
- B. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated construction, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- C. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.
- D. Cut or drill temporary test holes in duct as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist on metal caps.
- E. Permanent test holes shall be factory fabricated, airtight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

END OF SECTION

SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof exhausters.
- B. Cabinet exhaust fans.

1.02 RELATED REQUIREMENTS

- A. Section 23 3300 - Air Duct Accessories: Backdraft dampers.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 FIELD CONDITIONS

- A. Permanent ventilators may not be used for ventilation during construction.

PART 2 PRODUCTS

2.01 ROOF EXHAUSTERS

- A. Manufacturers:
 - 1. Greenheck Fan Corporation: www.greenheck.com.
 - 2. Loren Cook: www.lorencook.com
- B. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

- C. Roof Curb: 24 inch high self-flashing with continuously welded seams, and factory installed door nailer strip. Curbs shall be equal to Pate PC-2 for membrane roofs.
- D. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and wall mounted multiple speed switch.
- E. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
- F. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.02 CABINET EXHAUST FANS

- A. Manufacturers:
 - 1. Greenheck Fan Corporation: www.greenheck.com.
- B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.
- C. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.
- D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof fans with cadmium plated steel lag screws to roof curb.
- C. Extend ducts to roof fans into roof curb. Counterflash duct to roof opening.
- D. Install flexible electrical connections to allow hinged curbs to fully open for maintenance access.
- E. Hung Cabinet Fans:
 - 1. Install flexible connections specified in Section 23 3300 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.
- F. Provide sheaves required for final air balance.
- G. Install backdraft dampers on inlet to roof exhausters.

- H. Provide backdraft dampers on outlet from cabinet and ceiling exhaust fans and as indicated.

END OF SECTION

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Rectangular ceiling diffusers.
- B. Registers/grilles:
 - 1. Ceiling-mounted, egg crate exhaust and return register/grilles.
 - 2. Ceiling-mounted, exhaust and return register/grilles.
 - 3. Ceiling-mounted, supply register/grilles.
 - 4. Wall-mounted, supply register/grilles.
 - 5. Wall-mounted, exhaust and return register/grilles.
- C. Louvers.

1.02 REFERENCE STANDARDS

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012.
- B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (R2011).
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.04 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Price Industries: www.price-hvac.com.
- B. Titus: www.titus-hvac.com.

- C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SQUARE CEILING DIFFUSERS

- A. Type: Provide square, stamped, multi-core diffuser to discharge air in 360 degree pattern.
- B. Connections: Round.
- C. Frame: Provide inverted T-bar type.
- D. Fabrication: Steel with baked enamel finish.
- E. Color: As indicated.
- F. Accessories: Provide radial opposed blade volume control damper; removable core with damper adjustable from diffuser face.

2.03 CEILING SUPPLY REGISTERS/GRILLES

- A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection.
- B. Frame: 1 inch margin with concealed mounting and gasket.
- C. Construction: Made of aluminum extrusions with factory enamel finish.
- D. Color: As indicated.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.
- B. Frame: 1 inch margin with concealed mounting.
- C. Fabrication: Steel with 20 gauge, 0.0359 inch minimum frames and 22 gauge, 0.0299 inch minimum blades, steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: As indicated.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

2.05 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

- A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch, 1/2 by 1/2 by 1 inch, and 1 by 1 by 1 inch grid core.
- B. Fabrication: Grid core consists of aluminum with mill aluminum finish.
- C. Color: As indicated.

- D. Frame: 1 inch margin with concealed mounting.
- E. Frame: Channel lay-in frame for suspended grid ceilings.
- F. Accessories: Provide integral, gang & face operated opposed blade damper.

2.06 WALL SUPPLY REGISTERS/GRILLES

- A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, double deflection.
- B. Frame: 1 inch margin with concealed mounting and gasket.
- C. Fabrication: Steel with 20 gauge, 0.0359 inch minimum frames and 22 gauge, 0.0299 inch minimum blades, steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: As indicated.

2.07 WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.
- B. Frame: 1 inch margin with concealed mounting.
- C. Fabrication: Steel frames and blades, with factory baked enamel finish.
- D. Color: As indicated.

2.08 LOUVERS

- A. Acceptable Manufacturers
 - 1. Ruskin
 - 2. Greenheck
 - 3. Louvers and Dampers
 - 4. Type: 6 inch deep with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch square mesh screen over exhaust and 1/2 inch square mesh screen over intake.
 - 5. Mounting: Furnish with interior flat flange for installation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

20011 Gregg County Parking Garage and Office

- C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air tight connection.
- E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- F. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 9123.
- G. Diffusers and grilles mounted on side of duct shall be connected with a standoff so that it does not reduce free area of duct.

END OF SECTION

SECTION 23 40 00

HVAC AIR CLEANING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Disposable panel filters.

1.02 REFERENCE STANDARDS

- A. AHRI 851 (SI) - Performance Rating of Commercial and Industrial Air Filter Equipment; 2013.
- B. UL 900 - Standard for Air Filter Units; Current Edition, Including All Revisions.

1.03 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 FILTER MANUFACTURERS

- A. AAF International/American Air Filter: www.aafintl.com.
- B. The Camfil Group: www.camfilfarr.com.

2.02 PERFORMANCE REQUIREMENTS

- A. Comply with the rating requirements in AHRI 851 (SI).

2.03 DISPOSABLE PANEL FILTERS

- A. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.
 - 1. Thickness: 2 inch.
- B. Performance Rating:
 - 1. MERV 13 rating.
 - 2. Face Velocity: 500 FPM.
 - 3. Initial Resistance: 0.15 inch WG.
 - 4. Recommended Final Resistance: 0.50 inches WG.
- C. Casing: Cardboard frame.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install air cleaning devices in accordance with manufacturer's instructions.

- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

END OF SECTION

SECTION 23 54 00

FURNACES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Forced air furnaces.
- B. Thermostats.

1.02 REFERENCE STANDARDS

- A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2012, with 2015 amendments.
- B. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Amendments and Errata.
- C. ASHRAE Std 90.2 - Energy-Efficient Design of New Low-Rise Residential Buildings; 2007, Including All Addenda.
- D. NFPA 54 - National Fuel Gas Code; 2015.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.
- H. NFPA 211 - Guide for Smoke and Heat Venting; 2013, Including All Amendments.
- I. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Comply with NFPA 70.
- B. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

2.02 ELECTRIC FURNACES

- A. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, humidifier, and accessories; wired for single power connection with control transformer.
 - 1. Air Flow Configuration: Upflow.
 - 2. Heating: Electric.
- B. Cabinet: Steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation and reflective liner.
- C. Supply Fan: Centrifugal type rubber mounted with direct drive motor.
- D. Electric Heater: Helix wound bare nichrome wire heating elements arranged in incremental states of 5 kW each, with porcelain insulators.
- E. Electric Heater Operating Controls:
 - 1. Low voltage adjustable room thermostat energized heater stages in sequence with pre-determined delay between heating stages.
 - 2. High limit temperature control de-energizes heating elements, automatic resets.
 - 3. Supply fan starts before electric elements are energized and continues operating after thermostat is satisfied until bonnet temperature reaches minimum setting. Include manual switch for continuous fan operation.
 - 4. Outdoor thermostat locks out some heating elements until outdoor temperature drops.
- F. Air Filters: 2 inch thick glass fiber, disposable type arranged for easy replacement.

2.03 THERMOSTATS

- A. Manufacturers:
 - 1. Carrier Corporation: www.carrier.com.
 - 2. Trane Inc: www.trane.com.
 - 3. York International Corporation / Johnson Controls: www.york.com/#sle.
- B. Room Thermostat: Low voltage, controlling heat and fan to maintain temperature setting; with system selector switch (heat-off) and fan control switch (auto-off).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

- B. Verify that proper power supply is available and located correctly.
- C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction.
- B. Install in accordance with NFPA 90A.
- C. Provide vent connections in accordance with NFPA 211.

END OF SECTION

SECTION 23 62 13

PACKAGED AIR-COOLED REFRIGERANT COMPRESSOR AND CONDENSER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Condensing unit package.
- B. Charge of refrigerant and oil.
- C. Controls and control connections.
- D. Refrigerant piping connections.
- E. Motor starters.
- F. Electrical power connections.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete bases.
- B. Section 23 2300 - Refrigerant Piping.
- C. Section 23 5400 - Furnaces.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.
- B. AHRI 365 (I-P) - Performance Rating of Commercial and Industrial Unitary Air-Conditioning Condensing Units; 2009.
- C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.
- D. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; 2010.
- E. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Amendments and Errata.
- F. ASHRAE Std 90.2 - Energy-Efficient Design of New Low-Rise Residential Buildings; 2007, Including All Addenda.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- H. NEMA MG 1 - Motors and Generators; 2014.
- I. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams. Include equipment served by condensing units in submittal, or submit at same time, to ensure capacities are complementary.
- C. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.

1.05 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp: www.carrier.com.
- B. Trane, a brand of Ingersoll Rand: www.trane.com.
- C. York International Corporation/Johnson Controls, Inc: www.york.com.

2.02 MANUFACTURED UNITS

- A. Factory assembled, single piece, air-cooled air conditioner unit. Contained within the unit enclosure is all factory wiring, piping, controls, compressor, refrigerant charge R-410A, and special features required prior to field start-up.
- B. Unit Cabinet
 - 1. Unit cabinet, including louvered coil guard, will be constructed of galvanized steel, bonderized, and coated with a powder coat paint.
- C. Fans
 - 1. Condenser fan will be direct-drive forward-swept propeller type, discharging air upward.
 - 2. Condenser fan motors will be totally enclosed, 1-phase type with class B insulation and permanently lubricated bearings. Shafts will be corrosion resistant.
 - 3. Fan blades will be statically and dynamically balanced.
 - 4. Condenser fan openings will be equipped with coated steel wire safety guards.
- D. Compressor

1. Compressor will be hermetically sealed.
2. Compressor will be mounted on rubber split-post vibration isolators.
3. Compressor will be covered with a sound absorbing blanket.

E. Condenser Coil

1. Condenser coil will be air cooled.
2. Coil will be constructed of aluminum fins mechanically bonded to copper tubes which are then cleaned, dehydrated, and sealed.

F. Refrigeration Components

1. Refrigeration circuit components will include liquid-line back-seating shutoff valve with sweat connections, vapor-line back-seating shutoff valve with sweat connections, system charge of R-410A refrigerant, and compressor oil.
2. Unit will be equipped with high-pressure switch, low pressure switch and filter drier for Puron refrigerant.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's installation instructions.
- B. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.
- C. Provide for connection to electrical service. See Section 26 0583.
- D. Install units on concrete base as indicated. See Section 03 3000.
- E. Provide connection to refrigeration piping system and evaporators. See Section 23 2300. Comply with ASHRAE Std 15.

3.02 SYSTEM STARTUP

- A. Supply initial charge of refrigerant and oil for each refrigeration system. Replace losses of oil or refrigerant prior to end of correction period.
- B. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.
- C. Shut-down system if initial start-up and testing takes place in winter and machines are to remain inoperative. Repeat start-up and testing operation at beginning of first cooling season.
- D. Provide cooling season start-up, and winter season shut-down for first year of operation.

END OF SECTION

SECTION 23 81 26.13

SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air-source heat pumps.
- B. Controls.

1.02 REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.
- B. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; 2010.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.
- E. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience and approved by manufacturer.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Trane Inc: www.trane.com/#sle.
- B. Substitutions: Not permitted.

2.02 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

2.03 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.
- B. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion valves.
- C. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.
- C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this and the other Sections of Division 26.
- B. References.
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM A123, "Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products".
 - 2. ANSI/NFPA 70:
 - a. "National Electrical Code (NEC)", latest edition.
 - 3. National Fire Protection Association (NFPA).
 - 4. Federal Specification (FS).
 - 5. ANSI/IEEE C.2:
 - a. "National Electrical Safety Code (NESC)", latest edition.
 - 6. Underwriters' Laboratories, Inc. (UL).
 - 7. Insulated Cable Engineers Association, Inc. (ICEA).
 - 8. National Electrical Manufacturers Association (NEMA).

1.2 SUMMARY

- A. This Section includes limited scope general construction materials and methods for application with electrical installations as follows:
 - 1. Submittals.
 - 2. Coordination/Scheduling/Temporary Power/Quality Assurance
 - 3. Record documents.
 - 4. Maintenance manuals.
 - 5. Rough-ins.
 - 6. Electrical installations.
 - 7. Cutting and patching.
 - 8. Testing/Demonstration/Guarantee
 - 9. Conduit.
 - 10. Encasement for Underground Conduit.
 - 11. Conductors (under 600V).
 - 12. Wiring Devices.
 - 13. Electrical Boxes & Fittings.
 - 14. Equipment Supports Sleeves and Guards.

15. Miscellaneous Metals.
16. Joint Sealers.

B. Related Sections: Following Sections contain requirements that relate to this Section:

1. The remainder of Division 26, plus general related specifications including:
 - a. Access to electrical installations.
 - b. Excavation for electrical installations within the building boundaries and from building to utility connections.

1.3 DEFINITIONS

A. Hazardous Areas:

1. Open parking structures used for parking and storage are not classified as hazardous by National Electrical Code, ANSI/NFPA 70, Article 511.
2. Term "Contractor" used throughout Division 26 shall mean Electrical Subcontractor.
3. Term "provide" shall mean to furnish all necessary labor, materials, equipment, accessories, transportation, services, installation and adjustment under Contract amount, including Contractor's profit, overhead and payment of all taxes and fees.

1.4 SUBMITTALS

A. General: Submit the information specified in accordance with Conditions of Contract and Division 01 Specification Sections.

B. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.

C. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

D. General: Follow procedures specified in Division 01 Section "Submittal Procedures" and as specified in this Section.

E. Shop Drawings. Include:

1. Power and distribution panels.
2. Lighting panels.
3. Disconnect switches.
4. Motor starters.
5. Lighting control panel.
6. Light standards (poles) with material certifications.
7. Transformers.

F. Catalog sheets with notation of proposed materials. Include:

1. Light fixtures, lamps and ballasts.
2. Wire and cable.
3. Conduit, fittings and supports.
4. Electric heaters.
5. Controls.

6. Boxes.
7. Emergency batteries.
8. Time switches.
9. Contactors.
10. Relays.
11. Photoelectric controls.

G. Substitutions

1. Products are referenced in Specification and Drawings to establish standard of quality, style, design, and function of materials, equipment, apparatus, or product.
2. There are often several satisfactory substitutes for standardized utilitarian items which satisfy design objectives.
3. Since it is impractical to name all possible brands that might be furnished, substitutes may be proposed unless specifically stated otherwise.
4. Submit substitutions in accordance with Division 01 and General Conditions of Specification and as follows:
 - a. Submit proposed substitute material or equipment to be considered for approval as equivalent to Engineer/Architect at least 7 days before time set for receiving Bids.
 - b. Contractor shall assume all costs for engineering studies required to evaluate substitute material or equipment.
 - c. Contractor assumes all engineering and construction costs necessary for revision in Work due to substitute material or equipment.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer for the installation and application joint sealers, access panels, and doors.
- B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel".
 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.6 PROJECT CONDITIONS

- A. Conditions Affecting Selective Demolition: Following project conditions apply:
 1. Locate, identify, and protect electrical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.

1.7 COORDINATION/SCHEDULING/TEMPORARY POWER/CODES AND STANDARDS

- A. Coordination
 1. Visit site before Bidding to note apparent features which may affect Work. No subsequent allowance will be made because of failure to make examination before Bidding.

2. Check conditions in actual Project against Drawings for all dimensions door swings, ceiling heights or other features affecting electrical Work.
3. Verify all dimensions in field before ordering any material or doing any Work.
4. No extra compensation will be allowed because of differences between actual measurements and dimensions and those indicated on Drawings.
5. Notify Engineer/Architect in writing of any differences which may be found before proceeding with Work.

B. Scheduling

1. Schedule Work so as not to delay other Contractors.
2. Before starting Work, prepare and submit to Prime Contractor schedule of operations outlining proposed order of procedure, giving dates of execution and estimated time required for completion of each step.
3. Coordinate shut-off and disconnection of electrical service with the Owner and the utility company.
4. After schedule has been accepted by Prime Contractor and Engineer/Architect, do not deviate from schedule without written consent of Prime Contractor.
5. No subsequent extras will be allowed for materials and labor not included by Bidder for electrical Work due to lack of familiarity with Contract Documents as they relate to Work of all other trades required for Project.

C. Temporary Power

1. Provide temporary electric service as defined in Division 01 Section "Temporary Facilities and Controls".

D. Codes and Standards:

1. Comply with:
 - a. State electrical administration and local inspection department recognized by state as having jurisdiction.
 - b. Requirements of state and federal Occupational Safety and Health Acts.
 - c. Latest edition of "National Electrical Code", ANSI/NFPA 70.
 - d. Latest edition of "National Electrical Safety Code", ANSI C2.
 - e. Underwriters Laboratories (UL).
 - f. National Electrical Manufacturers' Association (NEMA).
 - g. Institute of Electrical and Electronics Engineers (IEEE).
 - h. Illumination Engineering Society (IES).
 - i. National Fire Protection Association (NFPA).
 - j. International Building Code (IBC):
 - 1) IBC International Building Code.

1.8 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 01 Section "Closeout Procedures". In addition to the requirements specified in Division 01, indicate installed conditions for:
1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.

2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
- B. Engage services of a land surveyor or professional engineer registered in the state in which the project is located as specified in Division 01 Section "Execution Requirements" to record locations and invert elevations of underground installations.

1.9 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 01 Section "Closeout Procedures". In addition to requirements specified in Division 01, include the following information for equipment items:
1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 4. Servicing instructions and lubrication charts and schedules.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Deliver materials to project in good condition. Store materials off ground and protected from elements.
- C. Identify distribution equipment, contactors, control stations, and other devices with permanent, engraved nameplates attached with screws proportional to size of equipment stating name of item and system of which it is part.

1.11 SEQUENCE AND SCHEDULING

- A. Coordinate shut-off and disconnection of electrical service with the Owner and the utility company.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide:
1. Materials that are new and listed by Underwriters' Laboratories, Inc., bearing their label.
 2. Materials suitable for environment and exposure
 3. Weatherproof or raintight outdoor equipment.

B. Conform with:

1. National Electrical Code (ANSI/NFPA 70).
2. All state and local codes.
3. National Electrical Manufacturers Association (NEMA).
4. American National Standards Institute (ANSI).
5. National Fire Protection Association, Inc. (NFPA).
6. Insulated Cable Engineers Association, Inc. (ICEA).
7. Underwriters' Laboratories, Inc. (UL).
8. Institute of Electrical and Electronic Engineers (IEEE).

2.2 CONDUIT

A. Exposed: Rigid hot-dipped galvanized steel with threaded fittings. (EMT conduit shall not be used in any location.)

1. Acceptable Manufacturers:
 - a. Allied Tube & Conduit Corp.
 - b. Western Tube & Conduit Corp.
 - c. Wheatland Tube Co.

B. Embedded and Underground: 100% pure, polyvinyl chloride (PVC) rigid, Schedule 40 with cemented couplings in accordance with NEMA TC-6:

1. Acceptable Manufacturers:
 - a. Carlon.
 - b. Condux International, Inc.
 - c. Certainteed Products Corp.
 - d. Thomas & Betts.

C. At building expansion joints provide at exposed conduit runs only:

1. O.Z. Gedney Type AX Expansion Fittings.

2.3 ENCASUREMENT FOR UNDERGROUND CONDUIT

A. Underground outside of structure and entire service entrance feed: Concrete, 3 in. separation and 3 in. encasement or as indicated on Drawings. Provide warning tape 6 in. below surface and 12 in. above encasement.

2.4 CONDUCTORS (UNDER 600 V)

- A. Use copper wire, sized as indicated on the drawings or per NEC when not indicated with No. 10 AWG being minimum allowable power conductor size. Control wiring shall not be less than No. 12 AWG unless otherwise indicated on Drawings.
- B. No. 10 AWG and No. 12 AWG; provide solid wire, No. 8 AWG and larger; provide stranded wire.
- C. Conductor Insulation: THWN

- D. Insulation types of better quality or ratings may be used with Engineer/Architect's approval.
- E. Include green colored grounding conductors, sized as indicated on Drawings or per NEC 250 when not indicated, but no smaller than #10, in conduits to provide electrical grounding continuity to all boxes, devices, and outlets.
- F. Color code secondary service, feeder, and branch circuit conductors with factory applied color as follows:

| <u>208Y/120 Volts</u> | <u>Phase</u> | <u>480Y/277Volts</u> |
|-----------------------|--------------|----------------------|
| Black | A | Brown |
| Red | B | Orange |
| Blue | C | Yellow |
| White | Neutral | Natural Gray |
| Green | Ground | Green |

Phasing at terminals shall be A-B-C, from front to back, top to bottom, or left to right as viewed from the front.

- G. The phase rotation of all normal power, generator power, and UPS systems must be aligned. Reduced size neutral conductors are not permitted.

2.5 WIRING DEVICES:

- A. Wiring devices shall be specification grade with rugged plastic housing and brown in color.
- B. All receptacles will be Ground Fault Circuit Interruptor (GFCI) Type.
- C. Switches shall be heavy duty, AC quiet type, toggle handle, 20 amp, 120-277 volts, Hubbell No. 1221.
- D. Device plates shall be Hubbell (302/304) brushed stainless steel in enclosed finished areas, hot-dip galvanized steel in enclosed unfinished areas and weather proof type cast metal in other areas or approved equivalents.
- E. Fractional Horsepower Manual Starters with thermal overloads (Square "D" Class 2510 or approved equivalent) shall be used to protect all equipment with fractional horsepower motors not controlled from magnetic starter.

2.6 ELECTRICAL BOXES AND FITTINGS:

- A. Outlet, device, pull and junction boxes, conduit bodies and fittings shall be sized per NEC Article 370. All conduit connections shall be threaded.
- B. Surface boxes and covers: (Aluminum boxes are not acceptable)
 - 1. Weatherproof hot-dip galvanized cast metal or malleable iron with threaded fittings.
 - 2. Weatherproof zinc electroplated cast metal or malleable iron with threaded fittings.
- C. Boxes for other areas and uses: Gasketed screw cover boxes, 14 or 12 gage, G-90 grade galvanized bodies, 12 or 10 gage G-90 grade galvanized steel covers, NEMA 3R GSC with threaded hubs.

- D. Boxes embedded in walls: Concrete type.

2.7 MATERIAL AND EQUIPMENT SUPPORTS, SLEEVES, AND GUARDS:

- A. Provide supports, foundations, stands, platforms, anchor bolts, and other necessary material required to install electrical equipment and systems. When anchor bolts for lighting poles, or other fasteners, are embedded in structure as it is being erected, provide templates and coordinate installation. Anchor bolts and baseplates shall be hot-dip galvanized in accordance with ASTM A153. Bond 1 anchor bolt to structural rebar.
- B. Provide hot-dipped galvanized steel sleeves in walls and floors for passage of exposed conduit. Make sleeves watertight and extend sleeves through floors 6 in. above finished floor. Caulk space between conduit and sleeve.
- C. Provide approved, hot-dipped galvanized steel guards around junction boxes, conduits, and equipment which may be exposed to vehicle damage.

2.8 MISCELLANEOUS METALS

- A. Steel plates, shapes, bars, and bar grating: ASTM A 36.
- B. Cold-Formed Steel Tubing: ASTM A 500.
- C. Hot-Rolled Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Schedule 40, welded.
- E. Nonshrink, Nonmetallic Grout: Premixed, factory-packages, nonstaining, noncorrosive, nongaseous grout, recommended for interior and exterior applications.
- F. Fasteners and Anchors: stainless steel, type, grade, and class as required. Mounting holes for all fasteners must be drilled. The use of powder, gas, or other types of power propelled fasteners is prohibited.

2.9 JOINT SEALERS

- A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application as specified in Division 07 "Joint Sealants".
- B. Colors: As selected by Engineer/Architect from manufacturer's standard colors.
- C. Fire-Resistant Joint Sealers: Two-part, foamed-in-place, silicone sealant formulated for use in through-penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters' Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Products: Subject to compliance with requirements, provide 1 of the following:
 - a. "Dow Corning Fire Stop Foam", Dow Corning Corp.

- b. "Pensil 851", General Electric Co.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of joint sealers and access panels. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 02 through 33 for rough-in requirements.
- C. Do not scale Drawings for rough-in measurements.

3.3 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Maintain competent superintendent at site throughout progress of Work until work completed.
 - 2. Use only skilled workers experienced in electrical construction.
 - 3. Coordinate electrical systems, equipment, and materials installation with other building components so as not to delay contractors.
 - 4. Verify all dimensions by field measurements.
 - 5. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
 - 6. Coordinate installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components as they are constructed.
 - 7. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 - 8. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 - 9. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 - 10. Install systems, materials, and equipment to conform with approved submittal data to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to Engineer/Architect.
 - 11. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

12. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
13. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames" and this section.
14. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
15. Provide and install or arrange for installation of anchors supports, support frames, light pole anchor bolts, and other items required for installation of materials or equipment specified under this Division.
16. Circuit lines shown on Drawings indicate locations of proposed conduit runs, unless noted otherwise.
17. Circuit numbers are shown at each outlet or are designated on each home run.
18. Conduit runs between outlets and home-run conduits may be arranged or grouped to suit job conditions, but follow circuit patterns as designated on Drawings.
19. Review location of all electrical conduit with Engineer/Architect before construction.
20. Cooperate with others to locate electrical conduit out of public view.
21. In case of conflict between riser diagram and floor plan, greater quantity or better quality prevails, subject to approval of Engineer/Architect.
22. After equipment suppliers are selected and exact power requirements known, Contractor shall verify that all components of power supply system are sized properly per NEC and any other governing codes. If any component of power supply system is found to be too small, Contractor shall increase component size to meet codes.
23. In case interferences between Work develop, Engineer/Architect will decide which Work is to be relocated regardless of which was first installed.
24. Conduit Slots: Where Drawings indicate conduits routed through slots in precast tees, personnel shall be at site during time tees are being erected so that conduits can be passed through slots in full lengths before end panels are installed. Otherwise it may be necessary to use shorter lengths of conduits.
25. Any galvanized equipment, materials or hardware that is cut, scratched or field threaded, shall be coated with a zinc rich coating (ZRC or approved equivalent) at these locations.
26. In locations where light fixtures, exit signs, emergency battery packs, remote heads, or other pieces of equipment needs to be mounted over piping or other obstacles, provide extension bracket made out of 1/4" hot dipped galvanized steel plates.
27. Trench and backfill in accordance with Division 31 Section "Earth Moving".
28. Cleanup: At completion of Work under this contract, remove from building site and dispose of all rubbish and discarded materials and restore disturbed facilities and surfaces.

3.4 CONDUIT INSTALLATION

- A. Conduit shall be sized to provide maximum 40% fill per NEC with 3/4 in. being minimum allowable size. Use large radius sweeps in all bends.
- B. In parking areas and unfinished equipment storage/utility rooms, run conduit under slab on grade or exposed unless otherwise indicated. Coordinate location with Engineer/Architect.
- C. In elevator lobbies, office areas and other finished areas, conceal conduit runs unless otherwise noted on Drawings.
- D. Terminate conduits at all outlets and switches in suitable outlet boxes. Where 2 or more compatible devices are set side by side, set in gang boxes, unless otherwise noted on Drawings.
- E. Coordinate with Engineer/Architect to locate exposed conduit runs. All exposed conduit shall be run square with building except where specifically noted otherwise on Drawings.

- F. Securely fasten exposed conduits to ceiling or walls with 1 hole stainless steel pipe straps and clamp backs at 8 ft on center maximum. Provide nest backs or other spacers or extensions as required to achieve proper mounting heights. Using blockouts or other structural members as a source of support is prohibited.
- G. Close all unused open knockouts.
- H. Provide nylon pull cords in all empty conduits.
- I. Take precautions to prevent water, dirt, concrete, or other material from entering conduit and junction boxes.
- J. Coring and drilling of walls and beams to conceal conduit and risers are responsibility of this Contractor. Slots in double tees are by precaster. Verify exact locations of penetrations with Engineer/Architect before coring and drilling. Seal all such openings in accordance with Division 07 "Joint Sealants".
- K. Use seal tight flexible conduit in lengths not greater than 2 ft to connect motors, transformers, and for whips connecting trunnion mounted fixtures to junction boxes. Do not install flexible conduit at other locations without written approval of Engineer.
- L. Obtain written approval of Engineer/Architect before making significant changes in conduit runs from those indicated on Drawings. Record all changes on set of Drawings furnished by Engineer/Architect. At completion of Work, prepare corrected Record Drawings on transparencies supplied by Engineer/Architect.
- M. Conduits penetrating through fire rated walls and floor slabs shall be sealed against spread of fire and products of combustion with intumescent fire barrier penetration sealing system with fire/smoke rating of floor or wall through which conduits pass. Firestopping materials are specified in Division 07 Section "Penetration Fire Stopping."
- N. Conduit containing emergency circuits shall not contain any other type of circuit.
- O. Box covers located less than 8 ft above the floor shall be equipped with tamperproof screws.
- P. All empty conduits shall be labeled at termination points.
- Q. Any conduit that is cut, scratched or threaded shall be coated with a zinc rich coating (ZRC or approved equivalent) at these locations.
- R. All conduit connections must be threaded. All conduit connections to panels, boxes, fixtures and other equipment must be made with gasketed threaded hubs.
- S. Do not route vertical conduit risers through expansion joints.

3.5 CONDUCTOR INSTALLATION:

- A. All conductors shall be run in conduit.
- B. All wire to wire connections shall be made with properly sized wire nuts.
- C. Increase wire sizes on long runs to minimize voltage drop to 3% maximum from panel to most distant outlet.

- D. Do not begin wiring until work which might cause damage to wires or conduit has been completed.
- E. When there are more than 3 current carrying conductors in conduit, apply NEC Ampacity Adjustment Factor, assuming no diversity, and increase conductor sizes as required. (Also comply with any additional local requirements.)
- F. Wiring from emergency source or emergency source distribution over current protection to emergency loads shall be kept entirely independent of all other wiring and equipment and shall not enter same raceway, cable, box, or cabinet with other wiring.
- G. Use Burndy reducer adaptors as required to connect oversized conductors to breakers or other pieces of equipment.

3.6 WIRING DEVICE INSTALLATION:

- A. Locate devices as shown on Drawings.
 - 1. Actual location may vary from these dimensions by enough distance to clear any construction interference or other obstruction.
 - 2. Owner's or Engineer/Architect's request for minor changes in location of switches, outlets, or connections shall not constitute an extra, provided changes are requested before particular outlet or circuit is installed.
- B. Switch Installation:
 - 1. Mount at 4 ft above finished floor. Adjust to fit masonry coursing where dimensions are not critical.
 - 2. Install switches on latch side of door unless otherwise noted.
 - 3. Install 2 or more switches together in standard ganged box.
- C. Convenience Outlet: Mount so that bottom of box is 18 in. above finished floor except in parking areas, mount bottom of box 36 in. above finished floor. Adjust to fit masonry coursing, strand rail and other obstructions as required.
- D. Receptacle plates and switch plates: Install specified device plate on every receptacle and switch shown on Drawings.

3.7 ELECTRICAL BOXES AND FITTINGS INSTALLATION:

- A. Provide box for each device and junction box shown on Drawings.
- B. Close unused openings in all boxes in accordance with NEC.
- C. All boxes and enclosures for emergency circuits shall be marked so they will be readily identified as component of emergency circuit.

3.8 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01 Section "Cutting and Patching". In addition to the requirements specified in Division 01, the following requirements apply:

1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
 2. Perform cutting, fitting, and patching of electrical equipment and materials required to:
 - a. Uncover Work to provide for installation of improperly scheduled Work.
 - b. Remove and replace defective Work.
 - c. Remove and replace Work not conforming to requirements of the Contract Documents.
 - d. Remove samples of installed Work as specified for testing.
 - e. Install equipment and materials in structures.
 - f. Upon written instructions from Engineer/Architect, uncover and restore Work to provide for Engineer/Architect observation of concealed Work.
 3. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.
 4. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
 5. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
 6. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
 - a. Refer to Division 01 Section "Reference Standards and Definitions" for definition of experienced "Installer".
 7. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
 - a. Refer to Division 01 Section "Reference Standards and Definitions" for definition of experienced "Installer".
- B. Seal all openings in accordance with Division 07 Section "Joint Sealants".

3.9 TESTING/ DEMONSTRATION/GUARANTEE

- A. Testing:
1. Provide installation free from any faults or grounds and in operating condition.
 2. Provide all equipment necessary to make tests.
 3. Test all completed electrical systems and components for proper operation.
 4. Test motors for proper rotation.
 5. If faults or grounds are present, correct problem and retest system.
- B. Demonstration:
1. After the Electrical Contractor states that the structure is ready to be checked by the Engineer/Architect for the electrical punchlist, the Electrical Contractor shall arrange for the Electrical superintendent to demonstrate the proper operation of all electrical components and systems to the Engineer/Architect. If it is discovered that any component or system does not operate properly the Electrical Contractor must pay all costs associated with return trips required to verify proper operation by the Engineer/Architect.

C. Guarantee:

1. Leave entire electrical system in proper working order.
2. Provide Owner guarantee that all material, equipment and wiring furnished and installed are free from all electrical and mechanical defects for 1-yr period from date of acceptance of work.
3. Make good any defects which become apparent within that 1-yr guarantee period without expense to Owner.
4. Provide Owner with any other guarantees extended by manufacturers of equipment furnished and installed in Project.

3.10 ELEVATOR WIRING:

A. Work Included:

1. Provide feeder circuit to elevators as shown on Drawings. Provide fused disconnect switches and make electrical connections to line side of motor controllers. After elevator supplier is selected and exact equipment power requirements known, Contractor shall verify that wire, conduit, disconnect switches and fuses in elevator feeder circuits are adequately sized and in accordance with the elevator manufacturers state-approved drawings. If feeders are too small, Contractor shall increase size of feeders to meet NEC requirements.
2. Provide 120V-30A, fused disconnect switch located in the elevator machine room. Provide 30 amp GFCI circuit breaker in the electrical room to feed the 30A fused disconnect switch in the elevator machine room. Elevator installer will continue circuit to cab.
3. Verify power requirements and outlet locations from approved Shop Drawings.
4. Provide worklights, switch and receptacle at base of each elevator shaft. Mount 18 in. minimum above lowest landing elevation.
5. Provide electric heat and ventilation and associated power circuits as required in elevator machine room. Coordinate with elevator supplier and mechanical contractor.
6. Provide heat and smoke sensing devices and connect to elevator sequencing equipment terminals in machine room as required.
7. Provide conduit and wiring to elevator machine room for emergency communications. Elevator installer will continue to cab.

- B. Work Excluded: Elevator installer will provide all other conduits, boxes, outlets and wiring for elevator controls, call buttons, or other equipment.

END OF SECTION 260500

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Consultants.

SECTION 26 20 00

LOW VOLTAGE ELECTRICAL TRANSMISSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 26 Sections "Common Work Results for Electrical".

1.2 SUMMARY

- A. Extent of service distribution work is indicated by Drawings and schedules.
- B. Types of service and distribution equipment in this Section include the following:
 - 1. Dry Type Transformers.
 - 2. Main Distribution Panel.
 - 3. Panel Boards.
 - 4. Uninterruptible Power Supply.
 - 5. Disconnect Switches.
 - 6. Fuses.
 - 7. Starters.
 - 8. Enclosures.
 - 9. Equipment Finish.
 - 10. Grounding.
- C. Wires/cables, raceways, and electrical boxes and fittings are specified in Division 26 "Common Work Results for Electrical" Section,
- D. Refer to other Division 26 Sections for wires/cables, raceways, and electrical boxes and fittings work required in connection with equipment.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's data on service and distribution equipment and accessories.
- B. Shop Drawings: Submit dimensioned layouts of service and distribution equipment, including spatial relationships to proximate electrical equipment and comply with submittal Section "Basic Electrical Requirements".
- C. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
- D. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of service and distribution equipment, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 yrs.
- B. Installer's Qualifications: Firm with at least 5 yrs of successful installation experience with projects utilizing service and distribution work similar to that required for this project.
- C. Codes and Standards
 - 1. Electrical Code Compliance: Comply with NFPA 70 "National Electrical Code" and all applicable local code requirements of the authority having jurisdiction.
 - 2. NEMA Compliance: Comply with applicable construction and installation requirements of NEMA standards for service and distribution equipment and accessories:
 - 3. Provide service-entrance equipment and accessories which are UL-listed and labeled, and marked, "SUITABLE FOR USE AS SERVICE EQUIPMENT".
 - 4. IEEE Compliance: Comply with applicable requirements of IEEE.
 - 5. ANSI Compliance: Comply with ANSI C2, "National Electrical Safety Code", installation requirements for aboveground service-entrance conductors.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment components properly packaged and mounted on pallets, or skids to facilitate handling of heavy items. Utilize factory-fabricated type containers or wrappings for service-entrance equipment and components which protect equipment from damage. Inspect equipment to ensure that no damage has occurred during shipment.
- B. Store equipment in original packaging and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.
- C. Handle equipment carefully to prevent physical damage to equipment and components. Remove packaging, including the opening of crates and containers, avoiding the use of excessive hammering and jarring which would damage the electrical equipment contained therein. Do not install damaged equipment; remove from site and replace damaged equipment with new.

1.6 SEQUENCING AND SCHEDULING

- A. Schedule delivery of equipment which permits ready building ingress for large equipment components to their designated installation spaces. Coordinate delivery of equipment with the installation of other building components.
- B. Coordinate the size and location of concrete equipment pads. Cast anchor bolt inserts into pad. Concrete, reinforcement, and formwork requirements are specified in Division 03 Sections.
- C. Coordinate with other electrical work including raceways, electrical boxes and fittings, and cabling/wiring work, as necessary to interface installation of service-entrance work with other work.

1.7 MAINTENANCE

- A. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to 1 unit for every 3 installed units, but not less than 3 units of each.

PART 2 - PRODUCTS

2.1 SERVICE AND DISTRIBUTION EQUIPMENT

- A. General: Provide equipment and accessories; of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified.
- B. Short Circuit Coordination Study: Equipment supplier shall perform a complete system short circuit coordination study and supply equipment that is properly rated to meet the calculated values.
- C. Dry Type Transformers
 - 1. Rating shown on Drawing.
 - 2. Taps: Six 2.5%, 2 above and 4 below normal.
 - 3. Insulation: Rated for 150° C. rise.
 - 4. Conform to latest ANSI, IEEE, UL and NEMA Standards.
 - 5. Acceptable Manufacturers:
 - a. Square D.
 - b. Siemens
 - c. Cutler Hammer
- D. Main Distribution Panel
 - 1. Brace for 65,000 amps.
 - 2. Provide panel with breakers, spaces, and bus rating as shown on Drawings.
 - 3. Panel shall be equipped with copper bus bars including full sized neutral and grounding bar.
 - 4. Panel shall be UL labeled for use as service equipment.
 - 5. Each section of the panel shall be identified with engraved nameplates attached with screws.
 - 6. Acceptable Manufacturers:
 - a. "VB", Siemens - I.T.E.
 - b. "QVB", Cutler-Hammer.
 - c. "QMB", Square D.
- E. Panelboards
 - 1. Lighting or equipment panels shall be rated as shown on Drawings.
 - a. Circuit breakers shall be bolted to mains.
 - b. Multi-pole breakers shall be single cased, common trip.
 - c. Mains, lugs, or main breaker shall be as indicated on panel schedule.
 - d. Acceptable Manufacturers:
 - 1) Cutler-Hammer.
 - 2) Square D.

3) Siemens.

2. Construction

- a. Panels shall meet FS W-P-115b, Type 1, Class 1, UL listed.
- b. Circuit breakers shall be rated 75° C minimum and also meet FS W-P-375B, GEN.
- c. Cabinets shall be constructed of galvanized code gage (16 gage minimum thickness) steel with concealed fastening screws, hinged cover, hinged door, cylinder lock, and catch: All keyed alike.
- d. Directory shall be framed under plastic and removable. Directory shall be typed.
- e. Cabinets located in open structure or out of doors shall be raintight and tamperproof.
- f. Doors 48 in. or longer shall be equipped with three point catch, vault type handle with cylinder lock.
- g. All panels shall be equipped with copper bus bars including full sized neutral bar and grounding bar.

F. Static Uninterruptible Power System

1. System shall be rated for 30 KVA / 24 KW, 480Y/277V three phase, 4 wire filtered input and 480Y/277V three phase, 4 wire output. Overload protection shall be provided at the output.
2. Battery shall be heavy duty industrial valve regulated recombinant lead-calcium type, sized to provide a minimum of 90 minutes of operation at full rated load.
3. System shall be UL 924 listed and power LED lighting used for emergency egress. The lights must remain illuminated through all power transfers. System trouble alarms shall be provided with contacts for remote alarm.
4. All equipment shall be completely enclosed and housed in cabinets. System must fit and operate properly in room provided.
5. System shall have a minimum 48 hour burn-in at factory and the manufacturer shall provide start up and field testing.
6. The complete UPS system shall be warranted for one year and the battery prorated for an additional 9 year minimum.
7. The system shall be LIEBERT NPOWER 30 KVA / 24 KW with optional input filter and 12 minute battery cabinet 1FJ with batteries included.

G. Disconnect Switches

1. Heavy duty, fused or unfused with interlocked covers.
2. Provide cartridge-type fuses as indicated on Drawings.
3. Provide raintight switches when exposed to weather or conditions where water may be present.
4. Acceptable Manufacturers:
 - a. Square D.
 - b. Siemens - I.T.E.
 - c. Cutler – Hammer.

H. Fuses

1. Dual element, current limiting, unless noted otherwise.
2. Fuses for motor circuits: Sized as recommended by motor manufacturer but not to exceed 150% of full-load current stated on motor nameplate.
3. Provide 25% (minimum of 6) spare fuses of each size and type by voltage and current.

4. Acceptable Manufacturers:

- a. Bussman.
- b. Gould/Shawmut.
- c. Reliance Fuse.

I. Starters

- 1. Sized for motor; pilot light; 120 volt controls.
- 2. Magnetic Starter: H-O-A selector switch.
- 3. Combination: Fused type.
- 4. Acceptable Manufacturers:

- a. Square D.
- b. Siemens - I.T.E.
- c. Cutler – Hammer.
- d. Furnas.

J. Enclosures

- 1. Tamperproof, vault type latches with lock.
- 2. Construction: Code gage steel, reinforced, welded seams.
- 3. Painting: Prime coat, 2 finish coats in accordance with Division 09 "Painting" Section, color to match panelboard.
- 4. Doors: Hinged and gasketed.
- 5. Mounting Hardware: As required.
- 6. Acceptable Manufacturers:

- a. Hoffman Company.
- b. Keystone.

K. Equipment Finish

- 1. Furnish all equipment with baked enamel factory finish or other approved finish. Touch up scratches.
- 2. If factory finish is not available, field paint equipment with 1 coat of prime and 2 finish coats in accordance with Division 09 Section "Painting".

L. Grounding

- 1. Driven ground mats of copperweld ground rods 3/4 in. diameter by 10 ft long bonded with #4/0 bare copper wire.
- 2. Drive additional or longer ground rods as required to achieve a maximum allowable ground resistance of 10 ohms.
- 3. Connections to ground rods: Brazed or exothermic weld ("Cad-Weld").

2.2 SERVICE AND DISTRIBUTION ACCESSORIES

- A. Wall and Floor Seals: Provide wall and floor seals complying with Division 26 Section "Common Work Results for Electrical".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which service-entrance equipment and components are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until satisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF EQUIPMENT

- A. Provide electrical service and materials in accordance with utility company standard practice, rules, and regulations. All service entrance conduits are to be concrete encased their entire length. See Drawings for additional requirements.
- B. Make application for service, and pay all costs assessed for service.
- C. Install transformer, transformer pad, footing, primary conduit, grounding, current transformer cabinets, and secondary conduit and wiring.
- D. Coordinate installation of underground service entrance.
- E. Mount all equipment plumb and rigid without distortion of box.
- F. All panels, disconnect switches, transformers and other equipment must be identified with engraved nameplates attached with screws.
- G. Provide 4 inch high concrete housekeeping pads with rounded edges under all floor mounted equipment where clearance allows.
- H. Panels
 - 1. Install as shown on plans. Never closer than 30" on center unless approved by engineer.
 - 2. Mounting Height: Locate top circuit breakers or fuse 6 ft - 6 in. maximum from floor.
 - 3. Vacuum clean cabinet interiors and align and bundle wires at completion of work.
 - 4. At completion of electrical work and before acceptance, clearly mark all breaker panels indicating circuit number and equipment controlled, as specified.
 - 5. All panels for emergency circuits shall be marked so they will be readily identified as component of emergency system.
 - 6. All circuits supplying motors, heaters or electric signs shall have disconnect switches permitting switch to be padlocked in off position for servicing.
- I. Install equipment as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that service-entrance equipment fulfills requirements. Comply with applicable installation requirements of NEC and NEMA standards.
- J. Install fuses, if any, in equipment.
- K. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B, and National Electrical Code.

3.3 FIELD QUALITY CONTROL

20011 Gregg County Parking Garage and Office

- A. Prior to energization of service-entrance equipment, check accessible connections for compliance to manufacturer's torque tightening specifications.
- B. Prior to energization of equipment, check with ground resistance tester, phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
- C. Prior to energization, check circuitry for electrical continuity, and for short-circuits.

3.4 GROUNDING

- A. Ground service per Article 250 of the NEC to ground grid, building foundation rebar, water piping and any additional grounds.
- B. Provide equipment grounding connections for service-entrance equipment as indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounding.

3.5 ADJUSTING AND CLEANING

- A. Adjust operating mechanisms for free mechanical movement.
- B. Touch-up scratched or marred enclosure surfaces to match original finishes.

3.6 DEMONSTRATION

- A. Upon completion of installation of equipment and electrical circuitry, energized circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and retest to demonstrate compliance.

END OF SECTION 262000

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Consultants.

SECTION 26 32 13

ENGINE NATURAL GAS GENERATING SYSTEM - STANDBY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 26 Sections "Common Work Results for Electrical".

1.2 SUMMARY

- A. Extent of emergency natural gas generating system work is indicated by Drawings and schedules.
- B. Intent of Specifications:
 - 1. It is the intent and purpose of these Specifications to secure for the purchaser one natural gas generator set of the latest commercial type and design. It shall be capable of continuous service at rated output for the duration of any utility power failure. The engine generator set shall be the product of a local authorized distributor and that distributor shall have sole responsibility for the performance of the natural gas engine generator set and its accessories. It shall be new with a weatherproof housing for outdoor installations that is designed to withstand local hurricane force wind conditions, completely assembled and tested. The generator shall meet all of the latest local and national emissions standards. An automatic exerciser shall be included.
 - 2. It is the intent and purpose of these Specifications to also secure for the purchaser any necessary controls and accessories to the extent that this equipment, in conjunction with the natural gas engine generator set, will comprise a complete operating package for installation 1000 feet above seal level in an ambient temperature of 105 degrees F. Maximum, -20 degrees F minimum. This generator package shall meet all NFPA 70, 99, 110 Level I requirements.
- C. Rating:
 - 1. Rating of the natural gas engine generator set shall be based on operation of the set when equipped with all necessary operating accessories such as radiator, fan, air cleaners, lubrication oil pump, fuel injection pump, jacket water pump, governor, alternating current generator, and exciter regulator.
 - 2. The natural gas engine generator set shall be capable of producing 180 KW standby, 180 KW continuous at 0.8 power factor for applications at the ambient and altitude conditions stated in Section 1.02.
- D. Wires/cables, raceways, and electrical boxes and fittings are specified in Division-26 "Common Work Results for Electrical."
- E. Refer to other Division 26 Sections for wires/cables, raceways, and electrical boxes and fittings work required in connection with equipment.

1.3 SUBMITTALS

- A. General: submit the information specified in the Submittals Section of "Basic Electrical Requirements" in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Product certifications signed by manufacturers of natural gas generator certifying that their products comply with specified requirements.
- C. Maintenance data for products for inclusion in Operating and Maintenance Manual specified in Division 01.
- D. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
- E. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of service and distribution equipment, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 5 years of successful installation experience with projects utilizing service and distribution work similar to that required for this project.
- C. Codes and Standards
 - 1. Electrical/NFPA Code Compliance: Comply with NFPA 70 "National Electrical Code NFPA 110" Emergency and standby power systems and all applicable local code requirements of the authority having jurisdiction.
 - 2. NEMA Compliance: Comply with applicable construction and installation requirements of NEMA standards for service and distribution equipment and accessories:
 - 3. IEEE Compliance: Comply with applicable requirements of IEEE.
 - 4. ANSI Compliance: Comply with ANSI C2, "National Electrical Safety Code", installation requirements for aboveground service-entrance conductors.

1.5 INFORMATION TO FURNISHED BY BIDDER

- A. Each bidder shall furnish with its bid the following information:
 - 1. Drawings of the natural gas generator set offered hereunder and its foundation requirements.
 - 2. Literature describing the natural gas engine generator set and indicating its current production status.
 - 3. Drawings and/or literature describing auxiliary equipment to be furnished.

1.6 EXCEPTIONS

- A. Exceptions to these Specifications will be considered sufficient cause for rejection for bids.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment components properly packaged and mounted on pallets, or skids to facilitate handling of heavy items. Utilize factory-fabricated type containers or wrappings for service-entrance equipment and components which protect equipment from damage. Inspect equipment to ensure that no damage has occurred during shipment.
- B. Store equipment in original packaging and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.
- C. Handle equipment carefully to prevent physical damage to equipment and components. Remove packaging, including the opening of crates and containers, avoiding the use of excessive hammering and jarring which would damage the electrical equipment contained therein. Do not install damaged equipment; remove from site and replace damaged equipment with new.

1.8 SEQUENCING AND SCHEDULING

- A. Schedule delivery of equipment which permits ready building ingress for large equipment components to their designated installation spaces. Coordinate delivery of equipment with the installation of other building components.
- B. Coordinate the size and location of concrete equipment pads. Cast anchor bolt inserts into pad. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- C. Coordinate with other electrical work including raceways, electrical boxes and fittings, and cabling/wiring work, as necessary to interface installation of service-entrance work with other work.

PART 2 - PRODUCTS

2.1 EMERGENCY NATURAL GAS GENERATOR EQUIPMENT

- A. General: Provide equipment and accessories; of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified.
1. Type: The engine shall be of either vertical in-line or V-type provided sufficient continuous/standby and continuous HP is developed as called for herein.
 2. Horsepower: Application as stated.
 - a. Engine manufacturer's published curves both standby and continuous shall be submitted. Set shall be capable of continuous operation for a minimum of 30 days without damage at the standby rating. Continuous rating shall be capable of 10% overload for 2 hours of any 24 and shall comply with NEMA standard practices.
 3. Speed: The engine speed shall not exceed 1800 RPM at normal full load operation.
 4. Fuel: Natural gas.
 5. Governor: The engine speed shall be governed by an all electric governor, Woodward 2301, Barker Coleman Model Dym 8000 or approved equal to maintain governed speed at precise isochronous control for 60 cycle operation. The frequency at any constant load, including no load, shall remain within a steady state band width of plus or minus 0.25% of rated frequency. The governor shall not permit frequency modulation (defined as the number of times per second that the frequency varies from the average frequency in cyclic manner) to exceed one cycle per second.
 6. Oil Pump and Cleaners:
 - a. The engine shall have a gear-type lubricating oil pump for supplying oil under pressure to main bearings, crank-pin bearings, pistons, piston pins, timing geared, camshaft bearings, and valve rocker mechanism.
 - b. Full flow oil filters, conveniently located for servicing, shall be provided. Filters shall be equipped with a spring bypass valve to insure oil circulation if filters are clogged.
 7. Cylinder Liners: The engine shall be provided with removable wet or dry type cylinder liners of close grained alloy iron.
 8. Air Cleaners: The engine shall be provided with one or more dry type air cleaners as recommended by the engine manufacturer.
 9. Starting: the engine shall be equipped with a 24 volt electric starting system with sufficient capacity to provide cranking of the engine at a speed which will allow natural gas starting of the engine.
 - a. A lead Acid storage battery set of the heavy duty natural gas starting type shall be provided. Battery voltage shall be compatible with the starting system. A battery rack constructed in conformance with NEC requirements and necessary cables and clamps shall be provided. Batteries shall be sized for low ambient starting conditions - less than 32 Degrees F per NFPA - 99 Code for emergency starting system.
 - b. Battery Charging: A current limiting, float equalize charger shall be furnished to automatically recharge batteries. The charger shall float at 2.17 volts per cell and equalize at 2.33 volts per cell. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressors, DC ammeter, voltmeter, and alarms for high/low DC output and input/output failure. AC input voltage shall be 120 volts or 277 volts, single phase as indicated on the drawings. Amperage output shall be no less than 10 amperes.

10. Starting Aid: An engine mounted, thermostatically controlled immersion type coolant heater shall be provided to insure a minimum coolant temperature of 120 degrees F. In a minimum room ambient of -20 degrees F. The heater shall be suitable for operation at 277 or 480 volts, AC power, as noted on drawings, and manufactured by Kim - "Hotstart" or approved equivalent.
11. Engine Instruments: The engine mounted instrument panel shall contain the following gauges for proper engine surveillance and maintenance:
 - a. Engine water temperature.
 - b. Engine lube oil pressure and DC volt meter.
 - c. Engine running hourmeter.
12. Cooling:
 - a. The engine shall be furnished with cooling system having sufficient capacity for cooling the engine when the natural gas generator set is delivering full-rated load in the ambient temperature stated in Section 1.02 and sized for a minimum of 105 degrees F. Ambient regardless of stated ambient.
 - b. The engine shall be equipped with an engine driven, centrifugal-type water circulating pump and thermostatic valve to maintain the engines at a recommended temperature level. System shall be filled with a 50/50 solution of ethylene glycol/water with conditioner/rust inhibitor. Heat rejection data on the engine and cooling capacity of the radiator shall be submitted showing calculations and capacities.
 - c. The engine shall be equipped with a radiator and fan of a type and capacity recommended by the engine manufacturer. A blower (or suction) fan shall be furnished.
13. Exhaust System:
 - a. A suitable silencer, of the reactive type, shall be furnished with the engine, including all associated piping, rain caps and tailpipes.
 - b. A flexible exhaust adapter at least 12 inches long shall be furnished for each exhaust outlet to the muffler.
 - c. Silencer shall be hospital/critical grade.
 - d. A Spark Arrestor shall be provided.
14. Safety Controls: the engine shall be equipped with automatic safety controls which will shut down the engine in the event of low lubricating oil pressure, high jacket water temperature, engine overspeed, low coolant level and engine overcrank, and make electrical contacts for alarm lights on the control panel as so equipped.
15. Mounting:
 - a. The engine and generator shall be equipped with a suitable sub-base for mounting the engine generator unit on a concrete foundation or on a suitable steel base.
 - b. Vibration Isolation: The engine shall be equipped with spring type vibration isolators between the sub-base and the concrete foundation. Isolators shall be Korfund type LK with adjustable snubbers. The quantity and load range shall be selected for a minimum efficiency of 90% or better.
16. Weatherproof Sheet Metal Enclosure sized to house unit panels and accessories, to match and mate with sub-base fuel tank. Provide fixed open louvers with birdscreen sized for adequate combustion and cooling airflow. Enclosure must be designed to withstand local hurricane force wind conditions. Provide access doors located for easy

access to service points and control panel, all lockable, keyed alike. Continuous non-corrosive hinge for enclosure doors. Paint with rust-inhibiting primer and two finish coats of enamel. Enclosure to be fully assembled, with WP silencer mounting kit installed (silencer ship loose due to height restrictions), batteries installed, charger(s) mounted, fuel system plumbed, and alarms wired to control panel prior to shipment.

B. Generator:

1. Rating: The generator shall be rated for continuous standby service at 180 KW, 200 KVA at 0.8 pf, 480 volts, three phase, four wire, wye connected, 60 Hz, 1800 RPM. It shall be capable of providing a minimum of 111 starting KVA at 0.8 PF at 20% voltage dip.
2. Type: The generator shall be three phase, single bearing, synchronous type, wet wound, tropicalized, and built to NEMA standards. Class H insulation shall be used on the stator and rotor, and both shall be further protected with an asphalt modified epoxy on all end coils. The generator shall include a resettable thermal protector and fuse for excitor/regulator protection against extended low power factor loads and faults. The generator rotor shall be dynamically balanced to sustain 25% overspeed.
3. Regulators: An automatic volts-per-Hertz type, solid state excitor/regulator, manufactured by the generator manufacturer shall be included and shock mounted inside the generator. Voltage regulation shall be +/- 0.5% from no load to full rated load. Readily accessible droop, voltage level, and voltage gain control shall be included in the module. Voltage level adjustment shall be a minimum of +/- 5%. The module shall include the following protective features:
 - a. Current limit circuits shall restrain the excitor field current while allowing full forcing voltage to be applied to obtain rapid response during transient conditions or service overloading on the generator.
 - b. A time delay circuit shall sense the current limit operation and cut off all field current to the generator after ten seconds.
4. Current Boost: The generator shall be capable of supporting 300% rated current for ten seconds for selective tripping of downline protection devices when a short circuit occurs.
5. Generator is to be equipped with integral breakers as shown on the power one line.

C. Control Equipment: Katolite, Caterpillar, Onan, or Automatic Switch Company.

D. Acceptable Manufacturers:

1. Katolite.
2. Caterpillar, Inc.
3. Onan.
4. Kohler.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which natural gas engine-driven generator unit is to be installed and notify Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until satisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION

A. Natural Gas Engine-Driven Generator Set:

1. Install natural gas engine-driven generator unit as indicated in accordance with equipment manufacturer's written instruction and with recognized industry practices, to ensure that engine generator unit fulfills requirements. Comply with NFPA and NEMA standards pertaining to installation of engine generator sets and accessories.
2. Coordinate with other work including raceways, electrical boxes and fittings, fuel tanks, piping and accessories, as necessary to interface installation of engine generator equipment work with other work.
3. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A, B, and the National Electrical Code.
4. Install unit on vibration isolators in accordance with sections of Division 21 and comply with manufacturer's indicated method of installation.
5. Align shafts of engine and generator within tolerances recommended by engine generator unit manufacturer.
6. Grounding: Provide equipment grounding connections for natural gas engine driven generator units as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounding.
7. Provide and install all components necessary to furnish a complete operating system that meets NFPA requirements.
8. Provide supervision by a factory representative for any breakdown and re-assembly required for installation.

B. Operation-Maintenance-Warranty:

1. Startup Testing:

- a. Engage local equipment manufacturer's representative to perform startup and building load tests upon completion of installation, with the Architect/Engineer in attendance. Provide certified test record. Tests are to include the following:
 - 1) Check Fuel, lubricating oil and antifreeze in liquid models for conformity to the manufacturer's recommendations under environmental conditions present.
 - 2) Test prior to cranking engine for proper operations, accessories that normally function while the set is in a standby mode. Accessories include: engine heaters and battery charger.
 - 3) Check, during startup test mode, for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and phase rotation.
 - 4) Test:
 - a) By means of simulated power outage, automatic startup by remote-automatic starting, transfer of load, and automatic shutdown. Prior to this test, adjust for proper system coordination, transfer switch timers. Monitor throughout the test, engine temperature, oil pressure, battery charge level, generator voltage, amperes, and frequency.
 - b) Prior to acceptance of the installation, the equipment shall be subjected to full load test. This test shall be performed at the job site, for the convenience of specifying Engineer or customer should either

wish to witness test and shall consist of 4 hours at full load Contractor shall provide load banks and operator for this test. Building load will not be utilized for this test.

- b. Upon completion of installation, demonstrate compliance; other wise, remove and replace with new units, and proceed with retesting. Initial testing and retesting to be at no cost to Owner.
2. Maintenance: The bidder shall furnish at least 3 copies of operating and maintenance instructions including complete parts book covering the engine generator and such auxiliary equipment as may require published operating instructions or periodic maintenance.
3. Warranty: The units offered under these Specifications shall be covered by the manufacturer's standard warranty or guarantee on new machines and shall be a minimum of five years/3000 hours.

END OF SECTION 263213

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Parking Consultants/Engineers, Inc.

SECTION 26 50 00

LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 26 Sections "Common Work Results for Electrical".

1.2 SUMMARY

- A. This Section includes the following types of lighting:
 - 1. Fixture components general.
 - 2. Light Emitting Diode (LED) lighting fixtures
 - 3. Emergency lighting systems.
 - 4. Fixture support components (pole standards).
 - 5. Lamps.
- B. Related Sections: Following Division 26 Sections contain requirements that relate to this Section:
 - 1. "Lighting Control Equipment" for lighting control systems, time switches, photoelectric relays, power relays, and contactors.

1.3 REFERENCES

- A. Definitions
 - 1. Fixture: Complete lighting unit. Fixtures include a housing, lens, reflector, ballast/driver, LED assembly, lamp or lamps and parts required to distribute the light, position and protect lamps, and connect lamps to the power supply.
 - 2. Lighting Unit: Fixture, or an assembly of fixtures with a common support, including a pole or bracket plus mounting and support accessories.
 - 3. Luminaire: A fixture.
- B. Reference Standards
 - 1. Illuminating Engineering Society of North America (IESNA):
 - a. RP 20, "Lighting for Parking Facilities".
 - b. G-1-03, "Guideline for Security Lighting for People, Property and Public Spaces"
 - c. LM-79 "Electrical and Photometric Measurements of Solid State Lighting"
 - d. LM-80 "Measuring Lumen Maintenance of LED Light Sources"
 - e. TM-21 "Projecting Long Term Lumen Maintenance of LED Light Sources"
 - 2. American Society for Testing and Materials (ASTM):
 - a. ASTM A36, "Specification for Structural Steel".
 - b. ASTM A123, "Specification for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip".

- c. ASTM A153, "Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware".
- d. ASTM A595, "Specification for Steel Tubes, Low-Carbon, Tapered for Structural Use".
- e. ASTM A675, "Specification for Special Quality Hot-Rolled Carbon Steel Bars Subject to Mechanical Property Requirements".
- f. ASTM D2092, "Preparation of Zinc-Coated Steel Surfaces for Painting".

1.4 SUBMITTALS

- A. General: Submit the information specified in the Submittals Section of "Basic Electrical Requirements" in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Product data describing fixtures, LED's/drivers, lamps, ballasts, poles, and accessories. Arrange product data for fixtures in order of fixture designation. Include data on features, poles, accessories, and the following:
 - 1. Outline drawings of fixtures and poles indicating dimensions and principal features.
 - 2. Electrical ratings and photometric data with certified results of laboratory tests.
- C. Product certifications signed by manufacturers of lighting units certifying that their products comply with specified requirements.
- D. Maintenance data for products for inclusion in Operating and Maintenance Manual specified in Division 01.
- E. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
- F. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

1.5 QUALITY ASSURANCE

- A. Comply with NFPA 70 "National Electrical Code" for components and installation.
- B. Comply with ANSI C2, "National Electrical Safety Code".
- C. LED fixtures to comply with U.S. Department of Energy LED Lighting Facts labeling.
- D. Listing and Labeling: Provide fixtures and accessories that are UL Listed and labeled for their indicated use and location on the Project.
- E. Manufacturers' Qualifications: Firms experienced in manufacturing lighting units that are similar to those indicated for this Project and that have a record of successful in-service performance.

1.6 STORAGE AND HANDLING OF POLES

- A. General: Store poles on decay-resistant treated skids at least 1 ft. above grade and vegetation. Support pole to prevent distortion and arrange to provide free air circulation.

- B. Metal Poles: Retain factory-applied pole wrappings until just before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.7 EXTRA MATERIALS

- A. Furnish extra materials matching products installed as described below, packaged with protective covering for storage, and identified with labels describing contents. Deliver extra materials to Owner.
 - 1.
 - 2. Lamps: 1 LED module for each 100 of each type and rating installed. Furnish at least 2 of each type. Fixtures with LED bar construction shall furnish a set of one set of fixture LED bars for each 100 fixtures.
 - 3. Lamps: 1 lamp for each 10 of each type and rating installed. Furnish at least 2 of each type.
 - 4. Glass and Plastic Lenses, Covers, and Other Optical Parts: 1 for each 50 of each type and rating installed. Furnish at least 2 of each type.
 - 5. Ballasts: 1 for each 50 of each type and rating installed. Furnish at least 2 of each type.
 - 6. Globes and Guards: 1 for each 20 of each type and rating installed. Furnish at least 2 of each type.
 - 7. Driver: 1 for each 200 of each type and rating installed. Furnish at least 2 of each type.

1.8 WARRANTY

- A. One year warranty against defects in materials and workmanship. 50,000 hour warranty on LED lamps and driver for defects resulting in a fixture lumen depreciation of 30% or greater.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers and fixtures are shown in schedules on Drawings. No substitutions permitted.

2.2 FIXTURE COMPONENTS, GENERAL

- A. Metal Parts: Free from burrs and sharp edges and corners.
- B. Sheet Metal Components: Corrosion-resistant aluminum or stainless steel, except as indicated. Form and support to prevent warping and sagging.
- C. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use with filter/breather.
- D. Doors, Frames, and Other Internal Access Provisions: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in the operating position. Provide for door removal for cleaning or replacing lens. Arrange for door opening to disconnect ballast if ballast is not located in separate compartment.
- E. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:

1. White Surfaces: 85%.
 2. Specular Surfaces: 95%.
- F. Plastic Parts: Resistant to yellowing and other changes due to aging and exposure to heat and UV radiation.
- G. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor mounting in fixture doors.
- H. Provide shielding and masking as specified on drawings.
- I. Photoelectric Relay: UL 773, "Plug-in, Locking Type Photocontrols for Use with Area Lighting" where noted.
1. Relays: Single-throw, arranged to fail in the "on" position and factory set to turn light unit on at 5 footcandles and off at 15 footcandles with 15 seconds minimum time delay unless noted otherwise on drawings.
 2. Mounting: In fixture housing.
- J. All fixtures/ballast/driver shall be protected by fuse of size and type recommended by manufacturer. Ballasts shall not contain polychlorinated biphenyls (PCB's)
- K. All lighting fixtures as specified on the Drawing shall be furnished under base bid.

2.3 LIGHT EMITTING DIODE (LED) FIXTURES

- A. Fixtures: Conform to UL Standards for Wet Location. IP65 per IEC 60598. LED Luminaires shall be tested to the IESNA LM-79-08 standard requiring spectroradiometric measurements for CRI and CCT as well as goniophotometric measurements for lighting distributions and total luminous flux.
- B. Marine grade die-cast aluminum. Rib reinforced construction. Integral heat sinks. Salt spray test: 1,000 hours. Housing shall be provided with knockouts for thru-wiring junction box mount or trunnion mount as specified on the Drawings. Fixtures shall be UL Listed for wet locations as specified on the drawings. Four tamperproof tools will be provided to the Owner for each type of tamperproof screw installed.
- C. LENS: UV-stabilized, high impact resistant, injection molded clear textured 100% DR acrylic or polycarbonate lens as shown on drawings. Lens secured with 4 Torx® fasteners.
- D. Driver:
1. Operating voltage matches system voltage.
 2. All wiring within luminaires shall carry no more than 80% of rated current and shall be listed by UL for use at a minimum of 600 V at 150° C.
 3. Driver shall operate within a 10% range of the nominal electrical distribution system voltage.
- E. Projected theoretical L70 lumen depreciation point shall be greater than 100,000 hours or as shown on Drawings and listed in light fixture schedule.
- F. Color temperature as shown on light fixture schedule.
- G. Fixtures efficacy shall be at least 90 lumens per watt.
- H. Acceptable Driver Manufacturers:

- a. Phillips Advance Transformer Company.
- b. Universal.
- c. Thomas Research.
- d. Kenall

2.4 EMERGENCY LIGHTING SYSTEMS

- A. Exit Signs: Exit signs shall be provided as shown on Drawings and listed in light fixture schedule. All exit signs shall be vandal resistant, tamper resistant, self contained units, and UL approved for wet locations.
- B. Battery Backed Fixtures (see following Section for Emergency Battery Packs): Battery backed fixtures shall be provided as shown on Drawings and listed in light fixture schedule. All battery backed fixtures shall be vandal resistant, tamper resistant, and UL approved for wet or damp locations unless otherwise specified.
 1. Battery Backed Fluorescent Fixtures: Battery backed emergency fluorescent fixtures shall contain battery, automatic charger, inverter, ready light and test switch. Upon loss of normal AC power, fixtures will automatically transfer to battery power and provide at least 1000 lumens for minimum of 90 minutes. Inverter shall automatically disconnect when battery is 87.5% discharged to prevent battery damage. Battery shall be maintenance free and not damaged when in 87.5% discharged condition at minus 30° C. Charger shall be capable of fully recharging battery in 12 hrs or less after full discharge.

2.5 FIXTURES SUPPORT COMPONENTS

- A. Lighting Standards (Poles):
 1. Design of metal poles shall be based on local maximum wind velocity and effective projected area of luminaires. In no case shall design be below:
 - a. 100 mph wind plus 30% gust derated for height of fixture above ground level as a minimum. If located in an area subject to hurricane force wind conditions, poles shall be designed to withstand code mandated wind loads. Increase pole wall thickness or size if necessary. Supply calculations to Engineer/Architect for approval.
 - b. 8 sq ft effective projected area.
 - c. Arm, Bracket, and Tenon Mount Materials: Match the poles
 - d. Mountings, Fastenings, and Appurtenances: Corrosion-resistant components compatible with the poles and fixtures that will not cause galvanic action at contact points. Provide mountings that will correctly position the luminaire to provide the indicated light distribution.
 2. Material:
 - a. Steel Poles:
 - 1) Shaft of steel poles shall conform to ASTM A500 Grade B or ASTM A595 Grade A.
 - 2) Base of steel poles shall be ASTM A36 telescoped on pole base, welded top and bottom.
 - 3) Poles shall be internally coated with thermalplastic hydrocarbon resin or hot dipped galvanized.
 - b. Anchor bolts shall be ASTM A675 Grade 90 with minimum yield strength of 50,000 psi. Bolts are "L" shape with 6 in. of threads and galvanized to ASTM A153 for minimum of 8 in. on threaded end. Position bolts using manufacturer's template.
 3. Accessories:
 - a. Hand hole on all poles, 1 ft - 6 in. above base.

- b. Metal anchor bolt/pole base covers secured to pole with tamper resistant fasteners.
 - c. Grounding lug.
 - d. Level with anchor bolt bottom nuts and shims, then grout with no-shrink, non-metallic grout leaving path for water to drain from inside pole.
 - e. Finish and color to match fixtures.
 - f. Miscellaneous screws to be passivated or stainless steel.
 - g. Provide lowering winch for all hinged poles.
4. Acceptable Manufacturers: (Only if pole does not have to be cut down.)
- a. Valmont Industries Inc.
 - b. KW Industries.

2.6 LAMPS

- A. As shown on Drawings and listed in light fixture schedule.
- B. Conform to ANSI Standards, C78 series, applicable to each type of lamp. Provide fixtures with indicated lamps. Where lamps are not indicated, provide lamps recommended by manufacturer.
- C. LED
 - 1. Projected theoretical L70 lumen depreciation point shall be greater than 100,000 hours or as shown on Drawings and listed in light fixture schedule.
 - 2. Color temperature as shown on light fixture schedule.

2.7 FINISH

- A. Metal Parts: Baked on polyester-powder coat finish except as otherwise indicated. Finish shall be free of streaks, runs, holidays, stains, blisters, and similar defects. Remove poles, fixtures, and accessories showing evidence of corrosion or finish failure during Project warranty period and replace with new items.
- B. Other Parts: Manufacturer's standard finish except as otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install lighting fixtures as shown on Drawings and listed in fixture schedule. Coordinate fixture locations with structure and signage location. Set units plumb, square, level and secure according to manufacturer written instructions and shop drawings.
- B. Lighting fixtures shall be fully lamped. This Contractor shall furnish lamps for all fixtures scheduled on plans. These lamps shall be new at time of acceptance by Owner.
- C. Pole Installation: Use fabric web slings (not chain or cable) to raise and set poles.
- D. Fixture Attachment: Fasten to indicated structural supports.
- E. Fixture Attachment with Adjustable Features or Aiming: Attach fixtures and supports to allow aiming for indicated light distribution.

- F. Lamp fixtures with indicated lamps according to manufacturer's instructions. Replace malfunctioning lamps.
- G. Install and wire outlets where shown on Drawings for illuminated signs.
- H. Emergency Lighting System:
 - 1. Illuminated Exit Signs: Connect circuits supplying illuminated exit signs to locked-on breakers in distribution panel indicated on Drawings.
 - 2. Stairway and Security Fixtures (NL): Connect circuits supplying stairway and NL fixtures to locked-on breakers in distribution panel indicated.
- I. Aim photoelectric controls away from nearby light sources and shield if required.
- J. Provide lamp shields for all fixtures in elevator machine rooms.

3.2 GROUNDING

- A. Ground fixtures and metal poles according to Division 26 Section "Common Work Results for Electrical", and as shown on the Drawings.

3.3 FIELD QUALITY CONTROL

- A. Inspect installed units for damage.
- B. Provide advance notice of dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Tests: Verify normal operation of lighting units after installing fixtures and energizing circuits with normal power source. Include the following:
 - 1. Photometric Tests: Measure light intensities at locations where specific illumination performance is indicated. Use photometers with calibration referenced to NIST standards.
 - 2. Check for excessively noisy ballasts.
 - 3. Check for uniformity of illuminations.
 - 4. Written report of tests indicating actual illumination results.
- E. Replace or repair damaged and malfunctioning units and retest.

3.4 ADJUSTING AND CLEANING

- A. Clean components on completion of installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 26 50 00

© Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Consultants/Engineers Inc.

SECTION 28 31 12

ZONED (DC LOOP) FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes communications, security and smoke detection or fire alarm system.

1.3 SUBMITTALS

- A. General: Submit the information specified in the submittals Section of "Basic Electrical Requirements" in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Wiring diagrams, detailing wiring for power, signal, and control, differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminals to facilitate installation, operation and maintenance.
- C. Maintenance data for materials and products, for inclusion in Operating and Maintenance Manual specified in Division 01 and Division 26 Section "Common Work Results for Electrical". Provide complete manual material concurrently with system submittal and provide updated final versions of manuals 1 month before completion of construction and final system turnover.
- D. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
- E. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who is a factory-authorized service representative to perform work of this Section.
- B. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code" including, but not limited to:
 - 1. Article 250, Grounding.
 - 2. Article 300, Part A. Wiring Method.
 - 3. Article 310, Conductors for General Wiring.
 - 4. Article 725, Remote Control, Signaling Circuits.
 - 5. Article 760, Fire Protective Signaling Systems.
 - 6. Article 800, Communication Systems.

- C. UL Compliance: Comply with all applicable requirements of UL.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- A. Communications and Security: Provide communications backboard, equipment, wiring, conduit and junction boxes as noted on Drawings.
 - 1. Backboard: 4 ft x 8 ft, 3/4 in. plywood, 2 coats fire retardant gray paint.
- B. Smoke Detection Equipment for Elevator Sequencing: Contractor shall supply and install smoke detectors, heat detectors, relays, trouble alarm, horn/strobes, smoke detector control panel and all other equipment necessary to provide dry contacts needed to sequence elevators in accordance with current edition of ANSI A17.1, "Safety Code for Elevators and Escalators" and any state or local codes:
 - 1. Panel: Simplex 4004 with all cards and other equipment required to form complete operating system with 8 input zones, trouble alarm, surge protection and battery backup. Panel shall operate at 120V.
 - 2. Smoke Detector: Simplex 4098-9601, operational from -9° C to +50° C., up to 95% humidity. Provide Simplex Wire Guard.
 - 3. Heat Detector: Simplex 2098-9443 (135° F fixed and rate of rise).
 - 4. Horn/Strobe: Simplex 4903-9238 with 4905-9907 high humidity gasket kit.
- C. Fire Alarm/Elevator Sequencing System: Contractor shall supply and install pull stations, horns, strobe horns, smoke detectors, relays, fire alarm panel and all other equipment necessary to provide fire alarm system as required by Fire Marshall and any local or state codes and as necessary to provide dry contacts needed to sequence elevators in accordance with current edition of ANSI A17.1, "Safety Code for Elevators and Escalators" and any state or local codes:
 - 1. Fire Alarm Panel: Simplex Cat. No. 4005 with all cards and other equipment required to form complete operating system with 36 zones, trouble alarm, surge protection, and battery backup. Panel shall operate at 120V.
 - 2. Smoke Detector: Simplex 4098-9601, operational from -9° C to +50° C., up to 95% humidity. Provide Simplex Wire Guard.
 - 3. Heat Detector: Simplex 2098-9443 (135° F fixed and rate of rise).
 - 4. Pull Stations: Simplex 2099-9755 with 9818 weatherproof shield.
 - 5. Horn/Strobe: Simplex 4903-9238 with 4905-9907 high humidity gasket kit.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting performance of the intercommunication system work.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. Communications and Security: Provide and locate materials as shown on Drawings. Connect per manufacturer's recommendations to provide complete operating system.
- C. Smoke Detection/Elevator Sequencing System Installation:
 - 1. Install smoke detectors in elevator lobby areas, electrical room, elevator machine rooms and at top of elevator hoistways as shown on the Drawings. Route circuits in separate conduit to Elevator Supervisory and Recall control panel per manufacturer's recommendations.
 - 2. Install smoke detector control panel in electrical or elevator machine room as shown on Drawings. Coordinate exact panel location with Elevator supplier. Connect to dedicated 120 volt circuit.
 - 3. Install horn/strobe trouble alarm outside elevator machine room.
 - 4. Coordinate primary and alternate return levels with elevator inspector.
 - 5. Run circuit with dry contact outputs from smoke detector control panel to elevator sequencing equipment. Elevator supplier will make connections to sequencing equipment. Coordinate installation with elevator supplier.
 - 6. Test system for proper operation.
- D. Fire Alarm/Elevator Sequencing System Installation:
 - 1. Size and locate wiring, conduit, junction boxes and equipment as shown on the Drawings.
 - 2. Install fire alarm panel, pull stations, horn/strobes and other circuits and devices as indicated on Drawings. Each pull station is to be zoned separately.
 - 3. Install smoke detectors in elevator lobby areas, elevator machine rooms and at top of elevator hoistways and other areas as shown on Drawings. Route circuits in separate conduit to fire alarm control panel per manufacturer's recommendations.
 - 4. Run circuit with dry contact outputs from fire alarm control panel to elevator sequencing equipment. Elevator supplier will make connections to sequencing equipment. Coordinate installation with elevator supplier.
 - 5. Test system for proper operation.
- E. Splices, Taps, and Terminations: Make splices, taps and terminations on numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets and equipment enclosures.
- F. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.
- G. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.
- H. Repairs: Wherever walls, ceilings, floors, or other building finishes are cut for installation, repair, restore, and refinish to original appearance.

3.3 GROUNDING

- A. Provide equipment grounding connections for intercommunication systems as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.

3.4 FIELD QUALITY CONTROL

- A. Operational Test: Perform an operational system test to verify conformance of system to these Specifications. Perform tests that include originating and page material at intercommunication stations and observing sound reproduction for proper routing and volume levels and for freedom from noise and distortion. Provide a written record of test results.

3.5 COMMISSIONING

- A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintenance of the system.
- B. Schedule training with Owner through the Engineer/Architect, with at least 7 days advance notice.

3.6 CLEANING AND PROTECTION

- A. Prior to final acceptance, clean system components and protect from damage and deterioration.

END OF SECTION 28 31 12

©Copyright 2022. All rights reserved. No part of this document may be reproduced in any form or by any means without permission from Walker Consultants.

SECTION 31 05 01 - FOUNDATION MATERIAL FOR UNSUITABLE SUBGRADE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This item shall govern for the removal of subgrade material deemed unsuitable or deficient as a result of proof rolling and the subsequent replacement and compaction of approved subgrade material.

1.2 RELATED SECTIONS

- A. Section 31 05 16– Aggregate

1.3 Materials REFERENCES

- A. Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges, 2014 Edition.
- B. ASTM C33 - Coarse Aggregates.
- C. ASTM D698 - Moisture-Density Relations of Soils (Standard.)
- D. ASTM D2487 - Classification of Soils for Engineering Purposes.
- E. ASTM D4254 - Minimum Index Density and Unit Weight of Soils and Calculations of Relative Density.
- F. ASTM D4318 - Test for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Crushed Rock: Section 31 05 16.2.1.D – Coarse Aggregate Type A3-1 – Foundation Material for Unsuitable Subgrade

PART 3 EXECUTION

3.1 CONSTRUCTION METHODS:

- A. The Contractor shall excavate all soils, which are soft or otherwise unusable for subgrade material.
- B. Excavation of unusable soils shall be conducted so that acceptable material directly adjacent to the construction limits will not be disturbed.
- C. The depth of excavation shall be determined by the City Engineer, but shall not be less than six (6) inches.

3.2 COMPACTION

- A. The approved foundation material shall be placed and compacted to 95 percent of maximum density within two percent of optimum moisture as measured by ASTM D698, in six (6) inch lifts.
- B. In place moisture-density test may be ordered by City of Longview to insure that all trench backfill complies with the requirements of the Specification.

3.3 DISPOSAL OF EXCESS MATERIAL

- A. Excavated materials shall be handled at all times in such a manner as to cause a minimum inconvenience to public travel and to permit safe and convenient access to private and public property adjacent to or along the line of the Work.
- B. In parkways and easements where it is necessary to deposit excavated materials on lawns during the Work, burlap or similar materials shall be placed on the lawn to prevent contact between excavated materials and the lawn.
- C. Remove waste and excess excavated material from the construction site before final inspection.
- D. Legally dispose of material at a licensed site or with written and notarized permission from the property owner for a private disposal site.
- E. All cost associated with waste material removal and disposal shall be paid for by the Contractor.

END OF SECTION

SECTION 31 05 13 - SOIL MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Subsoil materials.
- B. Topsoil materials.

1.2 RELATED SECTIONS

- A. Geotechnical Report: Bore hole locations and finding of subsurface materials.
- B. Section 01 45 00 – Quality Control: Testing soil fill materials.
- C. Section 31 05 16 – Aggregate Materials.
- D. Section 31 23 02 – Excavating, Backfilling, and Compacting for Utilities.

1.3 REFERENCES

- A. ASTM D698 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures.
- B. ASTM D2487 – Classification of Soils for Engineering Purposes.
- C. ASTM D2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D. ASTM D3017 – Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- E. Association of Official Agriculture Chemists

1.4 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 – Submittals: Procedures for submittals.
- B. Samples:
 - 1. Submit, in air-tight containers, 10 lb. sample of each type of fill to testing laboratory.
 - 2. All off-site materials must be approved by the City of Longview prior to installation.

1.5 SUBMITTALS FOR INFORMATION

- A. Section 01 33 00 – Submittals: Procedures for submittals.
- B. Materials Source: Submit name of imported materials source.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with Plans and Specification requirements, TxDOT standards, and City of Longview standards.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

- A. Soil Type S1 – Subgrade material:
 - 1. Material remaining in place after excavation.
 - 2. Suitable for slab/foundation subgrade, undisturbed nor over excavated.
 - 3. Where subgrade soils are soft, loose, or otherwise unsatisfactory, the soil shall be removed and replaced with select fill or soil cement as determined by the City of Longview.
- B. Soil Type S2 – Common Fill:
 - 1. Excavated and re-used material or from borrow approved by the City of Longview.
 - 2. Graded free of lumps larger than 3 inches, rocks larger than 2 inches, excessive silts and debris.
 - 3. Do not use soil containing brush, roots, or similar organic matter.
 - 4. Conforming to ASTM D2487 Class II or Class III soils with a liquid limit less than 40, and a plasticity index less than 20, but greater than 4.
- C. Soil Type S3 – Select Fill:
 - 1. Imported borrow material from borrow area approved by the City of Longview. Material shall be tested for compliance by the Contractor and test results submitted to the City of Longview for approval.
 - 2. Clayey sand soils free from organic matter with no lumps larger than 1 inch, no rocks larger than ½ inch, nor excessive silts.
 - 3. Do not use soils containing brush, roots, sod or other organic materials.
 - 4. Select fill shall conform to ASTM D2487 Class II or Class III and shall have a liquid limit less than 30 with a plasticity index less than 15 but greater than 4.
- D. Soil Type S4 – Top Soil:

1. Soil suitable for growth of surface cover. Material stripped and stockpiled from site or borrowed from off site.
2. Free from roots, brush, rocks, and other extraneous matter exceeding 1 inch in any direction. Free from weeds
3. Minimum 60% sand, Maximum 30% silts, Maximum 10% clay, no less than 6% and no more than 20% organic matter.
4. Submit test data showing compliance with these specifications. Include percent weight of constituent material, material particle size, and pH.
 - a. Topsoil shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches or more in diameter), clay lumps or similar objects.
 - b. There shall be not less than twenty percent (20%) nor more than eighty percent (80%) of the material passing the 200-mesh sieve as determined by the wash test in accordance with ASTM C 117.
 - c. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agriculture Chemists in effect on the date of the invitation of bids.
 - d. The organic content shall be not less than three percent (3%) nor more than twenty percent (20%) as determined by the wet-combustion method (chromic acid reduction).

2.2 SOURCE QUALITY CONTROL

- A. Section 01 45 00 – Quality Control: Testing and analysis of soil material.
- B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698.
- C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698.
- D. If tests indicate materials do not meet specified requirements, change material and retest.
- E. Provide materials of each type from same source throughout the Work. A change in source requires sampling, testing, and approval by the City of Longview.

PART 3 EXECUTION

3.1 SOIL REMOVAL

- A. Excavate soils from areas designated.
- B. Remove lumped soil, boulders, and rock.

- C. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.2 STOCKPILING

- A. Stockpile materials on site at locations designated by City of Longview.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Prevent intermixing of soil types or contamination.
- E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in a clean and neat condition
- B. If a borrow area is indicated, leave area in a clean and neat condition.
- C. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 05 16 - AGGREGATE MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aggregate materials.

1.2 RELATED SECTIONS

- A. Section 01 45 00 - Quality Control: Testing aggregate fill materials.
- B. Section 31 05 13 - Soil Materials.
- C. Section 31 23 01 - Excavation, Backfilling and Compaction for Structures.
- D. Section 31 23 02 - Excavation, Backfilling, and Compacting for Utilities.
- E. Section 31 23 03 - Excavation, Embankment and Compaction for Roadways and Channels.
- F. Section 31 05 01 - Foundation Material for Unsuitable Subgrade.

1.3 REFERENCES

- A. ASTM C29 - Unit Weight of Aggregate
- B. ASTM C88 - Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- C. ASTM C117 - Materials Finer than 75um (No. 200) Sieve in Mineral Aggregates by Washing
- D. ASTM C131 - Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
- E. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- F. ASTM D75 - Sampling Aggregate
- G. ASTM D693 - Crushed Stone, Crushed Slag, and Crushed Gravel for Dry-or Water-Bound Macadam Base Courses and Bituminous Macadam Base and Surface Courses of Pavements
- H. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures.
- I. ASTM D2419 - Sand Equivalent Value of Soils and Fine Aggregate
- J. ASTM D2487 - Classification of Soils for Engineering Purposes.

- K. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- L. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- M. ASTM D3665 - Random Sampling of Paving Materials
- N. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- O. Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges, 2014 Edition.

1.4 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Samples: Submit, in air-tight containers, 10 lb. sample of each type of material to testing laboratory.

1.5 SUBMITTALS FOR INFORMATION

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Materials Source: Submit name of imported materials suppliers.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with Plans and Specification requirements, TxDOT standards, and City of Longview standards.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

- A. Coarse Aggregate Type A1 - Drain Rock:
 - 1. As shown on the Plans, under structures and behind walls shall be clean, washed, sound durable, well-graded crushed rock, crushed gravel, or natural stone gravel.
 - 2. Conforming to ASTM C-33 Size No. 3 coarse aggregate between 1 inch and 2 inch.
- B. Coarse Aggregate Type A2 - Pipe Embedment:
 - 1. Angular $\frac{3}{4}$ inch to 1 inch crushed rock or natural stone meeting the requirements of ASTM C-33 No. 57.
 - 2. Embedment material shall be clean, washed, sound, durable and well graded.
- C. Coarse Aggregate Type A3 - Foundation Material:
 - 1. Coarse stone or crushed gravel.

- 2. Foundation material shall be pit run angular crushed, natural washed stone free of shale, clay, friable material and debris; well graded between 1 and 3 inches in size, with a minimum of 90% retained on a 1-inch sieve.
- D. Coarse Aggregate Type A3-1 - Foundation Material for Unsuitable Pavement Subgrade:
 - 1. Foundation material shall conform to the specification for TxDOT Item 247, Type "A", Grade 2.
- E. Aggregate Type A4 - Pea Gravel:
 - 1. Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM C136 to the following limits:
 - a. Minimum Size: 1/4 inch
 - b. Maximum Size: 5/8 inch
- F. Aggregate Type A5 – Type "R" Modified Rock Riprap:
 - 1. Natural stone, washed free of clay and shale, and shall meet all of the requirements of TxDOT Item 432, for Type R Stone Riprap with the following modifications:
 - a. Stones shall weigh between 50 to 150 pounds with no less than 50 percent of the stones shall weigh more than 100 pounds.
 - b. Rock's longest dimension shall not exceed 3 times that of the shortest dimension.
 - c. Delete paragraphs 432.5 Measurement and 432.6 Payment, and refer to Section 01200 – Unit Bid Prices of these Specifications.

2.2 FINE AGGREGATE MATERIALS

- A. Fine Aggregate Type A5 - Sand:
 - 1. Natural river or bank sand; washed, free of silt, clay, loam, friable or soluble materials and organic matter; graded in accordance with ASTM C136; within the following limits:

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| No. 4 | 100 |
| No. 14 | 10 to 100 |
| No. 50 | 5 to 90 |
| No. 100 | 4 to 30 |
| No. 200 | 0 to 10 |

2.3 SOURCE QUALITY CONTROL

- A. Section 01 45 00 - Quality Control: Source testing and analysis of aggregate material.
- B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, and ASTM C33.
- C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, and ASTM C33.
- D. If tests indicate materials do not meet specified requirements, change material or material source and retest.
- E. Provide materials of each type from same source throughout the Work. A change in source requires sampling, testing, and approval by the City of Longview.

PART 3 EXECUTION

3.1 STOCKPILING

- A. Stockpile materials on site at locations designated by the City of Longview.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

- A. Remove stockpile; leave area in a clean and neat condition. Grade site surface to prevent freestanding surface water.
- B. Leave unused materials in a neat, compact stockpile.
- C. If a borrow area is indicated, leave area in a clean and neat condition.
- D. Grade site surface to prevent freestanding surface water.

END OF SECTION

SECTION 31 23 01 - EXCAVATION, BACKFILLING, AND COMPACTING FOR STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavation shall include the removal of all earth, rock, or other materials to the extent necessary to install structures or storm sewer pipe, pre-cast reinforced concrete box culverts, and appurtenances in conformance with the lines and grades shown in the Plans or as specified.
- B. Backfilling and compacting shall included all backfilling, embankment, and compaction necessary to install structures or storm sewer pipe, pre-cast reinforced concrete box culverts, and appurtenances in conformance with the lines and grades shown in the Plans or as specified.

1.2 RELATED SECTIONS

- A. Section 31 05 13 – Soil Materials
- B. Section 31 05 16 – Aggregate Materials
- C. Section 31 41 33 – Trench and Excavation Safety System

1.3 REFERENCES

- A. ASTM C33 - Coarse Aggregates.
- B. ASTM D698 - Standard Methods of Test for Moisture-Density Relations of Soil (Standard).
- C. ASTM D1557 - Test for Moisture-Density Relations of Soil (Modified).
- D. ASTM D2487 - Classification of Soils for Engineering Purposes.
- E. ASTM D2922 - Density of Soil and Soil Aggregate In-Place by Nuclear Methods.
- F. ASTM D3017 - Moisture Content of Soil and Soil Aggregate In-Place by Nuclear Methods.
- G. ASTM D4254 - Minimum Index Density and Unit Weight of Soils and Calculations of Relative Density.
- H. ASTM D4318 - Test for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- I. OSHA - Occupational Safety and Health Administration and Related Regulations.

1.4 SUBMITTALS

- A. Procedures for Submittals: Section 01 33 00.
- B. Samples: Aggregate samples of material as required by the testing laboratory.
- C. Quality Control Submittals: For information only.

1.5 PROTECTION OR REMOVAL OF UTILITY LINES

- A. The Contractor shall anticipate all underground and above ground obstructions such as, but not limited to, water mains, gas lines, storm and sanitary sewers, telephone or electric light or power ducts, concrete, and debris.
 - 1. It shall be the responsibility of the Contractor to verify the existence and location of all underground and above ground utilities along the route of the work.
 - 2. Any such lines or obstructions indicated on the Plans show only the approximate locations and shall be verified in the field by the Contractor.
 - 3. The City of Longview will endeavor to familiarize the Contractor with all known utilities and obstructions, but this shall not relieve the Contractor from full responsibility in anticipating all underground and above ground obstructions whether or not shown on the Plans.
 - 4. The omission from or the inclusion of utility locations on the Plans is not to be considered as the non-existence of, or a definite location of existing utilities.
- B. The Contractor shall, at his own expense, maintain in proper working order and without interruption of service all existing utilities and services which may be encountered in the work.
 - 1. With the consent of the City of Longview and utility owner such service connections may be temporarily interrupted to permit the Contractor to remove designated lines or to make temporary changes in the locations of services.
 - 2. The cost of making any temporary changes shall be at the Contractor's expense.
- C. The Contractor will take the necessary precautions to protect existing utilities from damage due to his operations.
- D. Any damage to the utilities will be repaired at the Contractor's expense.
- E. Notify all utility companies involved to have their utilities located and marked in the field.
 - 1. All underground utilities shall then be uncovered to verify location and elevation before construction begins.

2. The Contractor shall obtain all necessary permits.
- F. The Contractor shall obtain necessary permits, except right-of-way permits, required for completion of the project.
- G. Utility Spacing: The spacing for utility lines shall meet the installation requirements and the requirements of the TCEQ 30TAC 290.44(e).

1.6 PROJECT CONDITIONS

- A. Maximum and Minimum Width of Excavation:
 1. Unless otherwise specified on the plans, the minimum width of trench in which the pipe may be installed shall be 12 inches plus the outside diameter of the pipe or the structure.
 2. The maximum width shall be 24 inches plus the outside diameter of the pipe or the structure.
 3. Whenever the prescribed maximum trench width is exceeded, except as such excess may be necessary for compliance with the plans or specifications, the pipe may be cradled with 2,500 psi Concrete as directed by the City of Longview, and at the expense of the Contractor.
- B. Protection:
 1. Erect sheeting, shoring, and bracing as necessary for protection of persons, improvements, existing structures, and excavations.
 2. See Section 31 41 33 for requirements for sheeting, shoring, and bracing for trench and excavation safety.
- C. Dewatering of Trenches and Excavations
 1. This section covers the dewatering of trenches to the extent that bedding material and pipe can be placed on dry, firm trench bottom.
 2. Provide dewatering and drainage necessary to keep excavations free of water.
 - a. Dewatering System shall maintain the water level a minimum of 3 feet below the excavation.
 - b. Contractor shall provide and maintain all dewatering equipment during excavation, construction, backfill, and until structure is placed in service.
 - c. Contractor shall operate dewatering system continuously without interruption during weekends and/or holidays.

3. Dewatering of trenches other than by wellpointing shall be accomplished by whatever means elected by the Contractor; however, bedding material or pipe may not be placed in wet or unstable trenches.
 4. Soil that cannot be properly dewatered shall be excavated and Coarse Aggregate Type A3-1 material placed to such a depth as may be required to provide a firm trench bottom.
 5. Surface Runoff:
 - a. Surface runoff water shall be diverted away from the trenches.
 - b. Such diversion shall be into existing drainage structures, such as storm sewers, ditches, or streams.
 - c. Diversion of surface runoff shall be in such a manner to prevent flooding of streets or private property.
 6. Disposition of Water from Dewatering:
 - a. All water removed from the trenches by wellpointing or any other means shall be pumped, piped, or drained into existing drainage structures, such as storm sewers, ditches, or streams.
 - b. The disposition of water from dewatering operations shall be accomplished in a manner that will prevent the flooding of public or private property.
 - c. Provisions shall be made for the satisfactory disposal of surface water pumped so as to prevent damage to public or private property.
- D. Coordination: Coordinate backfill operations with installation of utilities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General Site Fill: Section 31 05 13.2.1.B – Soil Type S2 – Common Fill
- B. Earth Backfill: Section 31 05 13.2.1.C – Soil Type S3 – Select Fill
- C. Topsoil: Section 31 05 13.2.1.D – Soil Type S4 – Top Soil
- D. Aggregate: Section 31 05 16.2.1.B – Coarse Aggregate Type A2 – Pipe Embedment
- E. Crushed Rock: Section 31 05 16.2.1.D – Coarse Aggregate Type A3 – Foundation Material
- F. Sand: Section 31 05 16.2.2.A – Fine Aggregate Type A5 - Sand

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examine project site and investigate existing subsurface conditions to determine nature, kind and character of materials and conditions to be encountered.
- B. Prior to commencing excavation operations, disconnect and cap or protect existing utility services, if any, in accordance with the requirements of the owning companies and applicable ordinances and regulations.
- C. Provide for surface drainage.
- D. Keep excavations free of water during entire progress of the work.
- E. Prior to backfilling grade beams and below grade walls, verify that beams, walls and footing have properly cured.
- F. Verify that forms, trash, debris and applicable temporary shoring have been removed.
- G. Verify that walls are supported at top and bottom.

3.2 EXCAVATION AND SUBGRADE PREPARATION – STRUCTURES

- A. Excavate beneath structures to lines, grades, and elevations as shown.
 - 1. Over excavation shall be restored by the Contractor at his own expense.
 - 2. Over excavation shall be corrected by backfilling with select fill in 8-inch lifts.
 - 3. Compact to 95% of maximum density within 2% of optimum moisture per ASTM D698.
- B. Scarify exposed surfaces to a depth of 8 inches and recompact to a density of 95 percent of the maximum density when tested by the Standard Proctor Compaction Test (ASTM D698), at a moisture content of ± 2 percent of optimum.
- C. Remove weak or highly organic soils noted by probing and replace with select site fill. Place fill in 8-inch lifts and compact to 95 percent of maximum density (ASTM D698) at a moisture content of ± 2 percent of optimum.
- D. Do not extend structure fill beyond structure lines or as shown.
- E. All excavation is unclassified.
 - 1. Break rock with hydraulic ram to obtain near neat line excavation.
 - 2. Blasting is not allowed.

3.3 BACKFILL – STRUCTURES

- A. Schedule backfilling to expedite construction progress.

- B. Backfill in manner to prevent excessive pressure against previously completed work and to prevent damage or displacement to utility systems.
- C. Place backfill materials for grade beams as follows:
 - 1. Exterior Face of Grade Beams: Where required, backfill with select fill Place backfill in layers of approximately eight (8) inches loose lifts and compact to 98 percent of maximum density at ± 2 percent of optimum moisture content. Standard Proctor Density (ASTM D698).
 - 2. Place backfill at grade beams as soon as forms are removed.
 - a. Keep grade beam excavations dry at all times.
 - b. If rain occurs before backfill is placed, remove water from excavations immediately.
- D. Backfill structure walls with select fill.
 - 1. Compact by vibrating to 95 percent of maximum density within two percent of optimum moisture as measured by ASTM D698.
 - 2. Do not over compact. Place backfill in 8-inch lifts.
- E. Exercise care to prevent over compaction of backfills.
- F. Where top of below grade structure backfill is not covered with paving or other impervious barrier, the final 2 feet of backfill shall be select fill.
 - 1. Place fill in 8 inch thick lifts and compact to 95 percent of maximum density at ± 2 percent of optimum moisture content.
 - 2. Allow for 4 inches of topsoil placement.

3.4 MATERIAL DISPOSAL

- A. Suitable excavated materials shall be piled adjacent to the work to be used for backfilling.
- B. Excavated materials unsuitable for the backfilling, or in excess of that required for backfilling shall be disposed of by the Contractor at locations designated on the plans or approved by the City of Longview.
- C. Desirable topsoil, sod, etc. shall be carefully piled separately in its original position when required.
- D. Excavated materials shall be handled at all times in such a manner as to cause a minimum inconvenience to public travel and to permit safe and convenient access to private and public property adjacent to or along the line of the work.

- E. In parkways and easements where it is necessary to deposit excavated materials on lawns during the work, burlap or similar materials shall be placed on the lawn to prevent contact between excavated materials and the lawn.
- F. Remove waste and excess excavated material from the construction site before final inspection.
- G. Legally dispose of material at a licensed site or with written and notarized permission from the property owner for a private disposal site.
- H. All costs associated with waste material removal and disposal shall be paid for by the Contractor.

END OF SECTION

SECTION 31 23 02 - EXCAVATION, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavating, trenching, backfilling and compacting for water distribution lines, sanitary sewer collection lines, reinforced concrete storm sewer pipe, and other utility systems and appurtenances, and the disposal of excess excavated material.

1.2 REFERENCES

- A. ASTM C33 - Coarse Aggregates.
- B. ASTM D698 - Moisture-Density Relations of Soils (Standard.)
- C. ASTM D2487 - Classification of Soils for Engineering Purposes.
- D. ASTM D4254 - Minimum Index Density and Unit Weight of Soils and Calculations of Relative Density.
- E. ASTM D4318 - Test for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- F. OSHA - Occupational Safety and Health Administration and Related Regulations.

1.3 PROTECTION OR REMOVAL OF UTILITY LINES

- A. The Contractor shall anticipate all underground and above ground obstructions such as, but not limited to, water mains, gas lines, storm and sanitary sewers, telephone or electric light or power ducts, concrete, and debris.
- B. Any such lines or obstructions indicated on the Plans show only the approximate locations and shall be verified in the field by the Contractor. Any adjustment to the proposed utility to avoid conflicts with obstructions, whether shown on the Plans or not, shall be subsidiary to the unit price for the proposed utility unless shown otherwise in the bid proposal.
- C. The City of Longview will endeavor to familiarize the Contractor with all known utilities and obstructions, but this shall not relieve the Contractor from full responsibility in anticipating all underground and above ground obstructions whether or not shown on the Plans.
- D. The Contractor shall, at his own expense, maintain in proper working order and without interruption of service all existing utilities and services which may be encountered in the work.

- E. With the consent of the City of Longview and utility owner such service connections may be temporarily interrupted to permit the Contractor to remove designated lines or to make temporary changes in the locations of services.
- F. The cost of making any temporary changes shall be at the Contractor's expense.
- G. Notify all utility companies involved to have their utilities located and marked in the field. All underground utilities shall then be uncovered to verify location and elevation before construction begins.
- H. The Contractor shall obtain necessary permits required for completion of the project.

1.4 PROJECT CONDITIONS

A. Excavations:

1. All excavations are unclassified.

B. Protection:

1. Erect sheeting, shoring, and/or bracing as necessary for protection of persons, structures, property corners, excavations, or other improvements. The cost for sheeting, shoring, and/or bracing shall be considered subsidiary to the cost for the utility to be constructed. No additional payment will be made for sheeting, shoring, and/or bracing as required for construction of proposed utilities.
2. Provide dewatering and drainage necessary to keep excavations free of water. Dewatering System shall maintain the water level a minimum of 3 feet below the excavation. Contractor shall provide and maintain all dewatering equipment during excavation, construction, backfill, and until utility is placed in service. Contractor shall operate dewatering system continuously without interruption during weekends and/or holidays.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Backfill: Backfill shall be excavated and reused or borrow material free of lumps larger than 1 inch, stones larger than 1/2 inch, trash, organic, spongy or otherwise objectionable material. Backfill materials shall be approved by City of Longview. Refer to section 31 05 16, 31 05 13, and the Plans.

- B. Sand: Sand shall be free from clay lumps, organic and other deleterious material, and have a plasticity index no greater than 12, as determined by ASTM D4318.
- C. Crushed Rock: Provide durable crushed rock free of clay lumps, organic or other deleterious material. Crushed rock size shall be Class I per ASTM D1487. ASTM C33, size No. 57 or 67 shall be considered Class I material.
- D. Coarse-Grained Soils: Coarse-grained soils for pipe bedding shall be ASTM D2487, Class II or III. See Section 31 05 16, Type A2 for pipe bedding.
- E. Aggregate Materials: Aggregate materials shall conform to the requirements of Section 31 05 16 of these specifications.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examine utility routes and coordinate excavation work to eliminate installation conflicts.
- B. Allow room for stockpiling excavated material and utility construction material during utility construction.

3.2 TRENCH EXCAVATION

- A. Procedure: Excavate to indicated or specified depths and widths.
 - 1. Excavate by open cut method, all excavations are unclassified.
 - 2. Dispose of unacceptable backfill material and provide suitable material for backfill without additional expense.
 - 3. During excavation, stockpile material suitable for backfilling in an orderly manner far enough from the bank of the trench to avoid overloading, slides, or cave-ins.
 - 4. Grade as necessary to prevent surface water from flowing into trenches or other excavations.
 - 5. Cut banks of trench as nearly vertical as practical. Remove stones as necessary to avoid point-bearing. Over-excavate wet or unstable soil from the trench bottom to permit construction of a more stable bed for pipe. Over excavation shall be filled and tamped with clean dry sand or other materials approved by the City of Longview to the required grade. Obtain approval from the City of Longview Representative prior to over excavation.

6. Excavate the trench the proper width as shown. If the trench width below the top of pipe is wider than specified in this Section or shown, install additional backfill. No additional payment will be made for additional material or work required for installation.
 7. Accurately grade the trench bottom to provide proper bedding as required for pipe installation.
 8. If any excavation is carried beyond the lines and grades required or authorized, the Contractor shall, at his own expense, fill such space with concrete or other suitable material as directed by the City of Longview. No additional payment will be made.
 9. Construct trench in accordance with Contractor's Trench Safety Plan.
- B. Sheeting and Bracing: Install sheeting and bracing necessary to support the sides of trenches and other excavations with vertical sides, as required by current OSHA regulations.
- C. Water In Excavation: Keep work free from ground or surface water at all times. Provide pumps of adequate capacity or other approved method to remove water from the excavation in such a manner that it will not interfere with the progress of the work or the proper placing of other work.
- D. Trenching Progress: Trenching operations shall not be in excess of 100 feet ahead of pipe laying operations in City streets or 2,000 feet in open country. Not more than two (2) consecutive cross-streets may be closed to traffic at any given time. Trench across only those streets identified to be open cut on the Plans.
- E. Existing Lawns and Shrubbery: The Contractor shall take particular care to preserve existing lawns and shrubbery. Make minor pipe alignment changes as may be necessary with the approval of the City of Longview.
- F. Existing Pavement: Existing pavement over trenches shall be removed to a width of 6 inches outside of the trench on each side. Remove to a neat line by sawing method perpendicular to the pavement.

3.3 PIPE BEDDING

- A. Pipe Zone: The pipe zone is defined as including the pipe bedding, backfill with crushed aggregate to 50% of the pipe diameter and the initial backfill to 12 inches above the top of the pipe.
- B. Class A Bedding:

1. Where shown, the Contractor shall install the pipe in concrete encasement.
2. Concrete for encasement shall be 3000 psi compressive strength as specified in Section 03300.
3. Precautions shall be used to prevent pipe movement or deflection during construction.
4. Concrete for encasement, shall be included in the unit price bid per linear foot in place.

C. Class B Bedding:

1. Accurately grade the bottom of the trench 4 inches below the bottom of the pipe and limits of clear space on either side of the pipe.
2. Place a minimum of 4 inches of compacted sand backfill up to the flow line of the pipe or above before pipe is laid. Install pipe, place additional sand backfill to springline and compact.
3. Complete bedding with compacted sand to 6 inches above the top of the pipe.
4. Compact the bedding and backfill to a minimum of 95 percent of maximum dry density per ASTM D698, maintaining moisture within ± 2 percent of optimum or 70 percent of relative density per ASTM D-4254.

D. Class C Bedding:

1. All pipe bedding shall be Class C, unless otherwise approved by the City of Longview.
2. Accurately grade the bottom of the trench 4 inches below the bottom of the pipe and to the limits of the clear space on either side of the pipe.
3. Place a minimum of 4 inches of compacted granular embedment material (Type A2) below the pipe and to 50% of the pipe diameter.
4. The initial layer of embedment material placed to receive the pipe shall be brought up to a grade slightly higher than that required for the bottom of the pipe and the pipe shall be placed thereon and brought to grade by tamping, or by removal of the slight excess amount of embedment under the pipe.
5. Adjustment to grade line shall be made by scraping away or filling with embedment materials. Wedging or blocking up of pipe will not be permitted.

6. Each pipe section shall have a uniform bearing on the embedment for the full length of the pipe, except immediately at the joint.
7. After each pipe has been graded, aligned, placed in final position on the bedding material and joint made, sufficient embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations.
8. Embedment material shall be deposited simultaneously on each side of pipe and compacted uniformly to the spring line or the elevation shown on the plans, whichever is higher.
9. Sheeting and shoring will not be allowed in the pipe zone during or after installation of the pipe or embedment material, unless special provisions are made to ensure the specified compaction of bedding and pipe alignment is maintained after removal of sheeting and shoring.

E. Class D Bedding:

1. Accurately grade the bottom of the trench 4 inches below the bottom of the pipe and to limits of clear space on either side of the pipe.
2. Place and compact a minimum of 4 inches of earthen backfill up to the flow line of the pipe or above before pipe is laid.
3. Install the pipe and place additional earthen backfill to the springline of the pipe and compact.
4. Complete bedding with compacted earthen backfill to 12 inches above the top of the pipe.
5. Compact the bedding and backfill to minimum of 95 percent of maximum density per ASTM D698. Maintain moisture within ± 2 percent of optimum.

3.4 UTILITY INSTALLATION

- A. Utility Lines: Provide a minimum cover over the top of the pipe as indicated. Avoid interference with other utilities. Provide class of bedding as shown. Install piping and appurtenances as specified.
- B. Excavation for Appurtenances: Excavate sufficiently for valves, valve boxes, manholes, junction boxes, and similar structures to leave at least 2 feet clear distance between the

outer surfaces and the embankment or timber that may be used to hold and protect the banks.

- C. Over excavation: Any over-depth excavation below appurtenances not directed will be considered unauthorized and will be refilled with concrete or approved foundation material, as directed by the City of Longview. Over excavation shall include over-depth and over-width excavation.

3.5 BACKFILLING

- A. Criteria: Backfill trenches to ground surface with material as specified. Reopen trenches improperly backfilled to depth required for proper compaction. Refill and compact as specified, or otherwise correct the condition in a manner approved by the City of Longview.

- B. Open Areas:

1. Above the pipe zone, Common Fill meeting the requirement of Soil Type S2 in 6 inch lifts. Mound excess material over trench to allow for settlement.
2. All forms, lumber, trash and debris shall be removed from trenches, manholes and other utility structures. Backfill for valves, valve boxes, and other utility structures shall be placed in accordance with applicable specification sections and the drawings.

- C. Pavement Section:

1. Above pipe zone, Select Fill meeting the requirement of Soil Type S3 in 6 inch lifts.
2. Compact to 95% of maximum density within 2% of optimum moisture per ASTM D698.
3. Complete the backfill with aggregate base course and asphalt paving as specified and detailed.

3.6 DISPOSAL OF EXCESS MATERIAL

- A. Remove waste and excess excavated material from the construction site before final inspection. Legally dispose of material at a licensed site or with written and notarized permission from the property owner for a private disposal site. All costs associated with waste material removal and disposal shall be paid for by the Contractor.

END OF SECTION

SECTION 31 23 03 - EXCAVATION, EMBANKMENT AND COMPACTING FOR ROADWAYS AND CHANNELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavating, embankment and compaction of roadways, channels and/or special excavation of the required material in the areas shown on the Plans and cross sections to the lines, grades and typical sections as specified, and the disposal of excess excavated material.
- B. Excavation shall be performed meeting the requirements of TxDOT Item 110 unless otherwise specified within this section.
- C. Embankment shall be performed meeting the requirements of TxDOT Item 132 unless otherwise specified within this section.
- D. Sprinkling shall be performed meeting the requirements of TxDOT Item 204 unless otherwise specified within this section.
- E. Rolling (Tamping, Pneumatic Tire, Heavy Pneumatic Tire and Vibratory) shall be performed meeting the requirements of TxDOT Items 211, 213, 214, and 217 respectively unless otherwise specified within this section.
- F. Rolling (Proof) shall be performed meeting the requirements of TxDOT Items 216 unless otherwise specified within this section.

1.2 RELATED SECTIONS

- A. Section 31 05 13 – Soil Materials
- B. Section 31 05 16 – Aggregate Materials

1.3 REFERENCES

- A. Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges, 2014 Edition.
- B. ASTM C33 - Coarse Aggregates.
- C. ASTM D698 - Moisture-Density Relations of Soils (Standard.)
- D. ASTM D2487 - Classification of Soils for Engineering Purposes.
- E. ASTM D4254 - Minimum Index Density and Unit Weight of Soils and Calculations of Relative Density.
- F. ASTM D4318 - Test for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

1.4 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with TxDOT Item 110 – Excavation.
- B. Perform Work in accordance with TxDOT Item 132 – Embankment.
- C. Perform Work in accordance with TxDOT Item 204 – Sprinkling. For this project, sprinkling shall not be measured or paid separately but shall be considered subsidiary to the various bid items.
- D. Perform Work in accordance with TxDOT Items 211, 213, 214, and 217 – Rolling (Tamping, Pneumatic Tire, Heavy Pneumatic Tire, and Vibratory) respectively. For this project, tamping, pneumatic tire, heavy pneumatic tire, and vibratory rolling shall not be measured or paid separately but shall be considered subsidiary to the various bid items.
- E. Perform Work in accordance with TxDOT Item 216 – Rolling (Proof).

PART 2 PRODUCTS

2.1 MATERIALS

- A. Embankment
 - 1. Embankment provided to establish subgrade lines and grade shall be Type A material per TxDOT Standard Specification Item 132, except for the following:
 - a. The plasticity index shall not be less than 5 nor greater than 15.
 - b. The liquid limit shall not exceed 35.
 - 2. Each layer shall be sprinkled as required and compacted to the extent necessary to provide the density specified of 95% of standard proctor density per ASTM D-698.
 - 3. All Roadway and Channel Embankment shall be Density Control as called for in TxDOT Item 132.3.(3).(b)
- B. Sand: Section 31 05 16.2.2.A – Fine Aggregate Type A5 - Sand
- C. Crushed Rock: Section 31 05 16.2.1.D – Coarse Aggregate Type A3-1 – Foundation Material for Unsuitable Subgrade
- D. Coarse-Grained Soils: Section 31 05 13.2.1.B – Soil Type S2 – Common Fill

PART 3 EXECUTION

3.1 DISPOSAL OF EXCESS MATERIAL

EXCAVATION, EMBANKMENT AND
COMPACTING FOR ROADWAYS AND
CHANNELS
STANDARD SPECIFICATIONS

CITY OF LONGVIEW
DEVELOPMENT SERVICES

- A. Excavated materials unsuitable for the backfilling, or in excess of that required for backfilling shall be disposed of by the Contractor at eligible locations.
- B. Desirable topsoil, sod, etc. shall be carefully piled separately in its original position when required.
- C. Excavated materials shall be handled at all times in such a manner as to cause a minimum inconvenience to public travel and to permit safe and convenient access to private and public property adjacent to or along the line of the Work.
- D. In parkways and easements where it is necessary to deposit excavated materials on lawns during the Work, burlap or similar materials shall be placed on the lawn to prevent contact between excavated materials and the lawn.
- E. Suitable excavated materials shall be piled adjacent to the Work to be used for backfilling.
- F. Remove waste and excess excavated material from the construction site before final inspection.
- G. Legally dispose of material at a licensed site or with written and notarized permission from the property owner for a private disposal site.
- H. All cost associated with waste material removal and disposal shall be paid for by the Contractor.

END OF SECTION

SECTION 31 41 33 - TRENCH AND EXCAVATION SAFETY SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for a Trench and Excavation Safety System to be designed and furnished by the Contractor for the safety and health of personnel.
- B. Submission of a written Plan describing the System in detail.

1.2 REFERENCES

- A. 29CFR1926 - Occupational Safety and Health Standards - Excavations, United States Department of Labor, latest edition.
- B. Others - Other applicable Federal, State, and local rules for Trench Construction or excavations.

1.3 REQUIREMENTS

- A. The Contractor shall develop, design, and implement a System.
- B. The Contractor shall bear the sole responsibility for the adequacy of the System.
- C. The requirements of 29CFR1926 shall be the minimum requirements for this Specification and are adopted as a part of this Specification.
- D. Other regulations relating to Trench and Excavation Safety shall also be considered a part of this Specification as if referenced directly.
- E. Should the System require wider trenches than shown, the Contractor shall be responsible for the costs associated with determining adequacy of pipe bedding and class, as well as, purchase and installation of alternate materials.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL

- A. Implement the system in accordance with the written System Plan and conduct affected work in accordance with the same.
- B. The system shall be in use during all phases of construction.

- C. The City of Longview is not responsible for ensuring the Trench and Evacuation Safety System is constructed and utilized in accordance with the Safety Plan.
- D. This shall be the sole responsibility of the Contractor.

3.2 EXISTING STRUCTURES

- A. Where existing buildings, other utilities, streets, highways, or other structures are in close proximity to the trench, adequate protection shall be provided by the use of sheeting and shoring to protect the structure, street, or highway from possible damage.
- B. In the case of utilities, the Contractor may elect to remove the utility provided that the removal and subsequent replacement meets with the approval of the City of Longview, the utility owner, or whoever has jurisdiction of the structure.
- C. In all cases, it shall be the responsibility of the Contractor to protect public and private property and any person or persons who might, as a result of the Contractor's work, be injured.

- 3.3 EXCAVATIONS, TRENCHING, AND SHORING: The Contractor shall include in his bid price and be solely responsible for trench safety provisions meeting the requirements of the United States Department of Labor Occupational Safety and Health Administration, as contained in Subpart P, Part 126 of the Code of Federal Regulations along with all other applicable subparts and regulations not contained therein.

END OF SECTION

SECTION 31 63 29
DRILLED CONCRETE PIERS AND SHAFTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Dry-installed drilled piers.
- B. Related Sections:
 - 1. Division 03 Section "Cast-in-Place Concrete" for general structural and building applications of concrete.

1.3 UNIT PRICES

- A. Unit prices are included in Division 01 Section "Unit Prices."
- B. Basis of Bids: Base bids on indicated number of drilled piers and, for each pier, the design length from top elevation to bottom of shaft.
- C. Basis for Payment: Payment for drilled piers will be made on actual net volume of drilled piers in place and approved. Actual length and shaft diameter may vary, to coincide with elevations where satisfactory bearing strata are encountered. These dimensions may also vary with actual bearing value of bearing strata determined by an independent testing and inspecting agency. Adjustments will be made on net variation of total quantities, based on design dimensions for shafts.
 - 1. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, testing and inspecting, and other items for complete drilled-pier installation.
- D. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed outside dimensions of drilled piers cast against rock. Unit prices for rock excavation include replacement with approved materials.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

- C. Shop Drawings: For concrete reinforcement detailing fabricating, bending, supporting, and placing.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and testing agency.
- B. Welding certificates.
- C. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Steel reinforcement and accessories.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates.
- E. Field quality-control reports.
- F. Other Informational Submittals:
 - 1. Record drawings.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in drilled-pier work.
- B. Testing Agency Qualifications: Qualified according to ASTM C 1077, ASTM D 3740, and ASTM E 329 for testing indicated.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.4, "Structural Welding Code - Reinforcing Steel."
- D. Drilled-Pier Standard: Comply with ACI 336.1 unless modified in this Section.
- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to drilled piers including, but not limited to, the following:
 - a. Review geotechnical report.
 - b. Discuss existing utilities and subsurface conditions.
 - c. Review coordination with temporary controls and protections.
 - d. Owner's safety procedures.

1.7 PROJECT CONDITIONS

- A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.
 - 1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for drilled piers.
- C. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
 - 1. Record and maintain information pertinent to each drilled pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.
- D. Contractor shall schedule and provide time and means for the testing agency to inspect each pier before concreting. This can include down-hole inspection. Safety procedures shall conform to OSHA regulations, Association of Drilled Pier Contractor's Recommended Procedures for the Entry of Drilled Shaft Foundation Excavation and other authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Plain-Steel Wire: ASTM A 82, as drawn.
- D. Deformed-Steel Wire: ASTM A 496.
- E. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain. Cut bars true to length with ends square and free of burrs.

2.2 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II. The following cementitious materials may Supplement the Portland Cement:
 - a. Fly Ash: ASTM C 618, Class C or Class F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregate: ASTM C 33, graded, with a nominal maximum coarse-aggregate size as indicated in the drawing General Notes. Provide aggregate from a single source.
 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M.
- D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 3. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 4. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.3 STEEL CASINGS

- A. Steel Pipe Casings: ASTM A 283/A 283M, Grade C, or ASTM A 36/A 36M, carbon-steel plate, with joints full-penetration welded according to AWS D1.1/D1.1M.

2.4 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 limits as if concrete were exposed to deicing chemicals.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Proportion normal-weight concrete mixture as follows:
 1. Compressive Strength (28 Days): See S-Series Contract Drawings Schedule
 2. Maximum Water-Cementitious Materials Ratio: See S-Series Contract Drawings Schedule
 3. Minimum Slump Range: Capable of maintaining the following slump until completion of placement:
 - a. 4-6inches (100 mm) for dry, uncased drilling method.
 - b. 6-8inches (150 mm) for temporary-casing drilling method.
 4. Air Content: Do not air entrain concrete.

- E. Concrete-mix design adjustments may be considered if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant. Resubmit and obtain approval of proposed changes to concrete-mix proportions.

2.5 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.6 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
 - 2. Do not add water to concrete mix after mixing.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.

3.2 EXCAVATION

- A. Classified Excavation: Excavation is classified as standard excavation, special excavation, and obstruction removal and includes excavation to bearing elevations as follows:
 - 1. Standard excavation includes excavation accomplished with conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size, power, torque, and downthrust necessary for the Work.
 - 2. Special excavation includes excavation that requires special equipment or procedures above or below indicated depth of drilled piers where drilled-pier excavation equipment used in standard excavation, operating at maximum power, torque, and downthrust, cannot advance the shaft.
 - a. Special excavation requires use of special rock augers, core barrels, air tools, blasting, or other methods of hand excavation.
 - b. Earth seams, rock fragments, and voids included in rock excavation area will be considered rock for full volume of shaft from initial contact with rock.
 - 3. Obstructions: Payment for removing unanticipated boulders, concrete, masonry, or other subsurface obstructions that cannot be removed by conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size, power, torque, and downthrust necessary for the Work will be according to Contract provisions for changes in the Work.

- B. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.
- C. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.
 - 1. Excavate bottom of drilled piers to level plane within 1:12 tolerance.
 - 2. Remove water from excavated shafts before concreting.
 - 3. Excavate rock sockets of dimensions indicated.
 - 4. Cut series of grooves about perimeter of shaft to height from bottom of shaft, vertical spacing, and dimensions indicated.
- D. Notify and allow testing and inspecting agency to test and inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by Engineer.
 - 1. Do not excavate shafts deeper than elevations indicated unless approved by Engineer.
 - 2. Payment for additional authorized excavation will be according to Contract provisions for changes in the Work.
- E. End-Bearing Drilled Piers: Probe with auger to a depth below bearing elevation, equal to diameter of the bearing area of drilled pier. Determine whether voids, clay seams, or solution channels exist.
 - 1. Test first three drilled piers and one of every six drilled piers thereafter.
 - 2. Fill auger-probe holes with grout.
- F. Excavate shafts for closely spaced drilled piers and for drilled piers occurring in fragile or sand strata only after adjacent drilled piers are filled with concrete and allowed to set.
- G. Temporary Casings: Install watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.
 - 1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete.
- H. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.
 - 1. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit design and construction proposals to Engineer for review before proceeding.
- I. Inspection: Each drilled pier must be inspected and tested by Owner's testing and inspecting agency before placing concrete.
 - 1. Provide and maintain facilities with equipment required for testing and inspecting excavations. Cooperate with testing and inspecting personnel to expedite the Work.
 - 2. Notify Engineer and testing agency at least six hours before excavations are ready for tests and inspections.

3.3 STEEL REINFORCEMENT

- A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

- B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.
- C. Fabricate and install reinforcing cages symmetrically about axis of shafts in a single unit.
- D. Accurately position, support, and secure reinforcement against displacement during concreting. Maintain minimum cover over reinforcement.
- E. Use templates to set anchor bolts, leveling plates, and other accessories furnished in work of other Sections. Provide blocking and holding devices to maintain required position during final concrete placement.
- F. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.

3.4 CONCRETE PLACEMENT

- A. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by Owner's independent testing and inspecting agency.
 - 1. Construct a construction joint if concrete placement is delayed more than one hour. Level top surface of concrete and insert joint dowel bars. Before placing remainder of concrete, clean surface laitance, roughen, and slush concrete with commercial bonding agent or with sand-cement grout mixed at ratio of 1:1.
- B. Dry Method: Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.
 - 1. Where concrete cannot be directed down shaft without striking reinforcement, place concrete with chutes, tremies, or pumps.
 - 2. Vibrate top 60 inches (1500 mm) of concrete.
- C. Coordinate withdrawal of temporary casings with concrete placement to maintain at least a 60-inch (1500-mm) head of concrete above bottom of casing.
 - 1. Vibrate top 60 inches (1500 mm) of concrete after withdrawal of temporary casing.
- D. Screed concrete at cutoff elevation level and apply scoured, rough finish. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation.
- E. Protect concrete work, according to ACI 301, from frost, freezing, or low temperatures that could cause physical damage or reduced strength.
 - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 2. Do not use calcium chloride, salt, or other mineral-containing antifreeze agents or chemical accelerators.
- F. If hot-weather conditions exist that would seriously impair quality and strength of concrete, place concrete according to ACI 301 to maintain delivered temperature of concrete at no more than 90 deg F (32 deg C).

1. Place concrete immediately on delivery. Keep exposed concrete surfaces and formed shaft extensions moist by fog sprays, wet burlap, or other effective means for a minimum of seven days.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 1. Drilled piers.
 2. Excavation.
 3. Concrete.
 4. Steel reinforcement welding.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Drilled-Pier Tests and Inspections: For each drilled pier, before concrete placement.
 1. Soil Testing: Bottom elevations, bearing capacities, and lengths of drilled piers indicated have been estimated from available soil data. Actual elevations and drilled-pier lengths and bearing capacities will be determined by testing and inspecting agency. Final evaluations and approval of data will be determined by Engineer.
- D. Concrete Tests and Inspections: ASTM C 172 except modified for slump to comply with ASTM C 94/C 94M.
 1. Slump: ASTM C 143/C 143M; one test at point of placement for each compressive-strength test but no fewer than one test for each concrete load.
 2. Concrete Temperature: ASTM C 1064/C 1064M; 1 test hourly when air temperature is 40 deg F (4.4 deg C) and below and 80 deg F (27 deg C) and above, and 1 test for each set of compressive-strength specimens.
 3. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test unless otherwise indicated. Mold and store cylinders for laboratory-cured test specimens unless field-cured test specimens are required.
 4. Compressive-Strength Tests: ASTM C 39; one set for each drilled pier but not more than one set for each truck load. One specimen will be tested at 7 days, 2 specimens will be tested at 28 days, and 1 specimen will be retained in reserve for later testing if required.
 5. If frequency of testing will provide fewer than five strength tests for a given class of concrete, testing will be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 6. If strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
 8. Report test results in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. List Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests in reports of compressive-strength tests.

9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
 10. Additional Tests: Testing and inspecting agency will make additional tests of concrete if test results indicate that slump, compressive strengths, or other requirements have not been met, as directed by Engineer.
 - a. Continuous coring of drilled piers may be required, at Contractor's expense, if temporary casings have not been withdrawn within specified time limits or if observations of placement operations indicate deficient concrete quality, presence of voids, segregation, or other possible defects.
 11. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.
 12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. An excavation, concrete, or a drilled pier will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports for each drilled pier as follows:
1. Actual top and bottom elevations.
 2. Actual drilled-pier diameter at top and bottom.
 3. Top of rock elevation.
 4. Description of soil materials.
 5. Description, location, and dimensions of obstructions.
 6. Final top centerline location and deviations from requirements.
 7. Variation of shaft from plumb.
 8. Shaft excavating method.
 9. Design and tested bearing capacity of bottom.
 10. Depth of rock socket.
 11. Levelness of bottom and adequacy of cleanout.
 12. Ground-water conditions and water-infiltration rate, depth, and pumping.
 13. Description, purpose, length, wall thickness, diameter, tip, and top and bottom elevations of temporary casings. Include anchorage and sealing methods used and condition and weather tightness of splices if any.
 14. Description of soil or water movement, sidewall stability, loss of ground, and means of control.
 15. Date and time of starting and completing excavation.
 16. Inspection report.
 17. Condition of reinforcing steel and splices.
 18. Position of reinforcing steel.
 19. Concrete placing method, including elevation of consolidation and delays.
 20. Elevation of concrete during removal of casings.
 21. Locations of construction joints.
 22. Concrete volume.
 23. Concrete testing results.
 24. Remarks, unusual conditions encountered, and deviations from requirements.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

20011 Gregg County Parking Garage and Office

END OF SECTION 316329

SECTION 32 01 00 - PAVEMENT REPAIR

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. The repair and replacement of an open-cut trench pavement section within the confines of an existing roadway pavement section including, but not limited to, asphalt (hot-mix, surface treatment, etc.), brick, concrete, gravel, oil-sand, and unimproved streets and roadways.

1.2 REFERENCES

- A. TxDOT Item 247 – Flexible Base Material
- B. TxDOT Item 300 – Asphalts, Oils, and Emulsions
- C. TxDOT Item 310 – Prime Coat (cutback asphaltic material only)
- D. TxDOT Item 340 – Hot Mix Asphaltic Concrete Pavement
- E. TxDOT Item 360 – Concrete Pavement
- F. TxDOT Item 421 – Portland Cement Concrete
- G. TxDOT Item 433 – Joint Sealant and Fillers
- H. TxDOT Item 536 – Membrane Curing
- I. ACI 301 – Specifications for Structural Concrete
- J. ASTM A615 – Deformed and Plain Billet Steel Bars
- K. ASTM A616 – Rail Steel Deformed and Plain Bars
- L. ASTM C260 – Air-Entraining Admixtures for Concrete
- M. ASTM C494 – Chemical Admixtures for Concrete

1.3 SUBMITTALS

- A. Procedures for Submittals: Section 01 33 00.
- B. Contractor shall certify the asphalt/concrete mixing plant will conform to the requirements of the TxDOT Standard Specifications for Construction of Highways, Streets, and Bridges, 2014 Edition.
- C. Contractor shall submit design mixtures for asphalt/concrete, including additive modifiers, for review and approval at least 30 days before any pavement is placed.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Asphaltic Concrete Material shall be hauled in tight trucks previously cleaned of all dirt and foreign material.
- B. All material shall be delivered and immediately placed or stockpiled. Care shall be taken when stockpiling to prevent contamination of materials.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Asphaltic Concrete shall not be placed when the ambient temperature is below 60 degrees F and is falling.
- B. Asphaltic Concrete may be mixed and placed when the ambient temperature is above 50 degrees F and is rising.
- C. Portland Cement Concrete shall not be placed when the ambient temperature is above 40 degrees F and falling.
- D. Portland Cement Concrete may be placed when the ambient temperature is above 35 degrees F and rising.
- E. Paving materials shall not be placed on wet or frozen subgrade.

PART 2 PRODUCTS

2.1 FLEXIBLE BASE

- A. TxDOT Item 247, Type A, Grade 2.

2.2 PRIME COAT

- A. Asphaltic Materials: TxDOT Item 300, "Asphalts, Oils and Emulsions."
- B. Provide grade MC-30, or as approved by the City of Longview, in accordance with TxDOT Item 310, "Prime Coat."

2.3 TACK COAT

- A. Asphaltic Materials: TxDOT Item 300, "Asphalts, Oils and Emulsions."
- B. Provide grade CRS-H, or as approved by the City of Longview.

2.4 HOT MIX ASPHALTIC CONCRETE SURFACE COURSE:

- A. TxDOT Item 340, Type D.

2.5 REINFORCEMENT

- A. Reinforcing steel shall meet the requirements of ASTM A616, Grade 60 new billet steel bars.

- B. Dowels for expansion joints shall meet the requirements of ASTM A615, Grade 60.

2.6 PORTLAND CEMENT CONCRETE

- A. Use either Type I or Type III, ASTM C-150 concrete.
- B. Concrete mix shall be TxDOT Class P having a minimum cement content of six (6) sacks per cubic yard and compressive strength of 4,400 psi.
- C. Mixing water shall be potable and not detrimental to the concrete.
- D. The concrete shall contain 5 to 7 percent entrained air and shall meet the requirements of ASTM C260.
- E. Do not use chemical admixtures such as water reducing, retarding and accelerating agents unless approved by the City of Longview. If admixtures are approved, they shall meet the requirements of ASTM C494.

PART 3 EXECUTION

3.1 EXTENT OF REPAIR

- A. Roadway/street shall be restored to its original condition or better as depicted on the Plans.
- B. The Contractor shall repair all pavement cuts, unless otherwise noted on the Plans.

3.2 FIELD QUALITY CONTROL

- A. The trench backfill supporting the pavement replacement shall be installed in accordance with Section 31 23 02.
- B. If, in the judgment of the City of Longview, the quality of materials used or the completed installation (including compacted density, surface thickness or surface texture) is questionable, the City of Longview may conduct the appropriate tests to verify the quality of the installation.
 - 1. If the installation does not meet the criteria listed in this section, the material shall be removed and replaced at the expense of the Contractor such that the installation meets the criteria in this section.
 - 2. If the installation does not meet the criteria listed in this section, the tests will be at the expense of the Contractor.

3.3 BARRICADES

- A. The Contractor shall maintain lights and barricades around the work areas until the pavement is ready for traffic.

- B. Control work so as to minimize disruption of normal traffic flow and prevention of access to normal traffic routes.

3.4 GRAVEL, OIL-SAND AND OTHER NON-PERMANENT ROADWAYS

- A. Ensure trench is backfilled in accordance with section 31 23 02.
- B. Place and compact a finished ten (10) inch layer of flexible base material over the ditch as shown on the Drawings for the finished surface of the roadway.
- C. The thickness of each layer before compaction shall not exceed six (6) inches.

3.5 ASPHALTIC CONCRETE ROADWAYS

- A. Ensure trench is backfilled in accordance with section 31 23 02.
- B. Flexible Base Course:
 - 1. Place and compact flexible base course under pavement sections over the ditch within roadways as shown on the Plans.
 - 2. The thickness of each layer before compaction shall not exceed six (6) inches.
- C. Prime Coat:
 - 1. Prime coat shall be applied at a rate of 0.25 gallons per square yard over compacted flexible base and shall be cured for 24 hours minimum.
- D. Tack Coat:
 - 1. Shall be applied to saw-cut edges, adjacent concrete or other appurtenances within the confines of the paved area.
 - 2. Apply at a rate of 0.10 gallons per square yard.
- E. Laying:
 - 1. Shall meet the requirements of TxDOT Item 334, or as approved by the City of Longview.
- F. Compacting:
 - 1. Contractor shall use any equipment deemed necessary.
 - 2. All equipment shall be approved by the City of Longview.
- G. Density:
 - 1. As specified within TxDOT Item 334.
- H. Surface Tests:

1. The finished surface of the replacement asphalt shall be at the same elevation and grade as the original pavement before cutting, or as shown on the Drawings.
2. The completed surface, when tested with a straightedge spanning between the undisturbed saw-cut pavement sections at the adjacent trench walls, shall show no deviation in excess of 1/16 inch per foot from the sawed edge.

I. Construction Joints

1. Place courses as nearly continuously as possible.
 - a. If work is interrupted, cut back the previously-laid material to produce a slightly beveled edge for the full thickness of the course.
 - b. Remove old material which has been cut away and lay the new mix against the fresh cut.
2. When the asphalt is laid against existing or old asphalt, the existing or old asphalt shall be cut to provide a straight smooth joint.
3. Apply tack coat to old asphalt edge as previously described in this specification, prior to laying new material.

3.6 PORTLAND CEMENT CONCRETE PAVEMENT

- A. Ensure trench is backfilled and compacted in accordance with City of Longview standards.
- B. Preparation:
 1. Moisten underlying pavement layer to minimize absorption of water from fresh concrete.
 2. Coat surfaces of manholes, drop inlets, etc. with oil to prevent bond with concrete.
- C. Forming:
 1. If available, use adjacent saw-cut edges of existing concrete pavement as forms to match grade.
 2. Use forming as necessary to contain the placed concrete when saw-cut edges are not available on both sides of the trench (ie. ditch is parallel to and at the edge of the roadway).
 3. Ensure completed edge of concrete matches the line and grade of adjacent roadway, if no grade changes are depicted on the Plans.
 4. Thickness of placed concrete shall match existing pavement.
- D. Reinforcement:
 1. If reinforcement is required, the size and location will be shown on the Plans.

E. Concrete Pavement:

1. Place concrete in accordance with TxDOT Item 360--Concrete Pavement, unless otherwise noted.
2. Place concrete over the ditch within roadways as shown on the Drawings.
3. Ensure reinforcement, inserts, embedded parts, formed joints, etc. are not disturbed during concrete placement.
4. Match pattern of expansion/control joints in existing concrete pavement.
5. Finished surface of concrete shall match the existing pavement.

F. Surface Tests:

1. The finished surface of the replacement concrete shall be at the same elevation and grade as the original pavement before cutting, or as shown on the Plans.
2. The completed surface, when tested with a straightedge spanning between the undisturbed saw-cut pavement section as the adjacent trench walls, shall show no deviation in excess of 1/16 inch per foot from the sawed edge.

END OF SECTION

SECTION 32 13 00 - PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete sidewalks, stair steps, integral curbs, gutters, parking areas, and roads.

1.2 RELATED SECTIONS

- A. Section 01 45 00 - Quality Control
- B. Section 31 23 01 - Excavation, Backfilling and Compacting for Structures.
- C. Section 32 16 00 - Concrete Curb and Gutter.
- D. Section 32 17 23 - Pavement Markings.

1.3 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
- C. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- D. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
- E. ASTM A616 Grade 60 – Reinforcing Steel.
- F. ASTM C33 - Concrete Aggregates.
- G. ASTM C94 - Ready Mix Concrete.
- H. ASTM C150 - Portland Cement
- I. ASTM C260 - Air-Entraining Admixtures for Concrete.
- J. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- K. ASTM C494 - Chemical Admixtures for Concrete.
- L. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

- M. ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- N. Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges (2014).
 - 1. Item 360 – Concrete Pavement.
 - 2. Item 420 – Concrete Structures.
 - 3. Item 421 – Portland Cement Concrete.
 - 4. Item 433 – Joint Sealers and Fillers.
 - 5. Item 437 – Concrete Admixtures.
 - 6. Item 440 – Reinforcing Steel.
 - 7. Item 526 – Membrane Curing.
 - 8. Item 529 – Concrete Curb, Gutter and Combined Curb and Gutter.

1.4 PERFORMANCE REQUIREMENTS

- A. Paving: Designed for parking movement of trucks up to 60,000 lbs.

1.5 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Product Data: Provide data on concrete mix design, joint filler, admixtures, and curing compounds.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301, the City of Longview standard, and TxDOT. Wherever there is a discrepancy between specifications the more stringent one shall be used.
- B. Obtain materials from same source throughout. A change in supplier requires resubmittal and approval by the City of Longview.

1.7 REGULATORY REQUIREMENTS

- A. Conform to TxDOT Item 360 for concrete pavement, Item 529 for curb and gutter, and other applicable TxDOT specifications as related to concrete roads and parking.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.1 FORM MATERIALS

- A. Form Materials: Conform to ACI 301, TxDOT Item 360.4.7 and 420.9, and City of Longview standards.

2.2 REINFORCEMENT

- A. Reinforcing Steel Bar and Wire Fabric: Type specified in City of Longview standards and TxDOT Item 440 and 360.

2.3 CONCRETE MATERIALS

- A. Concrete Materials: As specified in City of Longview standards, TxDOT Items 300, 360, 420, 421, 433, 437, 440, and 526.
- B. Concrete mix design shall not include flyash or other replacements for cement unless approved by the City of Longview.

2.4 CONCRETE MIX - BY PERFORMANCE CRITERIA

- A. Mix concrete in accordance with ACI 304. Deliver concrete in accordance with ASTM C94.
- B. Select proportions for normal weight concrete in accordance with ACI 301 Method 1.
- C. Use accelerating admixtures in cold weather only when approved by City of Longview. Use of admixtures will not relax cold weather placement requirements.
- D. Use calcium chloride only when approved by City of Longview.
- E. Use set retarding admixtures during hot weather only when approved by City of Longview.

2.5 SOURCE QUALITY CONTROL AND TESTS

- A. Section 01 45 00 - Quality Control: Provide mix design for City of Longview's approval.
- B. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of Work.
- C. Tests on cement and aggregates will be performed to ensure conformance with specified requirements.
- D. Test samples in accordance with ACI 301.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify compacted lime stabilized subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.2 SUB-BASE

- A. Sub-base shall be eight (8) inches of mechanically reworked and compacted soils. The top 8 inches shall be lime treated as described in the City of Longview standards.

3.3 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manhole, catch basin, and frames with oil to prevent bond with concrete pavement.
- C. Notify City of Longview minimum 24 hours prior to commencement of concreting operations.

3.4 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.
- D. Form work should be done in accordance with TxDOT Items 360 and 420.

3.5 REINFORCEMENT

- A. Place reinforcement as indicated in Plans.
- B. Interrupt reinforcement at joints as shown on the Plans.
- C. Place dowels and reinforcement to achieve pavement and curb alignment as detailed. Dowels shall be placed straight and level.
- D. Provide doweled joints 18 inches on center at transverse joints and interruptions of concrete, with one end of dowel set in capped sleeve to allow longitudinal movement
- E. Reinforcement should be done in accordance with TxDOT Items 360.7 and 440.

3.6 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301 and as specified in City of Longview standards and TxDOT Item 360.
- B. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.
- C. Place concrete continuously over the full width of the panel and between predetermined construction joints.

3.7 JOINTS

- A. Place expansion and contraction joints as shown in the Plans. Align curb, gutter, and sidewalk joints.
- B. Place joint filler between paving components and building or other appurtenances. Recess top of filler $\frac{1}{4}$ inch for sealant placement.
- C. Provide scored joints at 4-foot intervals, between sidewalks and curbs, and between curbs and pavement.
- D. Provide keyed joints as indicated.

3.8 FINISHING

- A. Roadway Paving: The surface shall be tined and carpet dragged as per TxDOT Item 360 unless otherwise approved by the City of Longview.
- B. Sidewalk Paving: Light broom.
- C. Curbs and Gutters: Light broom.
- D. Direction of Texturing: Perpendicular to pavement direction.
- E. Inclined Vehicular Ramps: Broomed perpendicular to slope.
- F. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.9 JOINT SEALING

- A. Separate pavement from vertical surfaces with $\frac{1}{2}$ inch thick joint filler.
- B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- C. Extend joint filler from bottom of pavement to within $\frac{1}{2}$ inch of finished surface. Complete joint with concrete joint sealer.

3.10 TOLERANCES

- A. Maximum Variation of Surface Flatness: $\frac{1}{4}$ inch in 10 feet.
- B. Maximum Variation From True Position: $\frac{1}{4}$ inch.

3.11 FIELD QUALITY CONTROL

- A. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.
- B. Three concrete test cylinders will be taken for every 100 cu yd or less of each class of concrete placed each day.
- C. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.
- D. One slump test will be taken for each set of test cylinders taken.
- E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.12 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury. Concrete shall be cured in accordance with TxDOT Item 360.11 and 360.12.
- B. Do not permit pedestrian or vehicular traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 32 16 00 - CONCRETE CURB AND GUTTER

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete curb and gutter

1.2 RELATED SECTIONS

- A. Section 01 45 00 – Quality Control

1.3 REFERENCES

- A. Texas Department of Transportation Standard Specifications for Construction of Highways, Streets, and Bridges, 2014 or latest edition.

1.4 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 - Submittals: Procedures for submittals
- B. Product Data: Provide data on concrete mix design, joint filler, admixtures, and curing compounds.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with TxDOT Item 529.

PART 2 PRODUCTS

2.1 CONCRETE

- A. Concrete shall be Portland Cement Concrete as described in the City of Longview standards.
- B. Concrete mix design shall not include fly ash or other replacement material for cement.

2.2 REINFORCING STEEL

- A. All reinforcing steel shall conform to the requirements of TxDOT.
- B. All steel reinforcement shall be accurately placed as shown on the Plans and held in place during progress of concreting by such effective means that it shall not be moved out of true position.
- C. All bars shall be wired at their intersections and at all laps or splices. All bars at splices shall be lapped a minimum of 20 diameters of the bar or 12 in., whichever is greater.

- D. All steel must be free from paint, oil, and all loose scale, rust, dirt, and foreign substances shall be completely removed before using.

2.3 EXPANSION JOINTS

- A. Expansion joints shall conform to the requirements of TxDOT.
- B. Expansion joints shall be constructed of an approved type of expansion joint.
- C. Expansion joints shall be placed in the curb and gutter at 40 ft intervals and at intersection returns and other rigid structures.
- D. Tooled joints shall be placed at 10 ft. intervals or matching abutting sidewalk joints and pavement joints.
- E. Expansion joints shall be laced at all intersections with concrete driveways, curbs, buildings, and other curb and gutters.
- F. All expansion joints shall not be less than ½ inch thick, extending the full depth of the concrete and shall be perpendicular and at right angles to the face of the curb.
- G. All joints shall be placed in strict alignment with concrete paving joints.
- H. All joints through the gutters shall be sealed with silicone sealant unless otherwise specified.

PART 3 EXECUTION

3.1 CONVENTIONALLY FORMED CONCRETE

- A. Forms shall be of wood, metal, or other approved material, of a section satisfactory to the City of Longview, straight, free of warp and of the depth required.
- B. The forms shall be securely staked to line and grade, and maintained in a true position during the placing of concrete.
- C. The concrete shall be placed into the forms and then struck off with a template which is approximately ¼" to ⅜" less than the dimension of the finished curb.
- D. After the concrete has been struck off and after it has become sufficiently set, the surface shall be plastered with a mortar consisting of one part of Portland cement and two parts fine aggregate.
- E. The mortar shall be applied with a template made to conform to the finished curb dimensions as shown on Plans.
- F. Exposed edges shall be rounded by the use of an edging tool to the radius shown on the Plans.
- G. All exposed surfaces shall be brushed to a smooth and uniform surface

- H. The completed work shall be cured for a period of not less than 72 hours by one of the methods specified in TxDOT Item 420.

3.2 EXTRUDED OR SLIPFORMED CONCRETE

- A. The concrete shall be placed with self-propelled equipment approved by the City of Longview.
- B. The line shall be maintained from a guideline set by the Contractor based on the alignment data shown on the Plans. The outline shall strictly to the details shown on the Plans.
- C. The forming tube of the extrusion machine or the form of the slipform machine shall be readily adjustable vertically during the forward motion of the machine to provide required variable heights necessary to conform to the established grade line.
- D. To provide a continual check on the grade, a pointer or gauge shall be attached to the machine in such a manner that a comparison can be made between the extruded or slipform work and the guideline.
- E. Concrete shall be fed into the machine in such a manner and at such consistency that the finished work will present a well-compacted mass with a surface free from voids and honeycomb, and true to the required shape, line and grade.
- F. Any additional surface finishing specified and/or required shall be performed immediately after extrusion or slipforming.
- G. The completed work shall be cured for a period of not less than 72 hours by one of the methods specified in TxDOT Item 420.

END OF SECTION

SECTION 32 17 23 - PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Reflectorized Pavement Markings
- B. Prefabricated Pavement Markings
- C. Raised Pavement Markers

1.2 REFERENCES

- A. Texas Department of Transportation – Standard Specifications for Construction of Highways, Streets and Bridges, 2014 Edition, Item 666 – Reflectorized Pavement Markings.
- B. Texas Department of Transportation – Standard Specifications for Construction of Highways, Streets and Bridges, 2014 Edition, Item 668 – Prefabricated Pavement Markings.
- C. Texas Department of Transportation – Standard Specifications for Construction of Highways, Streets and Bridges, 2014 Edition, Item 672 – Raised Pavement Markers.
- D. Texas Department of Transportation – Standard Specifications for Construction of Highways, Streets and Bridges, 2014 Edition, Item 678 – Pavement Surface Preparation For Markings.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets for marking paint.

1.4 PROJECT CONDITIONS

- A. Environmental Requirements: Do not apply marking paint when weather is foggy or rainy, or ambient pavement temperatures are below 50° F when measured in accordance with Tex-829-B, nor when such conditions are anticipated in subsequent 8 hours.
- B. Protection: Protect adjacent curbs, walks, fences and other items from over spray of marking paint.

PART 2 PRODUCTS

2.1 Pavement Markers:

- A. Type I Thermoplastic Traffic Marking Paint in accordance with TxDOT Item 666.
- B. DMS-8240 Type C Heated-in-Place Pavement Markers in accordance with TxDOT Item 668.

2.2 EQUIPMENT: Must comply with TxDOT Item 666.3.

PART 3 EXECUTION

3.1 PREPARATION

A. Prepare pavement per TxDOT requirements as outlined in Item 666.4.B.

3.2 APPLICATION

A. Install Type I Thermoplastic Traffic Marking Paint per TxDOT requirements as outlined Item 666.4.C.

B. Install DMS-8240 Type C Pavement Markers per manufacturer's instructions and in accordance with the surface condition, moisture, and temperature requirements as outlined in TxDOT Item 668.

3.3 CLEANING: Remove over spray from surfaces other than those requiring marking paint.

END OF SECTION

**SECTION 32 31 19
DECORATIVE METAL FENCES AND GATES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Decorative fences.

1.02 REFERENCE STANDARDS

- A. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- C. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus 2019.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- E. ASTM D523 - Standard Test Method for Specular Gloss 2014 (Reapproved 2018).
- F. ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints 2002 (Reapproved 2017).
- G. ASTM D822/D822M - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings 2013 (Reapproved 2018).
- H. ASTM D1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments 2008, with Editorial Revision (2017).
- I. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates 2021.
- J. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact) 1993 (Reapproved 2019).
- K. ASTM D3359 - Standard Test Method for Rating Adhesion by Tape Test 2017.
- L. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets 2016.
- M. ASTM F2656/F2656M - Standard Test Method for Crash Testing of Vehicle Security Barriers 2020.
- N. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing 2018.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Design Calculations: For high wind load areas, provide calculations for fence panels and accessory selection as well as line post spacing and foundation details. See CLFMI WLG 2445 for line post and spacing guidance.
- D. Shop Drawings:
 - 1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- E. Manufacturer's Installation Instructions: Indicate installation requirements, post foundation anchor bolt templates, and [_____].
- F. Installer's Qualification Statement.
- G. Manufacturer's Warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty for [_____].

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Decorative Metal Fences and Gates:
 - 1. Basis of Design: Ameristar Perimeter Security, USA; [_____]:
www.ameristarfence.com/#sle.
 - a. Type SF1: Echelon II in Majestic
 - b. Type SF2: Wireworks Anti-Climb - Custom as req. to meet height requirements.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FENCES

- A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:
 - 1. Capable of resisting vertical load, horizontal load and infill performance requirements for fence categories defined in ASTM F2408.
- B. Electro-Deposition Coating: Multistage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
 - 1. Total Coating Thickness: 2 mils (0.058 mm), minimum.
 - 2. Color: As selected by Architect from manufacturer's standard range.
 - 3. Coating Performance: Comply with general requirements of ASTM F2408.
 - a. Adhesion: ASTM D3359 (Method B); Class 3B with 90 percent or more of coating remaining in tested area.
 - b. Corrosion Resistance: ASTM B117, ASTM D714 and ASTM D1654; 1/8 inch (15.8 mm) coating loss or medium No.8 blisters after 1,500 hours.
 - c. Impact Resistance: ASTM D2794; 60 inch pounds (6.8 N m).
 - d. Weathering Resistance: ASTM D523, ASTM D822/D822M and ASTM D2244; less than 60 percent loss of gloss.
- C. Steel: ASTM A653/A653M; tensile strength 45,000 psi (310 MPa), minimum.
 - 1. Hot-dip galvanized; ASTM A653/A653M, G60.
 - 2. 62 percent recycled steel, minimum.
- D. Aluminum: ASTM B221.
 - 1. Tubular Pickets, Rails and Posts: 6005-T5 alloy.
 - 2. Extrusions for Posts and Rails (Outer Channel): 6005-T5 alloy.
 - 3. Extrusions for Pickets and Rail (Inner Slide Channels): 6063-T5 alloy.
- E. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.
 - 1. Tamper-proof security bolts.
 - 2. Self-drilling hex-head screws.
- F. Hinges: Finished to match fence components.
 - 1. Brackets: Square.
 - 2. Mounting: Center.
 - 3. Closing: Manual.
- G. Latches: Finished to match fence components.

1. Brackets: Square.
2. Locking: Magnetic.

2.03 HIGH-SECURITY FENCE

- A. Provide fence meeting requirements for Industrial class as defined by ASTM F2408 and capable of resisting impact from specified vehicle weight and speed when tested according to ASTM F2656/F2656M.
- B. Fence and Gate Design: As indicated on drawings.
- C. Type SF1: Ameristar Perimeter Security, USA - Echelon II in Majestic
 1. Materials:
 - a. Aluminum material for fence framework (i.e., tubular pickets, rails and posts) shall conform to the requirements of ASTM B221. The aluminum extrusions for posts and rails shall be Alloy and Temper Designation 6005-T52. The aluminum extrusions for pickets shall be Alloy and Temper Designation 6063-T52.
 - b. The manufactured framework shall be subjected to the Ameristar thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including, as a minimum, a six-stage pretreatment/wash and an electrostatic spray application of a polyester finish. The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.
 - c. Material for fence pickets shall be 1" square x 0.062" thick (.125" wall for Invincible) extruded tubing. The cross-sectional shape of the rails shall conform to the manufacturer's ForeRunner design with outside cross-section dimensions of 1.75" square. The top wall and internal web of the rail shall be 0.070" thick; the sidewalls shall be 0.070" thick for superior vertical load strength. Picket holes in the ForeRunner rail shall be spaced 4.715" o.c., except for Invincible style 6' long, which shall be, spaced 4.98" o.c. Picket retaining rods shall be 0.125" diameter galvanized steel. Fence posts and gate posts shall meet the minimum size requirements of Table 1. High quality PVC grommets shall be supplied to seal all picket-to-rail intersections.
 - d. Bracket to rail attachments shall be made using specially designed one-way tamperproof security nuts with carriage bolt. Bracket to post connections shall be made using self-drilling hex-head screws.
 - e. Aluminum castings shall be used for all rings, post caps, finials, and miscellaneous adornments.
 2. Fabrication:
 - a. Pickets, rails and posts shall be pre-cut to specified lengths. ForeRunner rails shall be pre-punched to accept pickets.
 - b. The rail inner slide shall be fully inserted into the rail outer channel to form the raceway for the internal retaining rod. Grommets shall be inserted into the pre-punched holes in the rails, and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal raceway of the two-part ForeRunner rails. (Note: This can best be accomplished by using an alignment template). Retaining rods shall be inserted into each ForeRunner rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly.
 - c. Completed panels shall be capable of supporting a 300 lb. load (applied at midspan) without permanent deformation. Panels shall be biasable to a 25% change in grade.
 - d. Gates shall be fabricated using 1.75" sq. reinforced ForeRunner rail material, 2" sq. x .250" gate ends, and 1" sq. x .125" pickets. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall be joined by welding.
 3. Color: Black
- D. Type SF2: Ameristar Perimeter Security, USA - Wireworks Anti-Climb
 1. Material:
 - a. Steel material for fence posts and rails shall be galvanized prior to forming in accordance with the requirements of ASTM A653/A653M, with minimum yield strength of 45,000 psi (310 MPa). The steel shall be hot-dip galvanized to meet

the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft, Coating Designation G-90. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

- b. Steel wire mesh fence panels shall be manufactured to meet ASTM F2453. Fence panels shall be pre-galvanized steel wire, welded at each crossing to form rectangles. Standard panel offering shall be 10.5ga. (0.128 inches) vertical wires spaced at 3 inches; horizontal 10.5ga. (0.128 inches) wires shall be spaced at .5 inches. Optional panel offering shall be 8ga. (0.162 inches) vertical wires spaced at 3 inches; horizontal 8ga. (0.162 inches) wires shall be spaced at .5 inches. The cold rolled wire shall have a tensile strength of at least 74,000 psi and 68,000 psi shear strength. Wire strand shall be galvanized before welded (GBW), .50 ounces per square foot zinc coating conforming to the ASTM A641.
 - c. The cross-sectional shape of the rails shall conform to the manufacturer's Impasse II C-rail design, a nominal 2" x 2" x 11 Ga. Tamperproof fasteners shall be used to fasten each wire mesh retaining bracket to rail at intervals not exceeding 18 inches. Posts shall conform to the manufacturer's Impasse II I-Beam design with a nominal 3" x 2.75" x 12 Ga. up to 8-foot height, and 4" x 2.75" x 11 Ga. up to 10-foot height.
2. Fabrication:
- a. Wire mesh panels and posts shall be pre-cut to specified lengths. Panel width shall be no greater than 96" wide.
 - b. The manufactured fence system (i.e., panels, brackets, posts, gates, and hardware) shall be subjected to the PermaCoat® thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils (0.0508mm). The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.
- E. Color: Black.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Set fence posts in accordance with the manufacturer recommended spacing.
- C. When cutting rails immediately seal the exposed surfaces by:
 1. Removing metal shavings from cut area.
 2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
 3. Apply two coats of custom finish spray paint matching fence color.
 4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.
- D. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
 1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.
 2. Identify the necessary hardware required for the application on the manufacturer's gate drawings.
 3. Provide gate hardware by the manufacturer of the gate and install in compliance with manufacturer's recommendations.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6.3 mm).
- B. Maximum Offset From Indicated Position: 1 inch (25.4 mm).
- C. Minimum Distance from Property Line: 6 inches (152 mm).

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.
- C. Gates: Inspect for level, plumb, and alignment.
- D. Workmanship: Verify neat installation free of defects.

3.06 CLEANING

- A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.
- B. Clean fence with mild household detergent and clean water rinse well.

3.07 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstrate proper operation of equipment to Owner's designated representative.
- D. Demonstration: Demonstrate operation of system to Owner's personnel.
 - 1. Use operation and maintenance data as reference during demonstration.
 - 2. Briefly describe function, operation, and maintenance of each component.
- E. Training: Train Owner's personnel on operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.

3.08 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 33 05 13 - MANHOLES AND COVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Modular precast concrete manhole sections with tongue-and-groove joints, covers, anchorage, and accessories.

1.2 REFERENCES

- A. ASTM A48 - Gray Iron Castings.
- B. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
- C. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

1.3 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Shop Drawings: Indicate manhole locations, elevations, piping, sizes and elevations of penetrations.
- C. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE MANHOLE

- A. MATERIALS: Manhole Sections: Reinforced precast in accordance with ASTM C478 with gaskets in accordance with ASTM C923.
- B. COMPONENTS
 - 1. Lid and Frame:
 - a. ASTM A48, Class 30B Cast iron construction, machined flat bearing surface, removable. Provide and install bolted, watertight lid when manholes are located within the 100-year floodplain or at locations required by the City of Longview.

- b. Lid design; live load rating of 20,000 psi, sealing gasket, molded with "SANITARY SEWER", or "STORM SEWER" depending the application for the lid.
 - c. Sanitary Sewer lids shall have a minimum of 30-in diameter opening.
 - d. Storm Sewer lids shall have a minimum of 24-in diameter opening.
 - e. The ring and lid shall weigh a minimum of 210 pounds.
 - f. Manufacturer: East Jordan Iron Works, Inc., Model V-1420/1430 or City of Longview approved equal.
 - g. Manhole rings and covers shall be watertight when within the 100-yr floodplain.
 - h. Bitumastic tape continuous at the exterior of the top of the cone to create a watertight seal at manhole ring and grade adjustment ring(s).
- 2. Base pads shall be precast in accordance with ASTM C478.
 - 3. Bituminous or non-shrink grout forming a watertight seal.
 - 4. Resilient Connectors: A-Lock X-Cel or City of Longview approved equal in accordance with ASTM C-923.

C. CONFIGURATION

- 1. Shaft Construction:
 - a. Concentric with concentric top section as shown on the drawings; lipped male/female joints; sleeved to receive pipe sections.
 - b. Joints shall be sealed with compression seal.
 - c. Seal shall be Forsheda No. 114 or City of Longview approved equal.
- 2. Shape: Cylindrical.
- 3. Clear Inside Dimensions:
 - a. Minimum inside diameter of 48 inches for standard manhole sections or as otherwise required.
 - b. For manhole section other than standard, the minimum inside diameter shall be as indicated on the Drawings.
- 4. Design Depth: As indicated.
- 5. Clear Lid Opening: Minimum 30 inches in diameter sanitary sewer and 24-in for storm sewer or larger as required by the City of Longview.

6. Pipe Entry: Provide openings as indicated or required.
7. Pipe Connections: Resilient connections cast into the wall of the precast base.
8. Manhole Inverts:
 - a. Grout inverts after pipes are in place.
 - b. Bench sides as required.
 - c. Slope for drainage.
 - d. Inverts shall meet the requirements of 30 TAC 217.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Verify excavation for manholes is correct.

3.2 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.3 PLACING MANHOLE SECTIONS

- A. Excavate to a uniform depth to permit the installation of a minimum of 12 inches of gravel material for base pad subgrade.
- B. Adjust elevation of gravel material as required to attain proper grade and alignment of the base section.
- C. Place base pad, set top surface level. Place manhole in accordance with manufacturer's recommendations.
- D. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.
- E. Cutouts in the bottom sections shall be appropriate for the pipe being laid and shall have identifying markings to facilitate their being used in the correct locations.
- F. The connecting pipe for concrete manhole installation with resilient connectors shall be plain end, square cut, spigots, which shall not protrude more than one inch inside the manhole.
- G. Stubs for future connections shall be provided at locations shown. Stubs shall be a minimum of one pipe joint long (13 feet) and terminate in a bell with a plug at the distal end.

- H. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.
- I. Set cover frames and covers level without tipping, to correct elevations.
- J. Coordinate with other sections of work to provide correct size, shape, and location.
- K. Manhole height shall be adjusted by using variable height risers set at the lowest section below natural grade.

3.4 INVERTS

- A. The bottom of each manhole shall be provided with a "U" shaped channel that is a smooth continuation of the inlet and outlet pipes. In manholes with pipes of different sizes, the tops of the pipes shall be placed at the same elevation, unless otherwise shown on the drawings, and flow channels in the invert sloped on an even slope from pipe to pipe.
- B. The surface of the concrete slab shaped to form the invert shall be sloped upward from the edge of the invert to the manhole wall.
 - 1. The upper half of any pipe extending inside the manhole shall be cut substantially flush with the wall.
 - 2. Any rough edge shall be smoothed with mortar.
- C. Mortar used in manholes shall be mixed in the proportions by volume of 1 part cement to 4 parts sand. Mortar shall have a workable consistency, but shall be as dry as feasible.
- D. The centerline projection of all pipes shall pass through the centerline of the manhole.

3.5 CONNECTION TO EXISTING MANHOLES

- A. Connection to existing manholes shall not be made until all downstream manholes and sewer lines have been completed, cleaned, tested, and inspected in accordance with the Specification. The City of Longview must grant approval prior to connection to existing manholes.
- B. Connections to existing manholes shall be made by cutting a hole in the wall of the existing manhole, shaping the bottom of the manhole to fit the invert of the connections, inserting a length of sewer pipe through the opening and filling around the pipe with cement mortar and troweling the cement mortar inside and outside the manhole to a neat finish.
 - 1. When necessary to satisfactorily perform the work, the flow of sewage shall be blocked at a time of minimum flow.
 - 2. If necessary to prevent flow back up in the line to the extent that the damage would occur, the Contractor shall maintain the flow level with a trench pump section inserted in the line or in the next upstream manhole.

3. Discharge shall be made into an appropriate manhole downstream of the construction.
4. Connections to manholes, mains, and house services shall be made in a thoroughly workmanlike manner to the satisfaction of the City of Longview.
5. All bypass pumping shall be considered subsidiary to the construction of the connection and shall be provided by the Contractor at no additional expense to the Owner.

3.6 CONNECTION TO EXISTING GRAVITY SEWER MAINS

- A. Connection to existing gravity sewer mains shall not be made until all downstream manhole and sewer lines have been completed, cleaned, tested, and inspected in accordance with the Specifications. The City of Longview must grant approval prior to connection to existing gravity sewer mains.
- B. Contractor shall carefully excavate around existing gravity sewer main and construct manhole base so as not to disrupt service of existing main. Contractor shall take all precautions and actions necessary to protect existing main.
- C. Connections to existing main shall be made by excavating around the main constructing the manhole to fit the existing main and the proposed effluent line.
 1. Once the manhole has been properly constructed, cut the existing main, plug the existing main effluent and direct the flow through the new main.
 2. When necessary to satisfactorily perform the work, the flow of sewage shall be blocked at a time of minimum flow.
 3. If necessary to prevent flow backup in the line to the extent that damage would occur, the Contractor shall maintain the flow level with a trench pump inserted in the line or the upstream manhole.
 4. Discharge shall be made into an appropriate manhole downstream of construction.
 5. All bypass pumping shall be considered subsidiary to the construction of connection to existing sewer mains and shall be provided by the Contractor at no additional expense to the Owner.

3.7 MANHOLES TO BE ABANDONED

- A. Manholes indicated on the Plans to be abandoned shall be abandoned in accordance with these Specifications and the details of the Plans.
- B. Manholes shall not be abandoned until the new interceptor has been completed, tested, inspected and approved by the City of Longview.

- C. The Contractor shall plug existing influent and effluent mains, fill lower section to 3' below natural ground with sand, then backfill the remainder of the manhole with accepted trench backfill material.
 - 1. Backfill material shall be placed in 8" lifts and compacted to 90% standard proctor or 95% standard proctor when in a pavement section.
 - 2. The manhole cone and riser shall be removed to an elevation of 3' below natural ground and then properly disposed of off-site.

3.8 MAHHOLE ACCESS

- A. Entrance into manholes in excess of four feet deep shall be accomplished by means of a portable ladder.
- B. Contractor shall provide such ladder as necessary during construction.
- C. Comply with appropriate OSHA requirements.

3.9 TESTING

- A. Manholes shall be tested for leakage separately and independently of the wastewater lines by hydrostatic exfiltration testing, vacuum testing, or other approved method.
- B. The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot diameter per foot of manhole depth per hour. Alternate test methods must ensure compliance with the above allowable leakage.
- C. Hydrostatic exfiltration testing shall be accomplished by sealing all wastewater lines coming into the manhole with an internal pipe plug.
 - 1. The manhole shall then be filled with water and maintained for at least one hour.
 - 2. For concrete manholes a wetting period of 24 hours may be used prior to testing in order to allow saturation of the concrete.
- D. Vacuum testing:
 - 1. Preparation of the Manhole.
 - a. All lift holes shall be plugged.
 - b. All pipes entering the manhole shall be temporally plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.
 - 2. Procedure.
 - a. The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.

- b. A vacuum of 10 in. of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 in. of mercury.
- c. The manhole shall pass if the time for the vacuum reading to drop from 10 in. of mercury to 9 in. of mercury meets or exceeds the values indicated in Table 1.
- d. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test is obtained.

3. Minimum Test Times for Various Diameter Manholes.

| <u>Depth (ft.)</u> | <u>Diameter (in.)</u> | | |
|--------------------|-----------------------|-----------|-----------|
| | <u>48 Time (sec.)</u> | <u>60</u> | <u>72</u> |
| 8 | 20 | 26 | 33 |
| 10 | 25 | 33 | 41 |
| 12 | 30 | 39 | 49 |
| 14 | 35 | 46 | 57 |
| 16 | 40 | 52 | 67 |
| 18 | 45 | 59 | 73 |
| 20 | 50 | 65 | 81 |
| 22 | 55 | 72 | 89 |
| 24 | 59 | 78 | 97 |

- 4. For manholes less than 8 ft. in depth, the minimum value listed shall be used. For other manhole diameters or greater depths, refer to ASTM C1244.
- E. If a manhole fails a leakage test, the manhole must be made watertight and retested at the Contractor's expense.
- F. Testing must meet the requirements of 30 TAC 217.58.

END OF SECTION

SECTION 33 11 00 - WATER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe and fittings for water lines including supply lines and potable water distribution lines.
- B. Fire hydrants, fittings, and appurtenances.

1.2 RELATED SECTIONS

- A. Section 01 33 00 – Submittals.
- B. Section 01 45 00 – Quality Control.
- D. Section 31 05 13 – Soil Materials.
- E. Section 31 05 16 – Aggregate Materials.
- F. Section 31 23 02 – Excavation, Backfill, and Compaction for Utilities.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A126 – Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - 2. ASTM A307 – Specification for Carbon Steel Bolts and Studs 60,000 psi Tensile.
 - 3. ASTM A536 – Ductile Iron Castings.
 - 4. ASTM B88 – Seamless Copper Water Tube.
 - 5. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - 6. ASTM D1784 – Standard Specification for Rigid PVC Compounds and Chlorinated PVE Compounds.
 - 7. ASTM D1785 – Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - 8. ASTM D2241 – Standard Specifications for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 - 9. ASTM D2464 – Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80.

10. ASTM D2466 – Standard Specifications for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 (SDR Series).
 11. ASTM D2467 – Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80.
 12. ASTM D2837 – Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
 13. ASTM D2855 – Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.
 14. ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 15. ASTM D3017 – Standard Test Methods for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 16. ASTM D3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
 17. ASTM F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 18. ASTM D3261 – Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Pipe and Tubing
 19. ASTM D 3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
- B. American Water Works Association (AWWA)
1. AWWA C104 – Cement Mortar Lining for Ductile-Iron Pipe and Fittings
 2. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems
 3. AWWA C110 – Ductile-Iron and Gray-Iron Fittings
 4. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 5. AWWA C115 – Flanged Ductile-Iron Pipe with Ductile-Iron or Gray Iron Threaded Flanges
 6. AWWA C116 – Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
 7. AWWA C150 – Thickness Design of Ductile-Iron Pipe
 8. AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast
 9. AWWA C153 – Ductile-Iron Compact Fittings for Water Service
 10. AWWA C502 – Dry-Barrel Fire Hydrants
 11. AWWA C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances

12. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
13. AWWA C800 – Underground Service Line Valves and Fittings
14. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inches through 12 inches, for Water Transmission and Distribution
15. AWWA C901 – Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, ½ inch through 3 inches for Water Service
16. AWWA C905 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inches through 48 inches, for Water Transmission and Distribution
17. AWWA C906 – Polyethylene (PE) Pressure Pipe and Fitting, 4 inches through 63 inches for Water Distribution and Transmission
18. AWWA C909 – Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 inches through 24 inches, For Water Distribution

C. National Sanitation Foundation (NSF)

1. NSF14 – Plastic Piping System Components and Related Materials.
2. NSF61 – Drinking Water System Components – Health Effects.

D. American National Standards Institute (ANSI).

1. ANSI B16.9 – Fittings.
2. ANSI B36.19 – Wall Thickness.
3. ANSI A21.11/AWWA C111 – Mechanical Joints.
4. ANSI B16.1 – Flanges and Flanged Fittings.

E. Texas Administrative Code, Volume 30, Chapter 290, Water Hygiene.

1.4 SUBMITTALS

Submit in accordance with Section 01 33 00 – Submittals.

- A. Product data sheets on all materials used in the project.

1.5 QUALITY ASSURANCE

- A. Pipeline installation shall be in accordance with manufacturer's recommendations and as supplemented by these specifications.
- B. Pipe shall be kept clean of all foreign matter.
- C. Jointing shall be by trained employees.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Each load of pipe delivered to the job site shall be inspected by the City of Longview.
- B. Pipe transported without adequate protection shall be rejected and removed immediately from the job site.
- C. If requested by the City of Longview, randomly selected samples of the pipe shall be forwarded immediately to an approved testing laboratory with instructions to check the pipe for compliance with applicable product standards, ASTM Specifications, and other applicable specifications.
- D. If the testing laboratory reports concur that the pipe does not meet specifications, the defective pipe shall be removed immediately from the job site by the Contractor.
- E. If the pipe is defective, all costs for shipping of samples, laboratory testing, removal of defective pipe, and replacement pipe shall be the sole responsibility of the Contractor. If the pipe is not defective, the Owner shall pay for shipping of samples, laboratory testing, and replacement of samples.

PART 2 PRODUCTS

2.1 PIPE

- A. Ductile Iron Water Pipe
 - 1. All ductile iron water pipe shall be in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.
 - 2. Ductile iron water pipe shall be at least Pressure Class 250.
 - 3. All pipes shall bear the NSF Seal of Approval.
 - 4. Interior surfaces shall be cement lined per AWWA C104.
 - 5. Exterior surfaces shall be coated with bituminous coating per AWWA C110.
 - 6. Pipe shall be free from excessive pits, scars, or other surface defects.
 - 7. Joints shall be integral bell with flexible elastomeric seal per AWWA C111.
 - 8. Install pipe as specified in AWWA C600.
 - 9. All ductile iron pipe, fittings, and appurtenances shall be wrapped in eight mil polyethylene and tape encasement per AWWA C105.
 - 10. Pre-approved Manufacturers
 - a. American Cast Iron Pipe Co.

- b. U.S. Pipe.
- c. Griffin.
- d. City of Longview Approved Product List.

B. PVC Water Pipe

1. AWWA C900 and AWWA C905 pipe four inches and larger in diameter shall be DR 18 pressure class 235.
2. AWWA C909 pipe shall be pressure class 235.
3. Pipe less than four inches in diameter shall be Type 1, Grade 1, Polyvinyl Chloride, Schedule 40 pipe conforming to ASTM D1785.
4. Blue pipe shall be supplied unless otherwise agreed upon at time of purchase.
5. All pipe shall bear the NSF seal of approval.
6. For pipe two inches and larger in diameter, the joints shall be integral bell with a flexible elastomeric seal. For pipe smaller than two inches in diameter, joints shall be glued.
7. Pipe shall be free of excessive pits, scars, or other surface defects
8. Joints shall be integral bell with flexible elastomeric seal per AWWA standards
9. Install pipe as specified in AWWA C605
10. Pre-approved Manufacturers for AWWA C900 and C905 pipe
 - a. Certainteed.
 - b. Napco.
 - c. JM/PW Eagle
 - d. Diamond Pipe Co.
 - e. Pipelife Jet Stream, Inc.
 - f. City of Longview Approved Product List.
11. Pre-approved Manufacturer for AWWA C909 Pipe
 - a. JM/PW Eagle
 - b. City of Longview Approved Product List.

C. Restrained Joint PVC Water Pipe

1. Pipe shall be DR 18 pressure class 235.
2. All pipe shall bear the NSF seal of approval.
3. The restrained joint pipe system shall meet all short and long term pressure test requirements of AWWA C900 and C905.
4. Pipe and coupling shall be made from unplasticized PVC compounds having a minimum cell classification of 12454-B as defined in ASTM D1784.
5. The compound shall qualify for a Hydrostatic Design Base of 4000 psi of water at 73.4° F in accordance with the requirements of ASTM D2837.
6. Blue pipe shall be supplied unless otherwise agreed upon at time of purchase.
7. Restrained joint PVC pipe products shall have been tested and approved by an independent third-party laboratory for continuous use at rated pressures.
 - a. Copies of agency approval reports or product listing shall be provided to the City of Longview if requested.
 - b. Products intended for contact with potable water shall be evaluated, tested, and certified for conformance with NSF Standard 61 or the health effects portion of NSF Standard 14 by an acceptable certifying organization when required by the regulatory authority having jurisdiction.
8. Pipe shall be joined using non-metallic couplings which, together, have been designed as an integral system for maximum reliability and interchangeability.
 - a. High-strength flexible thermoplastic splines shall be inserted into mating precision-machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading.
 - b. MJ Gland Adapters shall be used to anchor this restrained-joint PVC pipe to ductile iron accessories such as fittings and valves.
 - c. Couplings shall be designed for use at the rated pressures of the pipe with which they are utilized and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477.
 - d. Joints shall be designed to meet the leakage test requirements of ASTM D3139.
9. Install pipe as specified in AWWA C605
10. Pre-approved Manufacturer for Restrained Joint PVC Water Pipe
 - a. Certainteed – Certa-Lok.
 - b. City of Longview Approved Product List.

2.2 FIRE HYDRANTS

- A. Hydrants shall conform to AWWA C502, the following specifications and shall be compression type. Construction of the hydrants shall be in accordance with the following:
1. The minimum working pressure shall be 150 psi.
 2. The size of the valve opening shall be a minimum of 5¼ inches.
 3. The diameter of the inlet connection shall be six inches.
 4. The inlet connection shall be mechanical joint with follower gland, gland bolts, and accessories.
 - a. Nozzles shall be 2 – 2½” w/NST Threads & 1 – 4½” pumper w/NST Threads.
 - b. Nozzles shall be “threaded” style and not “leaded” style.
 5. Finish shall be one coat of primer and two coats of enamel. Hydrant color shall match the Owner’s standard.
 6. Hydrant assembly shall include extensions as required to bring the hydrant to the manufacturer’s recommended level above grade.
 7. The direction to open shall be counterclockwise.
- B. Manufacturer
1. American Flow Control – American Darling B84B
 2. Mueller – A-423 Super Centurion.
 3. Clow – Medallion.
 4. City of Longview Approved Product List.

2.3 FITTINGS

- A. Fittings (two inches and larger in diameter)
1. Fittings shall be ductile iron according to AWWA C110 (full body) /AWWA C153 (compact) for fittings 2 inches in diameter and larger.
 2. Interior surfaces shall be cement lined in conformance with AWWA C104.
 3. Exterior surfaces shall be bituminous coated in accordance with AWWA C110.
 4. Fittings shall have mechanical joints with retainer glands and concrete thrust restraint unless otherwise specified or shown.

5. Any of the following are acceptable types and manufacturers of thrust restraining devices for the pipe types listed unless otherwise specified or shown on the plans. The method for thrust restraining all joints shall have a working pressure rating equal to or exceeding the pressure rating of the fitting which it restrains. The use of thrust restraining devices shall be at the direction of the City of Longview.
 - a. Multiple Gripping Wedges
 - 1) Follower glands utilizing multiple gripping wedges shall utilize torque limiting twist off nuts.
 - 2) Pre-Approved Manufacturer
 - (a) For use on ductile iron pipe, AWWA C900 PVC pipe, and C909 PVC pipe - Star Pipe, Smith Blair Cam-lock, Ford Uniflange, and Ebaa Iron Megalug.
 - b. Full Circle Gripping Ring
 - 1) Pre-Approved Manufacturer
 - (a) For use on ductile iron pipe, AWWA C900 PVC pipe, and C909 PVC pipe – Midco Perma-Grip by Midland Mfg. Co.
6. Fittings shall be rated for a working pressure of 350 psi.

B. Fittings (smaller than two inches in diameter)

Fittings for pipe smaller than two inches in diameter shall be in accordance with ASTM D2466.

2.4 COUPLINGS

- A. Supply couplings with a steel center band, steel gland rings, gaskets, and bolts.
- B. Couplings shall be rated for 1.25 times the maximum operating pressure of the line to be connected.
- C. All couplings near bends, fittings, or valves shall be restrained with a City of Longview approved mechanical restraint system.
- D. Pre-approved Manufacturers
 1. Dresser Industries.
 2. Smith-Blair.
 3. City of Longview Approved Product List.

2.5 BOLTS AND GASKETS

- A. Gaskets shall be 1/16-inch cloth insert, red rubber, full face.
- B. Bolts shall be in accordance with the following:
 - 1. Non-Pressure Applications: ASTM A307A with hot dipped galvanized finish
 - 2. Pressure Applications: ASTM A307B with hot dipped galvanized finish
 - 3. Submerged/Splashed (Pressure or Non-Pressure): 316 stainless steel

2.6 PIPE SUPPORTS

- A. Install adjustable pipe supports manufactured by Grinnell Inc. or City of Longview approved equal as shown on the plans.

2.7 TAPPING SLEEVES

- A. Sleeves shall be designed for a working pressure of at least 150 psi and furnished with a brass or stainless steel test plug through the body for hydrostatic pressure testing.
- B. The outlet shall conform to ANSI B16.1, Class 125 flanges designed to accept tapping valves.
- C. Sleeves shall be designed to properly fit the type and class of pipe on which they will be used. Sleeves may be cast iron, ductile iron, or welded steel.
- D. Tapping sleeves, unless otherwise specified, shall be stainless steel or epoxy coated with stainless steel nuts and bolts.
- E. Sleeves which are designed in such a manner that the watertight seal around the outlet is achieved by a gasket placed between the sleeve body and the pipe barrel shall be provided with a recess in the sleeve body to accommodate the gasket.
- F. Pre-approved Manufacturers
 - 1. Smith Blair
 - 2. JCM
 - 3. Ford
 - 4. City of Longview Approved Product List.

2.8 SERVICE LINES

- A. Water service lines shall be C901 polyethylene (HDPE) with integral tracer wire unless otherwise specified or shown.
- B. The water service lines shall be sized to match existing services with a minimum line size of one inch.
- C. Pre-approved Manufacturers for HPDE Service Lines

1. Endot Industries – Endotrace
 2. City of Longview Approved Product List
- D. Service Saddles
1. Service saddles to be installed on lines up to four inches shall be single stainless steel strap with NPT tap. Service saddles to be installed on lines over four inches shall be double stainless steel strap with NPT tap. Saddle body shall be ductile iron with epoxy coating.
 2. Pre-approved Manufacturers
 - a. Smith Blair.
 - b. City of Longview Approved Product List.
- E. Pre-approved Manufacturers for Curb Stops
1. Ford.
 2. Mueller.
 3. A.W. McDonald Mfg. Co.
 4. City of Longview Approved Product List.
- F. Corporation Stops
1. Corporation stops shall be bronze with tapered plug and flat key operator. Stops shall have iron pipe threads on inlets and outlets.
 2. Pre-approved Manufacturers
 - a. Ford.
 - b. Mueller.
 - c. A.W. McDonald Mfg. Co.
 - d. City of Longview Approved Product List.
- G. Meter Boxes
1. Meter boxes for 1" and 5/8" water meters in driveways, sidewalks, or pavement shall be Hubbell Power Systems, Inc. A221118501050 or City of Longview approved equal. Meter boxes shall be provided with one 2" touch read hole and mouse holes on centered on each end.
 2. Meter boxes for 1-1/2" and 2" water meters in driveways, sidewalks, or pavement shall be Hubbell Power Systems, Inc. A281730507050 or City of Longview

approved equal. Meter boxes shall be provided with one 2" touch read hole and mouse holes on centered on each end.

3. Meter boxes outside of driveways, sidewalks, or pavement shall be NDS part number D15AMR2-OLLOC or City of Longview approved equal. Meter boxes shall be provided with mouse holes on centered on each end.

2.10 BACK FLOW PREVENTERS

- A. Backflow preventers shall be of the reduced pressure principle type compliant with all provisions of AWWA C511.

2.11 TRACER WIRE FOR PLASTIC PIPE

- A. A continuous THHN 14 solid insulated copper wire shall be installed along with all PVC/HDPE water mains/service lines to assist in locating the line following installation.

PART 3 EXECUTION

3.1 PREPARATION

- A. Do not lay pipe in water or when trench or weather is unsuitable for work. Keep water out of trench until jointing is complete and bedding and backfill are placed to the top of the pipe. When work is not in progress, close the ends of the pipe and fittings securely so that no trench water, earth, or other substances will enter pipe or fittings.
- B. Keep the inside of the pipe free from foreign matter during operations by plugging or other approved method.
- C. Place pipe so that the full length of each section rests solidly upon pipe bedding with recesses excavated to accommodate joints. Take up and re-lay pipe when grade or joint is disturbed after laying.
- D. Handle pipe and accessories so that pipe placed in the trench is sound and undamaged. Take particular care not to injure pipe coating when applicable.
- E. Cut neatly using approved type mechanical cutter without damaging pipe. Use wheel cutters when possible.
- F. Install in locations shown using hangers, brackets, supports, etc. at spacings as recommended by the pipe manufacturer.
- G. Field cutting of stainless steel pipe will not be allowed.

3.2 PIPE BEDDING AND BACKFILL – SEE SECTION 31 23 02

3.3 PLACING AND LAYING

- A. Bury/Bore water lines as shown.
- B. Intersecting lines shall be joined by an appropriate fitting.

3.4 JOINTS

- A. Install mechanical joints in accordance with the manufacturer's recommendations.
- B. Make push-on joints in accordance with the manufacturer's recommendations.
- C. Install solvent weld joints in accordance with ASTM D2855.
- D. Joint lubricant shall be as recommended by the pipe manufacturer.
- E. Install joints in the field by cleaning all joint surfaces and gaskets with soapy water, tighten bolts alternately, evenly and to the specified torques. Extension wrenches shall not be used to secure greater leverage.
- F. Anchor tees, bends and plugged, valved or capped ends of pipe with concrete thrust blocks as necessary and as shown. Place blocks so that the pipe and fitting joints will be accessible for inspection and repair.
- G. Water lines shall not be laid within nine feet of sanitary sewer lines. When this separation distance can not be achieved, the water and sewer lines shall be made to comply with 30 TAC Chapters 290 and 217.

3.5 TESTING

A. Hydrostatic Testing

- 1. Perform testing in accordance with AWWA C600/AWWA C605
- 2. Test pressure shall be 150 psi (1.5 times the working pressure of 100 psi).
- 3. Pipeline fill rate shall not exceed 1,000 gpm.
- 4. Hydrostatic test shall be at least 2 hours in duration. During tests, test pressures shall not vary by more than +/- 5 psi (95 to 105 psi)
- 5. Test pressure shall be maintained within the tolerance by adding makeup water into the pipeline. The amount of makeup water added shall be accurately measured and shall not exceed the testing allowance. No pipe installation will be accepted if the quantity of makeup water is greater than that determined by the testing allowance
- 6. Testing allowance:

$$L = \frac{S \times D \times VP}{148,000}$$

Where:

L = testing allowance (makeup water), in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during hydrostatic test, in psi

END OF SECTION

SECTION 33 12 16 - VALVES AND COUPLINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section includes all material, labor and other items necessary to furnish, install, and test, all pipe, pipe supports, anchors, fittings, valves, specials as shown and specified, and the installation of in-line equipment and appurtenances furnished by others, for process piping systems, and plumbing piping systems.

1.2 RELATED SECTIONS

- A. Section 01 33 00 – Submittals.
- B. Section 01 45 00 – Quality Control.
- C. Section 33 11 00 – Water System.

1.3 SUBMITTALS

- A. Procedures for Submittals: Section 01 33 00.
- B. The Contractor shall submit shop drawings of all fabricated piping and shall submit shop drawings and/or manufacturer's literature for all valves, gauges, and miscellaneous appurtenances, for review prior to ordering or installing any item.
- C. Product Data: Manufacturer's product data sheets on all materials incorporated into work.

PART 2 PRODUCTS

2.1 COUPLINGS AND FITTINGS

- A. Flanges, Gaskets and Bolts:
 - 1. Cast iron flanges shall conform to ANSI B16.1 Class 125 or 250 as required on the Drawings.
 - 2. Flange gaskets shall be full-face type, rubber, suitable for the intended service. Substitution of other gasket materials shall be only with the express written consent of the City of Longview.
 - a. Thickness shall be 1/16" for pipe 10" and less and 1/8" for larger pipe.
 - b. Flange assembly bolts shall be standard square head carbon steel machine bolts with heavy, hot pressed, hexagon nuts, ANSI B18.2.
 - c. Threads shall conform to ANSI B1.1, coarse thread series, Class 2 fit. Bolt length shall be such that after joints are made up the bolt shall protrude through the nut, but not more than 1/2".

- d. Bolts for use in submerged service shall be galvanized.
 - e. All screwed flanges on cast iron pipe shall be refaced, as required, after fabrication to ensure that pipe ends are flush with face of flange.
3. Forged steel flanges shall conform to ANSI B16.5, R.F.
- a. Flange gaskets shall match raised faces and shall be asbestos composition.
 - b. On 3½" flanges and smaller, gaskets shall be 1/16" thick.
 - c. On 4" flanges and larger, gaskets shall be 1/8" thick.
 - d. Flange assembly bolts shall be standard square head carbon steel machine bolts with heavy, hot pressed hexagon nuts, ANSI B18.2.
 - e. 150 psi steel flanges may be bolted to cast iron valves, fittings or other parts, having either integral Class 125 cast iron flanges or screwed Class 125 companion flanges.
 - f. When such construction is used, the raised face on the steel flange shall be removed.
 - g. Where shown on the Drawings, steel flanges shall match the bolt pattern of ANSI B16.1 Class 250.
- B. Pipe Threads:
- 1. Unless noted otherwise, all pipe threads shall conform in dimensions and limits of size to ANSI B2.1, taper joint thread.
- C. Flange Coupling Adapters:
- 1. Flanged coupling adapters shall be Clow F-2535, Dresser Style 127 or 128, or equal.
 - 2. Coupling gaskets shall be as recommended by the coupling manufacturer for the service intended.
- D. Compression Fittings:
- 1. Compression fittings for copper pipe shall be Dresser Style 88, McDonald, or equal.
- E. Joints:
- 1. All other joints shall be mechanical type or push-on type.
 - 2. Lubricant for push-on type shall be that recommended by the manufacturer of the pipe.

F. Flexible Couplings:

1. There shall be installed where shown on the Plans and as required for proper pipe make-up, sleeve-type couplings equal to Style 38 couplings, as manufactured by the Dresser Manufacturing Division of Dresser Industries.
2. They shall be designed to fit accurately, the outside diameters of the pipe to which they are to connect.
3. Gaskets shall be of molded rubber, Dresser Plain, Grade 27 or equal.
4. Couplings shall be furnished complete with bolts, nuts, and gaskets.
5. Middle rings shall be made up without a pipe stop where necessary for pipe installation or future removal of valves and fittings.
6. The ends of pipe and fittings which are to receive sleeve-type couplings shall be dressed for a distance of not less than the length of the middle ring plus the width of one follower ring in order to remove welding beads or any obstruction to free the movement of the middle ring.
7. There shall be harnesses provided on steel pipe where shown on the Plans, or as necessary for restraint.
8. The harnesses shall be designed for the design operating pressure of the pipeline with a safety factor of 2.
9. The harnesses are to be designed in accordance with AWWA Manual M11, Steel Pipe Design and Installation.

2.2 VALVES

A. General

1. A union or flagged connection shall be provided within 2 feet of each threaded end valve unless the valve can be otherwise easily removed from the piping. Unless otherwise indicated, the direction of rotation of the valve operating, wrench nut, shall be to the left (counterclockwise) to open the valve.
2. Wrench nuts shall be provided on all buried valves, on all valves which are to be operated through floor boxes, and where shown. All wrench nuts shall comply with Section 20 of AWWA C-500.
3. For all valves buried at a depth of greater than 3 feet, a pinned extension stem shall be provided to bring the operating nut within 2 feet of the finished elevation.
4. Bolt patterns for the flange connections shall match the pipe either Class 125 or Class 250 as shown on the plans.

B. Buried Valve Boxes & Extension Stems

1. Valves buried in the ground shall be provided with cast iron valve boxes of proper dimensions to fit over the valve bonnets and then extend to such elevation at or slightly above the finished ground line as directed by the City of Longview.
2. Tops shall be complete with covers and shall be adjustable.
3. Valve boxes shall be set vertical and concentric with the valve stem.
4. Any valve box, which has so moved from its original position as to prevent the application of the valve key, shall be satisfactorily reset by the Contractor at his own expense.
5. A concrete pad 1.5' x 1.5' x 4" thick shall be poured around all valve boxes which are not to be located within proposed or existing pavements.
6. Extension stems shall be provided and installed for all valves with 2" square nut operators so that operating nut is within 2' of the ground surface.
7. Valve boxes shall be the H-10346, 562-A, two-piece, sliding type, 5½" shaft, 24-36" extension, with drop cover marked water as manufactured by the Mueller Co. or City of Longview approved equal.
8. Except as may be otherwise approved by the City of Longview, all gate valves required shall be from one manufacturer and similar types and sizes shall be identical and the parts interchangeable.

C. Gate Valves

1. Gate valves, 2 inches through 12 inches shall be designed for a working pressure 200 psi.
2. Valves shall conform to AWWA C509 R/S "550 Coated Epoxy" with iron bonnet (bronze mounted), non-rising stem resilient seat, two O-ring stem seals and 2" x 2" square operating nut.
3. Valves shall open when the operating nut is turned to the left (counterclockwise).
4. Unless otherwise specified, valves 12 inches in diameter and larger shall be design for horizontal installation with totally enclosed gear cases.
5. Valve ends shall be mechanical joint complete with accessories or as specified.
6. Tapping valves shall conform to above specification except that the connections shall be ANSI B16.1, Class 125 flange on one side (inlet) and mechanical joint on the other (outlet) or as specified.
7. Wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber except for guide and wedge nut areas.

8. Wedge rubber shall be molded in place and bonded to the ductile iron portion, and shall not be mechanically attached with screws, rivets, or similar fasteners.
9. Valve operator shall be capable of seating and unseating valves and operating through their full stroke against pressures and velocities as shown by conditions on the Plans.
10. Manual operators shall be the worm gear type having permanently grease lubricated totally enclosed gearing with operating nut and gear ratio design to require not more than 40 lbs. pull. Operator shall be provided with adjustable limit stops on the input shaft to the operator. Limit stops on output shaft of operator will not be permitted. Operator shall be designed for direct burial service and valve box shall be provided over operating nut. Extension stem shall be provided to bring operating nut within 2 feet of ground surface.
11. Pre-approved Acceptable Manufacturers
 - a. Mueller
 - b. American flow control / American Darling
 - c. M & H
 - d. Clow R/S
 - e. City of Longview Approved Product List

D. Tapping Sleeves & Valves

1. Tapping valves, 2 inches through 12 inches shall be designed for a working pressure 200 psi.
2. Valves shall conform to AWWA C509 R/S "550 Coated Epoxy" with iron bonnet (bronze mounted), non-rising stem resilient seat, two O-ring stem seals and 2" x 2" square operating nut.
3. Valves shall open when the operating nut is turned to the left (counterclockwise).
4. Tapping sleeves, unless otherwise specified, shall be epoxy coated, with stainless steel nuts and bolts; or all stainless steel.
5. Unless otherwise specified, valves 12 inches in diameter and larger shall be design for horizontal installation with totally enclosed gear cases.
6. Valve ends shall be mechanical joint complete with accessories or as specified.
7. Tapping valves shall conform to above specification except that the connections shall be ANSI B16.1, Class 125 flange on one side (inlet) and mechanical joint on the other (outlet) or as specified.

8. Wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber except for guide and wedge nut areas.
 9. Wedge rubber shall be molded in place and bonded to the ductile iron portion, and shall not be mechanically attached with screws, rivets, or similar fasteners.
 10. Valve operator shall be capable of seating and unseating valves and operating through their full stroke against pressures and velocities as shown by conditions on the Plans.
 11. Manual operators shall be the worm gear type having permanently grease lubricated totally enclosed gearing with operating nut and gear ratio design to require not more than 40 lbs. pull. Operator shall be provided with adjustable limit stops on the input shaft to the operator. Limit stops on output shaft of operator will not be permitted. Operator shall be designed for direct burial service and valve box shall be provided over operating nut. Extension stem shall be provided to bring operating nut within 3 feet of ground surface.
 12. Pre-approved Acceptable Manufacturers for Tapping Valves
 - a. Mueller
 - b. American flow control / American Darling
 - c. M & H
 - d. Clow R/S
 - e. City of Longview Approved Products List
 13. Pre-approved Acceptable Manufacturers for Tapping Sleeves
 - a. Smith Blair
 - b. JCM
 - c. Ford
 - d. City of Longview Approved Products List
- E. Detector Check Valves
1. Detector check valves, 4 inches through 10 inches shall be designed for a maximum working pressure 175 psi.
 2. Detector check valves shall be install on fire protection or automatic sprinkler systems when connect to potable water supply or as shown in the Plans.
 3. Detector check valves shall include a bypass meter.

4. The Valve body shall be formed, welded units, in heavy steel. Valve shall be hydrostatically tested in excess of 700 psi. All valve linkage parts shall be stainless steel. Valves shall be fusion bonded epoxy coated in accordance with AWWA C550.
5. Detector check valves shall have flanged end connections in accordance with ANSI B16.5 Class 125/AWWA C207 unless shown otherwise in the Plans.
6. Detector check valves shall be Ames Fire and Waterworks Series 1000DCVGPM or City of Longview approved equal.
7. Detector check installation include isolation valves that will allow removal of the entire assembly (gate valve on supply and discharge) as well as curb stops on each side of the meter to isolate and replace the meter.
8. Detector check meter shall be installed in plastic meter box in unpaved areas and traffic load rated CDR box in paved areas.
9. Materials shall conform with the City of Longview Approved Product List.

F. Pipe Supports

1. All exposed piping shall be supported in conformance with the pipe support and structural attachment details of this section.

G. Joint Restraint

1. Where thrust rod anchors are shown or specified the Star Joint Restraint System as manufactured by Star National Products of Columbus, Ohio shall be utilized.
2. This system consists of the use of Super Star Tiebolts, Tienuts, Tierods ($\frac{3}{4}$ ") and Tieceplings.
3. The number of stainless steel tie rods required is listed as follows:

| <u>Pipe Size (in.)</u> | <u>Number of $\frac{3}{4}$" Rods Required</u> |
|------------------------|--|
| 6 | 2 |
| 8 | 2 |
| 10 | 2 |
| 12 | 4 |
| 14 | 4 |
| 16 | 6 |
| 18 | 6 |
| 20 | 8 |
| 24 | 10 |
| 30 | 12 |

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify building and trench backfilling have been inspected.
- B. Verify substrate base has been contoured and compacted.

3.2 SUBSTRATE PREPARATION

- A. Eliminate uneven areas and low spots.
- B. Remove debris, roots, branches, stones, in excess of 1 inch in size. Remove subsoil contaminated with petroleum products.
- C. Scarify surface to depth of 4 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.3 PLACING TOPSOIL

- A. Place topsoil in areas where seeding, sodding, and planting is required, to thickness as scheduled. Place topsoil during dry weather.
- B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.
- C. Remove roots, weeds, rocks, and foreign material while spreading.
- D. Manually spread topsoil close to plant life, buildings, and structures to prevent damage.
- E. Lightly compact placed topsoil.
- F. Remove surplus subsoil and topsoil from site.
- G. Leave stockpile area and site clean and raked, ready to receive landscaping.
- H. If approved by the City of Longview, 1-in stainless steel tie rods can be used as an alternate to $\frac{3}{4}$ -in tie rods to reduce to number of rods required. The total cross sectional area of the 1-in rods shall meet or exceed the total cross sectional area of the $\frac{3}{4}$ -in rods listed in the table.
- I. Weld tie rods to casing or attach to other fixed objects as directed by the City of Longview.

END OF SECTION

SECTION 33 31 00 - SMALL DIAMETER SANITARY SEWER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sanitary sewer lines including, blocking, joints, fittings, and other appurtenances for sewer lines 18 inches in diameter or less.

1.2 REFERENCES

- A. ANSI/AWWA C104/A21.4 - Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water.
- B. ANSI/AWWA C110/A21.10 - Ductile Iron and Gray Iron Fittings 3 inch through 48 inch, for Water and Other Liquids.
- C. ANSI/AWWA C111/A21.11 - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- D. ANSI/AWWA C150/A21.50 - Thickness Design of Ductile Iron Pipe.
- E. ANSI/AWWA C151/A21.51. - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water and Other Liquids.
- F. ANSI/AWWA C153/A21.53 - Ductile Iron Compact Fittings for 3 inch through 16 inch for Water and Other Liquids.
- G. ASTM A746 - Ductile Iron Gravity Sewer Pipe.
- H. ASTM D-3034 – Pipe Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe
- I. ASTM D-3212 – Joints for Drain and Sewer Plastic Pipes Using Elastomeric Seals
- J. ASTM F-477 – Elastomeric Seals (Gaskets)_ for Joining Plastic Pipe
- K. ASTM D-1784 – Rigid Poly (Vinyl Chloride) (PVC) Compounds
- L. ASTM D-2412 – Standard Test Method for Determination of External Loading of Plastic Pipe by Parallel Plate Loading
- M. ASTM D-2231 – Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity-Flow Applications

1.3 SUBMITTALS

- A. Section 01 33 00 - Procedures for Submittals.
- B. Product Data: Manufacturer's product data sheets on all materials incorporated into Work.

- C. Quality Control Submittals: For information only.
 - 1. Certificates: Manufacturer's certificates attesting compliance with applicable specifications for grades, types, classes, and other properties.

1.4 QUALITY ASSURANCE

- A. Pipeline installation shall be in accordance with manufacturer's recommendations.
- B. Pipe shall be kept clean of all foreign matter.
 - 1. At termination of pipe laying, provide suitable cover to close open end until burying operations are resumed.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Each load of pipe delivered to the job site shall be inspected by the Resident Project Representative.
- B. Pipe shall be transported with ends covered to prevent debris accumulation during transport.

1.6 PRODUCT CONDITIONS

- A. Perform no pipe work in fill areas until embankment or fill has been completed to at least two (2) feet above top of pipe and properly compacted.

PART 2 PRODUCTS

2.1 GRAVITY SYSTEMS

- A. Pipe:
 - 1. Polyvinyl Chloride Pipe (PVC)
 - a. PVC pipe shall be in accordance with ASTM D-3034 with integral wall ball and spigot joints.
 - b. PVC pipe shall be manufactured from clean, virgin, NSF approved PVC compound meeting the requirements of Cell Class 12454-B as defined by STM D-1784.
 - c. Pipes shall be produced with a wall thickness corresponding to dimension ratio SDR-26, with a pipe stiffness value of 115 psi when tested in accordance with ASTM D-2412.
 - 2. Ductile Iron (DI) Pipe:
 - a. Ductile Iron Pipe shall be in accordance with ANSI/AWWA C151/A21.51 with thickness as determined by ANSI/AWWA C150/A21.50.

- b. All Ductile Iron Pipe shall be (Protecto 401) per ANSI/AWWA C104/A21.4 and have a bituminous coated exterior according to ANSI/AWWA C151/A21.51 or C115/A21.15.
- c. Pressure Class 150 shall be used unless otherwise noted.
- d. Ductile Iron Pipe as manufactured by American Cast Iron Pipe or U.S. Pipe shall be used. No other suppliers shall be accepted.

B. Joints:

- 1. Joints shall be mechanical joint or push-on joint conforming to AWWA C111.
 - a. Joint material for Ductile Iron Pipe shall be rubber gasket type conforming to ANSI/AWWA C111/A21.11.
 - b. The gaskets shall be furnished by the pipe manufacturer.
- 2. Each mechanical joint shall consist of a bell cast integrally with the pipe or fitting and provided with an exterior flange having bolt holes and a socket with annular recesses for the sealing gasket and the plain end of the pipe or fitting; a pipe or plain end; a sealing gasket; a follower gland with bolt holes; and tee-head bolts and hexagonal nuts. The mechanical joint shall meet the requirements of ANSI/AWWA C111/A21.11-85.
- 3. Push-on (bell and spigot) joints shall consist of a bell cast integrally with the pipe or fitting and a socket with annular recesses for the sealing gasket and the plain end of the pipe or fitting.
 - a. The push-on joints shall meet the requirements of ANSI/AWWA C111/A21.11-85.
 - b. Joints for PVC pipe shall conform to ASTM D-3212 with elastomeric seals conforming to ASTM F-477.
- 4. All piping shall be push-on, unless otherwise required in the standard details or as required by the City of Longview.

C. Fittings:

- 1. Standard Fittings: All bends, tees, plugs, adapters, wyes, and other fittings shall meet the requirements of the type and kind of pipe used.
- 2. Adapters:
 - a. When joining dissimilar pipe materials or repairing pipe, suitable adapters shall be used.
 - b. The adapters shall be insert or bonded coupling type and shall meet strength and chemical requirements of ASTM C594.

3. Ductile Iron:
 - a. Fittings shall be push-on type meeting ANSI/AWWA C110/A21.10.
 - b. Fittings shall be cement lined in accordance with ANSI/AWWA C104/A21.4 and shall have a bituminous coated exterior per ANSI/AWWA C110/A21.10 or C153/A21.53.

2.2 ACCESSORIES

- A. Non-shrink grout:
 1. Gifford-Hill - Supreme.
 2. L&M – Crystex.
 3. Master Builders – Masterflow 713 Grout.
 4. Sauereisen Cements – F0100 Level Fill Grout.
 5. City of Longview Approved Products List
- B. Waterstops:
 1. Waterstops shall be as recommended by pipe manufacturer and approved by the City of Longview.
- C. Polyethylene Encasement:
 1. When ductile iron pipe is installed, the entire length of the D.I.P. with the exception of bore encasement shall be encased with polyethylene.
 2. D.I.P. shall be encased with 8-mil thick polyethylene in accordance with ANSI/AWWA C104/A21.5 standard.

PART 3 EXECUTION

3.1 PREPARATION

- A. Stake locations of fittings, valves and accessories prior to installation for review by City of Longview.
- B. Prior to installation, remove foreign matter from within pipes and fittings and verify material is in satisfactory condition.
- C. Trench sufficiently ahead of pipe installation to uncover any potential conflicts with grade.
- D. Each joint shall be carefully inspected before being placed in the trench. Any joint found to be cracked or otherwise damaged as to impair its usefulness shall be plainly marked then removed from the site as soon as possible.

3.2 PIPE INSTALLATION

- A. Pipe shall be installed in accordance with ASTM D2321/ASTM D2231.
- B. Preparation:
 - 1. Do not lay pipe in water, or when trench or weather are unsuitable for work.
 - a. Keep water out of trench until jointing is complete and bedding is placed to top of pipe.
 - b. When work is not in progress, close ends of pipe and fittings securely so that no trench water, earth or other substances will enter pipes or fittings.
 - 2. Keep inside of pipe free from foreign matter during operations by plugging or other City of Longview approved method.
 - 3. Place pipe so that full length of each section rests solidly upon pipe bed, with recesses excavated to accommodate bells and joints. Take up and relay pipe when grade or joint is disturbed after laying.
 - 4. Handle pipe and accessories so that pipe placed in trench is sound and undamaged. Take particular care not to injure pipe coating when applicable.
 - 5. Cut neatly, using approved type mechanical cutter without damaging pipe. Use wheel cutters when practicable.
- C. Excavation, Compaction and Backfill: In accordance with Section 31 23 02, Excavating, Backfilling and Compacting for Utilities.
- D. Bedding: In accordance with Section 31 23 02 and as shown on the Drawings.
- E. Placing and Laying:
 - 1. Set and bury lines accurately to grades as shown on the plans.
 - 2. Do not exceed 75 percent of pipe manufacturer's recommendations for deflections from straight line or grade as required by vertical curves, horizontal curves, or offsets. If alignment requires deflections in excess of these limitations, use fittings.
 - 3. Intersecting lines shall be joined by an appropriate fitting.
 - 4. Any adjustment to obtain correct line shall be made by tamping or removing soil and in no case by wedging or blocking pipe.
 - 5. Pipe shall be secured against upheaval or floating during the placement of concrete bedding, encasement, or anchors.

F. Joints:

1. Make push-on joints in accordance with manufacturer's recommendations. Lay spigot ends downstream and push-on to full depth.
2. Spigot and bells shall be cleaned thoroughly before the application of lubricant and attachment of the preformed joint gasket.

G. Connections to Existing Sewers:

1. Connections to existing sewers shall not be made until all of the proposed sewer lines and manholes have been constructed, cleaned and approval granted by the City of Longview for making connection.
2. No connection shall be made until all new sewers have passed specified leakage tests.

3.3 REMOVAL AND REPLACEMENT OF PIPE IN ORIGINAL LOCATION

A. Preparation

1. Carefully remove or protect surface features in work area. Excavate to completely expose the existing pipe, taking adequate precautions not be disturb any other existing underground facilities and handling excavated materials as described in other Sections.
2. The section of pipe to be replaced shall be isolated by plugging and/or by-pass pumping or by any other method proposed by the Contractor and approved by the City of Longview. All plugging and bypass pumping shall be considered subsidiary to the cost of removal and replacement of pipe.

B. Excavation

1. Remove and dispose of the existing pipe and concrete encasement, if any. This shall be phased and coordinated with its replacement so as to minimize public inconvenience.
2. The trench bottom shall be reshaped to accommodate the new pipe and embedment or encasement as required.

C. Bedding: In accordance with Section 31 23 02 and as shown on the Plans.

D. Placing and Laying

1. In accordance with Section 3.2 E above.
2. Make connections to existing or proposed manholes or cleanouts and to existing pipe remaining in place.
3. Install wyes or tees, with branches temporarily plugged, to make reconnections to existing service laterals, if any.

4. Except for testing, service shall be maintained at all times. Where necessary, services shall be temporarily reconnected to the new main.

3.4 TESTING AND INSPECTION

A. Low Pressure Air Test:

1. A low pressure air test shall be performed after completing a section of sewer line in accordance with the following:
 - a. The procedure for the low pressure air test shall conform to the procedures described in ASTM C-828, ASTM C-924, ASTM F-1417 or other appropriate procedures, except for testing times.
 - b. The test times shall be as outlined below.
 - c. For sections of pipe less than 36-inch average inside diameter, the following procedure shall apply unless the pipe is to be joint tested.
 - d. The pipe shall be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe.
 - e. Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be computed from the following equation:

$$T \equiv \frac{0.085 \times D \times K}{Q}$$

T = time for pressure to drop 1.0 pound per square inch gauge in seconds

K = 0.000419 x D x L, but not less than 1.0

D = average inside pipe diameter in inches

L = length of line of same pipe size being tested, in feet

Q = rate of loss, 0.0015 cubic feet per minute per square foot internal surface

- f. Since a K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as follows:

| Pipe Diameter (inches) | Minimum Time (seconds) | Maximum Length for Minimum Time (feet) | Time for Longer Length (seconds/foot) |
|------------------------|------------------------|--|---------------------------------------|
| 6 | 340 | 398 | 0.855 |
| 8 | 454 | 298 | 1.520 |
| 10 | 567 | 239 | 2.374 |
| 12 | 680 | 199 | 3.419 |
| 15 | 850 | 159 | 5.342 |
| 18 | 1020 | 133 | 7.693 |
| 21 | 1190 | 114 | 10.471 |
| 24 | 1360 | 100 | 13.676 |
| 27 | 1530 | 88 | 17.309 |
| 30 | 1700 | 80 | 21.369 |
| 33 | 1870 | 72 | 25.856 |

- g. The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time.
- h. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test shall continue for the entire test duration as outlined above or until failure.

B. Infiltration and Exfiltration Test:

1. Infiltration and Exfiltration tests shall conform to 30 TAC 217.57(a)(2) and shall be performed under the observation of the Owner and City of Longview.
2. If an Infiltration or Exfiltration Test produces results that exceed the maximum allowable limit as stated in 30 TAC 217.57 (a)(2) and as outlined below, the Contractor shall repair or replace all necessary sections of the sewer line to bring the line into compliance with such standards.
3. The total infiltration shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of 2.0 feet above the crown of the pipe at the upstream manhole or two feet above the existing ground water whichever is greater.
4. When pipes are installed below the groundwater level, an infiltration test shall be used in lieu of an Exfiltration test.
5. For pipe constructed within the 25-year flood plain, the Infiltration or Exfiltration shall not exceed 10 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of 2.0 feet.

6. If the Exfiltration exceeds the maximum allowable amount, the Contractor shall replace or repair the section of the sewer line necessary to meet the specified limits.

C. Deflection Test:

1. A Deflection Test shall be performed on all flexible pipes (PVC).
2. The deflection test shall conform to the requirements of 30 TAC 217.57(b) as outlined below.
3. For collection pipes with an inside diameter less than 27 inches, deflection measurement requires a Rigid Mandrel. Flexible mandrels shall be prohibited.
 - a. The Rigid Mandrel shall have an outside diameter equal to 95% of the average inside diameter of the pipe.
 - b. The Rigid Mandrel shall be constructed of metal or a rigid plastic material and shall be able to withstand 200 psi without being deformed and shall have a length of at least 75% of the inside diameter of the pipe.
 - c. The Mandrel shall have 9 or more odd number of runners.
 - d. Each Mandrel shall use a separate proving ring.
 - e. The Mandrel shall have 9 or more odd number of runners.
4. Television Inspection shall not substitute for a Deflection Test.
5. Mechanical pulling devices shall not be used during Testing.
6. Deflection Tests shall be performed no sooner than 30 days following final placement of backfill.
7. If the deflection exceeds the maximum allowable amount (5%), the Contractor shall replace or repair the section of the sewer line necessary to meet the specified limits.

CI. Upon completion of all required testing, the Contractor shall provided a signed and notarized affidavit certifying that the system has been tested and meets applicable requirements.

CII. System Flushing:

1. Upon completion of each sewer line or segment of line the Contractor shall flush the sewer line with a sufficient quantity of clean water. The flushing shall be performed until the water runs clear and clean.
2. The quantity of water shall be sufficient to properly flush the line and shall not be less than 200 gallons per minute. The Contractor shall be responsible for acquiring the necessary water and facilities for flushing.

F. Final Inspection:

1. Prior to final inspection, the Contractor shall complete all work on the portion of the line to be tested. The ditches shall be dressed and debris removed.
2. The final inspection shall include the entire length of the line and include clean up.
3. All defects noted shall be repaired by Contractor at his own expense, prior to final payment.

END OF SECTION

SECTION 33 41 00 - STORM DRAINAGE SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Site storm sewerage drainage piping, fittings and accessories, and bedding.
- B. Inlets, junction boxes, cleanouts, and site surface drainage.
- C. Culverts, headwalls, safety end treatments.

1.2 RELATED SECTIONS

- A. Section 31 05 13 – Soil Materials.
- B. Section 31 05 16 – Aggregate Materials.
- C. Section 31 23 01 – Excavation, Backfilling, and Compacting for Structures.
- D. Section 33 05 13 - Manholes and Covers.

1.3 REFERENCES

- A. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- B. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- C. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures.
- D. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- E. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Product Data: Provide data indicating pipe, and pipe accessories.

1.5 SUBMITTALS FOR INFORMATION

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

PART 2 PRODUCTS

2.1 STORM SEWER PIPE MATERIALS

- A. All storm sewer pipe shall be RCP unless otherwise approved by the City of Longview.
- B. Reinforced Concrete Pipe (RCP): ASTM C76, Class IV with Wall Type C; bar reinforcement; inside nominal diameter of as shown on the Plans.
- C. All pipe shall be machine-made by a process, which shall provide for uniform placement of zero slump concrete in the form and compaction by mechanical devices, which shall assure a dense concrete in the finished pavement.
- D. Reinforced Concrete Pipe Joint Device: ASTM C443, rubber compression gasket joint. Joints shall be made with Forsheda pre-lubricated gaskets.
- E. Concrete Cylinder Pipe (CCP): AWWA C303 Bar Wrapped Concrete Cylinder Pipe; pressure class 50; nominal inside diameter as shown on the Plans.

2.2 PRECAST BOX CULVERT MATERIALS

- A. Precast Reinforced Concrete Box Culverts: ASTM C789 or ASTM C8506 as shown on the Plans.
- B. All box culverts shall be machine-made by a process, which shall provide for uniform placement of zero slump concrete in the form and compaction by mechanical devices, which shall assure a dense concrete in the finished pavement.
- C. Precast Reinforced Concrete Box Culvert Joint Device: ASTM C443, rubber compression gasket joint. Joints shall be made with Forsheda pre-lubricated gaskets.

2.3 ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
- B. Filter Fabric: Non-biodegradable, non-woven, manufactured by Mirafi.

2.4 INLETS

- A. All concrete shall have a compressive strength of 3,500 psi @ 28 days
 - 1. Submit mix design for City of Longview approval.
- B. Reinforcement shall be deformed, Grade 60 steel and shall be continuous through all joints and corners. Reinforcing bars shall lap a minimum of 36 bar diameters and shall be tied securely with steel wire ties. .
- C. Ring and Cover: Cast iron construction, removable, watertight, minimum 210 lbs. as listed on the City of Longview Approved Products List.
 - 1. Cover Design: Machined flat bearing surface.
 - 2. Nominal Ring and Cover Size: 30 inches

3. Manhole must have "STORM SEWER" printed on cover.

2.5 BEDDING AND COVER MATERIALS

- A. Bedding: Fill Type A2 as specified in Section 31 05 16.
- B. Select Fill: Fill Type S3, as specified in Section 31 05 13.
- C. Cover: Fill Type S2, as specified in Section 31 05 13.

2.6 CULVERTS, HEADWALLS, SAFETY END TREATMENTS

- A. All culverts shall be reinforced concrete pipe unless otherwise approved by the City of Longview.
- B. Headwall material and construction shall be cast in place in accordance with TxDOT Item 466 with dimensions and reinforcement per TxDOT Bridge Standards for Culverts and Drainage or otherwise approved by the City of Longview.
- C. Safety End Treatments shall be precast meeting the materials and construction requirements of TxDOT Item 467 with dimensions and reinforcement per TxDOT Bridge Standards for Culverts and Drainage or as otherwise approved by the City of Longview.

PART 3 EXECUTION

- 3.1 EXAMINATION: Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on Plans.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.
- B. Remove large stones or other hard matter, which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 01 for work of this section.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.

3.4 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with ASTM C12, ASTM D2321, and Manufacturer's instructions.
- B. Seal joints watertight, and wrap all joints with Dupont Typar filter fabric a minimum of 24 inches around the pipe and shall be 18 inches wide.

- C. Embankment and backfill shall be in accordance with Section 31 23 01 for work of this section.
- D. Lay pipe to slope gradients noted on Plans with maximum variation from true slope of 1/8 inch in 10 feet.
- E. Do not displace or damage pipe when compacting.
- F. Refer to Section 33 05 13 for manhole requirements.
- G. Concrete Cylinder Pipe shall be used at locations designated on the Plans. The CCP shall span between junction boxes on each side of the telecommunication duct bank with no pipe joints between the proposed junction boxes.

3.5 INSTALLATION – PRECAST BOX CULVERTS

- A. Install a concrete mud slab prior to the placement of the box culvert as shown on the plans.
- B. Install box culverts, fittings, and accessories in accordance with ASTM C12, ASTM D2321, and Manufacturer's instructions. Seal joints watertight.
- C. Lay pipe to slope gradients noted on Plans with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Install Type A2 aggregate at sides up to haunch. Provide top cover Type A5 to minimum compacted thickness of 12 inches, compact to 95 percent.
- E. Refer to Section 31 23 02 for requirements. Do not displace or damage pipe when compacting.
- F. Refer to Section 33 05 13 for manhole requirements.

3.6 INSTALLATION – CLEANOUTS, JUNCTION BOXES, AND INLETS

- A. Excavate to a uniform depth to permit the installation of a minimum of 12 inches of gravel material for base pad subgrade. Adjust as required to attain proper grade and alignment of the base section.
- B. Place base pad, set to surface level.
- C. Place boxes and cleanouts plumb and level, trim to correct elevation, anchor to base pad.
- D. Cutouts in the bottom sections shall be appropriate for the pipe being laid and shall have identifying markings to facilitate their being used in the correct locations
- E. Natural or artificial "O" ring rubber gaskets shall be used in joints.
- F. Mount ring and cover level in grout, secured to top section to elevation indicated.

3.7 FIELD QUALITY CONTROL

- A. Request inspection prior to and immediately after placing aggregate cover over pipe.
- B. Compaction testing will be performed in accordance with ASTM D698, AASHTO T180, ASTM D2922, ASTM D3017.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- D. Frequency of Tests: As required by the City of Longview.
- E. Infiltration Test: As determined by a hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole, or at least two feet above existing groundwater level, whichever is greater.
- F. Deflection Test: Do not exceed Manufacturer's recommendation.
- G. Pressure Test: Test in accordance with ASTM C828, ASTM C-924, and ASTM F1417.

END OF SECTION