

PROJECT MANUAL

City of Castroville Regional Park Community Building



City of Castroville

City Council

Sheena Martinez – District 1

Paul Carey – District 2

Phil King – District 3

David Merz – District 4

Herb Dyer – District 5

Mayor

Darrin Schroeder

LPA, Inc.
1811 S. Alamo, Unit 100
San Antonio, Texas 78204
210.829.1737

April 19, 2024

**CITY OF CASTROVILLE REGIONAL PARK
COMMUNITY CENTER**

PROJECT DIRECTORY

OWNER

City of Castroville
1209 Fiorella St
Castroville, TX 78009
phone 830.423.6050

ARCHITECT

LPA, Inc.
1811 South Alamo, Suite 100
San Antonio, TX 78204
phone 210.829.1737

CIVIL ENGINEER

Moy Tarin Ramirez Engineers, LLC
12770 Cimmaron Path, Suite 100
San Antonio, Texas 78249
phone 210.698-5051

LANDSCAPE ARCHITECT

LPA, Inc.
1811 South Alamo, Suite 100
San Antonio, TX 78204
phone 210.829.1737

IRRIGATION CONSULTANT

CFZ Group, LLC
7410 John Smith Drive, Suite 208
San Antonio, TX 78229
phone 210.366.1911

STRUCTURAL ENGINEER

LPA, Inc.
1811 South Alamo, Suite 100
San Antonio, TX 78204
phone 210.829.1737

MECHANICAL / ELECTRICAL / PLUMBING ENGINEER

H2MG
8000 IH-10 West, Suite 1002
San Antonio, Texas 78230
phone 210.525.0220

DATA / SECURITY CONSULTANT

Alliance of Community Solutions
19953 W 162nd Street
Olathe, Kansas 66062

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4-19-2024

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END OF SECTION

**Request for Competitive Bids
for
Construction Services
for the
City of Castroville Regional Park
Community Building**

City of Castroville, Texas

April 19, 2024

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I. BACKGROUND

1. General Description

The City of Castroville, Texas (the “City”) invites the submittal of responses to this Request for Bids (RFB) from qualified firms interested in providing construction services in connection with the construction of the City of Castroville Regional Park Community Building

The Project has been designed by LPA, Inc. The Project is anticipated to include some or all of the following items within its scope: wood framing, stucco, metal roofing, drywall, paint, polished concrete, mechanical, plumbing, electrical, technology, earth work, landscape, hardscape, and all other appurtenances necessary to complete the Project.

Responses are solicited for this service in accordance with the terms, conditions, and instructions set forth in the RFB guidelines.

2. Purposes of RFB

The City issues this RFB seeking competitive sealed Bids in accordance with Chapter 2269 of the Texas Government Code for the construction of a Project further described in Section III, Scope of Work.

The City seeks the lowest responsible bidder, as that term is used in section 2269.101. In accordance with section 2269.055, the City will determine the lowest responsible bidder based on the criteria described as follows:

1. the price;
2. the offeror's experience and reputation;
3. the quality of the offeror's goods or services;
4. the impact on the ability of the City to comply with rules relating to historically underutilized businesses;
5. the offeror's safety record;
6. the offeror's proposed personnel;
7. whether the offeror's financial capability is appropriate to the size and scope of the project; and
8. prior business history with the City.

Bidder shall use the bid form in this package to include pricing information and provide the additional information requested in this section in a format deemed appropriate by bidder.

3. Location

The facility will be located at the entrance to Castroville Regional Park at 816 Alsace Avenue, Castroville, Texas 78009.

4. Project Duration

The City has established a target commencement date for construction activities as June 1, 2024. The projected completion date is estimated to be April 1, 2025. The City reserves the right to phase the construction of the Project or modify the schedule as needed and determined by the City Council or staff due to modifications in scope.

5. Project Budget

Estimated maximum construction budget is approximately \$1,700,000.00. This includes all incidental and contingent expenses associated with the construction of the Project.

6. To Be Opened

The City will be accepting sealed Bids until 2:00pm CST on Tuesday, May 7, 2024 at which time they will be opened publicly and the name of the offeror and the monetary component of the Bids shall be read aloud. Any Bid received after bidding time will be returned unopened. Receipt of response does not bind the City to any contract for said services, nor does it give any guarantee that a contract for the Project will be awarded.

Bid forms, contract documents, and construction plans and specifications can be obtained by accessing Civcast at www.civcastusa.com and searching for the City of Castroville and the Castroville Community Center Building Construction Package.

Offerors shall return **1 clearly marked original and 2 copies** of their Bids to: Scott Dixon, City Administrator, 1209 Fiorella Street, Castroville, Texas 78009, in an envelope or package no smaller than 8-1/2" X 11" and clearly marked in the lower left hand corner:

SEALED BID

Submitting Company Name: _____

Castroville Community Building

May 7, 2024

7. Pre-bid Conference

A pre-bid conference for all interested parties will be held at 1209 Fiorella Street, Castroville, Texas at 10:00 am CST on Tuesday, April 30, 2024 with a visit to the job site afterward. It is highly recommended that all parties interested in submitting a bid for this work be present.

8. Bid Bond

Each Bid must be accompanied by an approved Bid Bond in the amount of **5%** of the Bid cost, payable to the City of Castroville without recourse, as a guarantee bidder will enter into a contract at the stated price. The successful bidder must execute 100% performance and payment bonds on the forms provided, within ten (10) days after the contract has been awarded.

9. Rights Reserved

Bids shall remain open and may be held by the City for Ninety (90) days for full evaluation and ranking of offerors. Based on its sole discretion, the City reserves the right to determine the propriety of any bid and may disqualify any bidder based on an incomplete, inaccurate, or noncompliant bid. The City reserves the right to reject any or all of the Bids, to waive formalities, and to make an award to an offeror as outlined in this RFB. Bidders will be notified in writing of any determinations made by the City pursuant to this section.

10. Disclosure

The State of Texas Local Government Code (Chapter 176) requires that all vendors seeking to do business with the City file a disclosure questionnaire identifying any business relationship they have with a city council member or the mayor. For more information or to obtain the Questionnaire CIQ, go to the Texas Ethics Commission web page at: www.ethics.state.tx.us/forms/CIQ.pdf. The disclosure questionnaire **must be submitted with your Bid**.

11. Certificate of Interested Parties

State of Texas Local Government Code (Chapter 2252) states that the City may not enter into a contract with a business entity unless and until the business entity has submitted a Certificate of Interested Parties (hereafter referred to as "Form 1295") to the City for filing with the Texas Ethics Commission (hereafter referred to as "TEC"). Instructions for completing this form are included at https://www.ethics.state.tx.us/whatsnew/elf_info.form1295.htm. Form 1295 **must be submitted with your Bid**.

12. Questions and Addenda

Questions regarding this RFB or the services requested must be sent to Laurence Garcia with LPA, Inc. **before May 1, 2024 at 5:00 pm CST**. Any changes, additions, or clarifications to the RFB are made by amendments (addenda) and will be posted on the public purchase website. Any respondent in doubt as to the true meaning of any part of the RFB or other documents may request an interpretation from the City. At the request of the respondent, or in the event the City deems the interpretation to be substantive, the interpretation will be made by written addendum issued by the City. Such addendum will be attached to the original RFB in the public purchase file and will become part of the RFB package having the same binding effect as provisions of the original RFB. It shall be the respondent(s) responsibility to ensure that they have received all Addenda with respect to this project. Furthermore, respondents are advised that they must recognize, comply with, and attach a signed copy of each Addendum, which shall be made part of their submittal. Respondent(s) signature on Addenda shall be interpreted as the respondent's recognition and compliance to official changes as outlined by the City and as such are made part of the original RFB documents. Failure of any respondent to receive any such addendum or interpretation shall not relieve such Respondent from its terms and requirements. No verbal explanations or interpretations will be binding. The City does not assume responsibility for the receipt of any addendum sent to respondents.

13. RESTRICTIONS ON COMMUNICATION

Respondent(s) are prohibited from communicating with City Council Members and City staff regarding the RFB or bids from the time the RFB has been released until the contract is awarded. These restrictions extend to “thank you” letters, phone calls, emails and any contact that results in the direct or indirect discussion of the RFB or bid submitted by Respondent. Violation of this provision by Respondent or its agent may lead to disqualification of Respondent’s proposal from consideration.

Exceptions to the restrictions on communication with City employees include that Respondents may ask verbal questions concerning this RFB during the pre-bid conference or submit clarification requests pursuant to “Questions and Addenda” Section.

14. INVITATION FOR RESPONSES PREPARATION COSTS

Issuance of this RFB does not commit the City, in any way, to pay any costs incurred in the preparation and submission of a response. All costs related to the preparation and submission of this RFB shall be borne by the respondent.

II. OBJECTIVES

The City proposes to retain a highly qualified, capable firm to act as its general contractor for the construction of the Project. Firms who participate in this RFB process are sometimes referred to as “Bidders,” “Respondents,” and “Offerors.” The City will give prime consideration to the Offerors with significant, current experience in the management and construction of similar projects. Experience in construction of similar types of projects is essential.

III. SCOPE OF WORK

The City anticipates the scope of work to consist of the following responsibilities:

The City anticipates the following items will be included in the scope of the Project: wood framing, stucco, metal roofing, drywall, paint, polished concrete, mechanical, plumbing, electrical, technology, earth work, landscape, hardscape, and all other appurtenances necessary to complete the Project; and all other appurtenances necessary to complete the Project. The Project will be designed and constructed so as to meet all applicable federal, state, and local accessibility standards.

The selected Offeror will be also responsible for: obtaining all applicable permits and inspections; providing all necessary performance and payment bonds and insurance requirements; and providing the City with all manufacturers’ warranties and all operations and maintenance (O & M) manuals for all equipment installed.

IV. SELECTION PROCESS

Respondents should prepare a sealed Bid responsive to all information requested in this RFB.

The City will select the lowest responsible bidder who submits the Bid that meets the criteria in this request. The City reserves the right to and may contact Offerors with questions or clarifications relating to that Offeror's response to this RFB.

The bid set of Contract Documents, including the forms for the Contract Agreement between Owner and Contractor, Bid Form (Exhibit B to the Contract Agreement), the Standard General Conditions of the Contract, the Insurance Rider (Exhibit A to the General Conditions), the Special Conditions, the Technical Specifications, the requisite bond forms, and the Drawings and Specifications are included with this RFB for Offeror evaluation prior to submission of a Bid.

Each Bid, completed and signed by person(s) authorized to bind individual, partnership, firm, corporation, or any other legal entity, shall include the following in one envelope furnished by bidder:

- One copy of Bid Form completed and signed.
- Acknowledgment of receipt of Addenda issued in spaces provided in Bid form.
- Required bid guaranty.
- Copy of Articles of Incorporation, Partnership Agreements and resolution or board minutes empowering signatory to bind bidder, attested by an officer of bidder.
- One copy of Insurance, completed and signed.
- Other Required information indicated in Drawings or Contract Documents.

Bid shall include all specified items in this section and be placed in envelopes furnished by bidder, sealed and clearly identified on outside as a Bid to the City, with bidder's name and address, and project name. Failure to submit Bid in these envelopes may subject bidder to disqualification. Bid must be delivered in person, by United States Mail, or by private courier service.

**The City of Castroville
c/o Scott Dixon
1209 Fiorella Street
Castroville, Texas 78009**

When sent by in person, by United States Mail, or by private courier service, sealed Bid (marked as indicated above) shall be enclosed in an additional envelope clearly identified on outside as a Bid to the City with bidder's name and address, Project name, and Bid date and time. It is the sole responsibility of bidder to ensure timely delivery of Bid. The City will not be responsible for failure of service on the part of the U.S. Post Office, courier services, or any other form of delivery service chosen by bidder.

Bids shall include all specified items in this RFB. Failure to submit any required item may subject bidder to disqualification.

BID SCHEDULE

DATE	MILESTONE
April 23, 2024	RFB advertised and posted
April 30, 2024	Pre-Bid Conference
May 1, 2025	Deadline for questions and requests for clarification (Addenda)
May 7, 2024	Bid submission deadline/Bid opening
May 28, 2024	Anticipated Approval & Award of Contract by City Council

V. AWARD OF CONTRACT

1. The City reserves the right to reject any and all Bids, to waive any and all formalities not involving price, time, or changes in the work with the successful bidder, and the right to disregard all nonconforming, nonresponsive, unbalanced or conditional Bids. The City also reserves the right to reject the Bid of any bidder if the City believes that bidder has not demonstrated that bidder is a responsible bidder. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.
2. In evaluating Bids, the City will consider whether or not the Bids comply with the prescribed requirements, and such alternatives, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
3. If the Contract is to be awarded, it will be awarded to the lowest responsible bidder.
4. If the contract is to be awarded, the City will give the successful bidder a Notice of Award within ninety (90) days after the day of the Bid opening.
5. The City reserves the right to increase the value of the contract by adding alternatives described in the Proposal.

VI. ADDITIONAL INSTRUCTIONS, NOTIFICATIONS, AND INFORMATION

1. All Information True

Respondent represents and warrants to the City that all information provided in the response shall be true, correct and complete. Respondents who provide false, misleading,

or incomplete information, whether intentional or not, in any of the documents presented to the City for consideration in the selection process shall be excluded.

2. Inquires

Do not contact the City during the selection process to make inquiries about the progress of this selection process. Such contact may result in disqualification. Respondents will be contacted when it is appropriate to do so.

3. Cost of Responses

The City will not be responsible for the costs incurred by anyone in the submittal of responses.

4. No Obligation

By publishing this request for bids, the City is under no obligation to enter into a contract with bidder and reserves the right to cancel the entire process.

5. Equal Employment Opportunity

Respondent agrees that it will not discriminate in hiring, promotion, treatment, or other terms and conditions of employment based on race, sex, national origin, age, disability, or in any way violate Title VII of 1964 Civil Rights Act and amendments, except as permitted by said laws.

6. Independent Contractor

It is expressly understood and agreed by both parties hereto that the City is contracting with the successful Respondent as independent contractor. The parties hereto understand and agree that the City shall not be liable for any claims which may be asserted by any third party occurring in connection with the services to be performed by the successful Respondent under this contract and that the successful Respondent has no authority to bind the City.

7. Respondent's Employees

Neither the Respondent nor his/her employees engaged in fulfilling the terms and conditions of any awarded contract shall be employees of the City. The method and manner of performance of such undertakings shall be under the exclusive control of the vendor on contract. The City shall have the right of inspection of said undertakings at any time.

8. Confidential Information

A. Any information deemed to be confidential or proprietary by the Respondent should be clearly annotated on the pages where confidential or proprietary information is contained. The City cannot guarantee that it will not be required to disclose all or part of any public record under Texas Public Information Act, since information deemed to be confidential or proprietary by the Respondent may not be confidential or proprietary under Texas Law, or pursuant to a Court order. Pursuant to the Texas Public Information Act, the City must disclose certain contracting information and the law presumes that most contracting information is public. Certain types of contracting information must

generally be released under the Act: overall price; price and description of items or services to be delivered; delivery and service deadlines; remedies for breach of contract; identity of the parties to the Contract; execution and effective dates; and information connected to a vendor or contractor's performance on the Contract. Additionally, information regarding performance under the Contract, including breaches of the Contract, Contract variances, amendments, liquidated damages, and other penalties for non-performance, must generally be released under the Public Information Act.

B. The requirements of Subchapter J, Chapter 552, Government Code, may apply to this RFB and the contractor or vendor agrees that the Contract can be terminated if the contractor or vendor knowingly or intentionally fails to comply with a requirement of that subchapter.

9. Jurisdiction

Contract(s) executed as part of this solicitation shall be subject to and governed under the laws of the State of Texas without regard to its conflict of law principles. Any and all obligations and payments are due and performable and payable in Waller County, Texas.

10. Venue

The parties agree that exclusive venue for purposes of any and all lawsuits, cause of action, arbitration, or any other dispute(s) arising from this bid or any resulting contract shall be in a state district court in Waller County, Texas.

11. Conflict of Interest

Chapter 176 of the Texas Local Government Code requires that any vendor or person considering doing business with a local government entity must disclose in the Questionnaire Form CIQ, the vendor or person's affiliation or business relationship that might cause a conflict of interest with a local government entity. This questionnaire must be filed, by law, with the City no later than the 7th business day after the date the person becomes aware of facts that require the statement be filed. See Section 176.006, Local Government Code. A person commits an offense if the person violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor. For more information or to obtain the Questionnaire CIQ go to the Texas Ethics Commission web page at www.ethics.state.tx.us/forms/CIQ.pdf.

IF YOU HAVE ANY QUESTIONS ABOUT COMPLIANCE, PLEASE CONSULT YOUR OWN LEGAL COUNSEL. COMPLIANCE IS THE INDIVIDUAL RESPONSIBILITY OF EACH PERSON OR AGENT OF A PERSON WHO IS SUBJECT TO THE FILING REQUIREMENT. AN OFFENSE UNDER CHAPTER 176 IS A MISDEMEANOR.

12. Certificate of Interested Parties

Pursuant to Section 2252.908, Texas Government Code, as amended and formal rules released by the Texas Ethics Commission (TEC), all contracts with private business entities requiring approval by the City Council, will require the on-line completion of Form 1295 "Certificate of Interested Parties." Form 1295 is also required for any and all

contract amendments, extensions or renewals. Contractors are required to complete and file electronically with the Texas Ethics Commission using the online filing application.

13. Prohibition on Contracts with Certain Companies

The City will review the website of the Comptroller of the State of Texas to determine if the respondent is on the list of companies that provide supplies or services to a foreign terrorist organization as defined in Chapter 2252 of the Texas Government Code, as amended. Any company identified on such list will be disqualified from consideration.

14. Texas Public Information Act

All information, documentation, and other materials submitted in response to this RFB are considered non-confidential and/or non-proprietary and are subject to public disclosure under the Texas Public Information Act (Texas Government Code, Chapter 552.001, et seq.) after the solicitation is completed.

The requirements of Subchapter J, Chapter 552, Texas Government Code, may apply to this RFB and the bidder agrees that any contract resulting from this solicitation can be terminated by the City if the bidder knowingly or intentionally fails to comply with a requirement of that subchapter.

This subchapter does not create a cause of action to contest a bid for or the award of a contract with the City.

The City may not accept a bid for a contract described by Subchapter J, Chapter 552 or award the contract to an entity that the City has determined has knowingly or intentionally failed to comply with Subchapter J in a previous bid or contract described by that section unless the City determines and documents that the entity has taken adequate steps to ensure future compliance with the requirements of Subchapter J.

Nothing in this subchapter prevents the City from including and enforcing more stringent requirements in a resulting contract to increase accountability or transparency.

END OF DOCUMENT

SECTION 00 100
A AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

- A Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of the Contract Documents as follows:
- B Geotechnical Reports
- 1 Subsurface Exploration Laboratory Testing Program and Foundation and Pavement Recommendations for the Proposed Parks and Recreation Community Building at 11454 Alameda Avenue, Castroville, as per Contract Number G2237-7 Rev 1 dated February 2, 2021.
 - 2 This report identifies properties of soil, grade conditions and offers recommendations for the design of foundations prepared primarily for the use of Architect.
 - 3 The recommendations described shall not be construed as a requirement of this Contract unless specifically referenced in the Contract Documents.
- These reports by their nature cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made at the resulting credits or expenditures to the Contract Price accruing to Architect.

PART 2 PRODUCTS NOT USED

PART 3 EXECUTION NOT USED

END OF SECTION



- GEOTECHNICAL ENGINEERING
- CONSTRUCTION MATERIALS
ENGINEERING & TESTING
- SOILS • ASPHALT • CONCRETE

February 28, 2024

City of Castroville
1209 Fiorella St
Castroville, Texas 78009

Attention: Devin Frederickson

**SUBJECT: SUBSURFACE EXPLORATION, LABORATORY TESTING PROGRAM,
AND FOUNDATION AND PAVEMENT RECOMMENDATIONS
FOR THE PROPOSED
PARKS AND RECREATION COMMUNITY BUILDING
816 ALSACE AVE
CASTROVILLE, TEXAS
ROCK Project Number: G223767 REV 1**

Dear Mr. Frederickson,

In accordance with our agreement, Rock Engineering & Testing Laboratory, LLC (ROCK) performed a subsurface exploration and foundation and pavement evaluation for the referenced project. The results of this exploration, together with our recommendations, are presented in the accompanying report, an electronic copy of which is being transmitted herewith. ROCK will provide up to two (2) hard copies of this report at your request.

Often, because of design and construction details that occur on a project, questions arise concerning soil conditions. ROCK would be pleased to continue its role as the Geotechnical Engineer during project implementation.

ROCK also has great interest in providing materials testing and special inspection services during the construction phase of this project. If you will advise us of the appropriate time to discuss these engineering services, we will be pleased to meet with you at your convenience.

Sincerely,

Kyle D. Hammock, P.E.
Vice President - San Antonio

ROCK ENGINEERING & TESTING LABORATORY, LLC

Corpus Christi

Office: 361.883.4555
Fax: 361.883.4711
6817 Leopard St.
Corpus Christi, TX 78409

San Antonio

Office: 210.495.8000
Fax: 210.495.8015
10856 Vandale
San Antonio, TX 78216

Round Rock

Office: 512.284.8022
Fax: 512.284.7764
7 Roundville Ln.
Round Rock, TX 78664

www.rocktesting.com

**SUBSURFACE EXPLORATION, LABORATORY TESTING PROGRAM,
AND FOUNDATION AND PAVEMENT RECOMMENDATIONS
FOR THE PROPOSED
PARKS AND RECREATION COMMUNITY BUILDING
816 ALSACE AVE
CASTROVILLE, TEXAS**

ROCK PROJECT NUMBER: G223767 REV 1

PREPARED FOR:

**CITY OF CASTROVILLE
1209 FIORELLA ST
CASTROVILLE, TEXAS 78009**

February 28, 2024

PREPARED BY:

**ROCK ENGINEERING & TESTING LABORATORY, LLC
10856 VANDALE ST.
SAN ANTONIO, TX 78216
PHONE: (210) 495-8000; FAX: (210) 495-8015**

**TEXAS BOARD OF PROFESSIONAL ENGINEERS
FIRM REGISTRATION NUMBER 2101**



A handwritten signature in blue ink, appearing to read "Kyle D. Hammock".

**Kyle D. Hammock, P.E.
Vice President – San Antonio**



A UES Company

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INTRODUCTION

This report presents the results of a subsurface exploration and foundation and pavement evaluation for the proposed Parks and Recreation Community Building to be constructed at 816 Alsace Ave in Castroville, Texas. This study was conducted for the City of Castroville.

Authorization

The work for this project was performed in accordance with ROCK Proposal No. SGP120123B dated December 1, 2023. The proposal contained a scope of work, fee, and limitations. The proposal was approved and signed by Devin Frederickson on December 4, 2023 and returned to ROCK via email.

Purpose and Scope

The purpose of this study was to provide applicable foundation and pavement design recommendations for the proposed project. The project includes the construction of a new single-story wood framed building with a footprint on the order of 6,000 square feet, as well as associated pavements. The scope of this study included the subsurface exploration, field and laboratory testing, engineering analysis and evaluation of the subsurface soils, development of foundation and pavement recommendations suitable for the proposed project, and preparation of this report.

The scope of services did not include an environmental assessment. Any statements in this report, or on the Logs of Boring, regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of the client.

General

The exploration and analysis of the subsurface conditions reported herein are considered sufficient in detail and scope to form a reasonable basis for foundation and pavement designs. The recommendations submitted for the proposed project are based on the available soil information and the preliminary design details provided to ROCK by Devin Frederickson representing the City of Castroville and the Geotechnical Request Letter prepared by LPA. If other design criteria are required for the structural and civil engineers to complete the foundation and pavement designs, and the requested information can be obtained from the agreed upon scope of work, ROCK will provide the requested information as a supplement to this report.

The Geotechnical Engineer states that the findings, recommendations, specifications or professional advice contained herein, have been presented after being prepared in a manner consistent with the level of care and skill ordinarily exercised by reputable members of the Geotechnical Engineer's profession practicing contemporaneously under similar conditions in the locality of the project.

ROCK operates in accordance with “*Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction*”, (ASTM D3740). No other representations are expressed or implied, and no warranty or guarantee is included or intended.

FIELD EXPLORATION

Scope

The field exploration, completed in order to evaluate the engineering characteristics of the subsurface conditions, included a reconnaissance of the project site, drilling test borings and recovering disturbed and relatively undisturbed samples of the subsurface materials encountered at the test boring locations. ROCK performed a total of three (3) borings at the site. The table below provides the boring locations, number, and depths.

SUMMARY OF BORING INFORMATION		
Boring Location	Boring Identification	Boring Depth (ft)
Building	B-1	35
	B-2	35
Paving	B-3	6

During the sample recovery operations, the soils encountered were classified and recorded on Logs of Boring in accordance with “*Standard Guide for Field Logging of Subsurface Exploration of Soil and Rock*”, (ASTM D5434). Upon completion of the drilling operations and obtaining the groundwater observations, the drill holes were backfilled with excavated soil.

ROCK personnel determined the number, depth, and location of the borings. The borings were located in the field by ROCK personnel and ROCK completed the drilling operations. A Boring Location Plan is provided in the Appendix of this report.

Drilling and Sampling Procedures

The test borings were performed using a drilling rig equipped with a rotary head turning solid flight augers to advance the boreholes to the termination depths. Disturbed samples were obtained employing split-barrel sampling procedures in general accordance with the procedures for “*Penetration Test and Split-Barrel Sampling of Soils*” (ASTM D1586). Relatively undisturbed soil samples were obtained using thin-wall tube sampling procedures in accordance with the procedures for “*Thin Walled Tube Sampling of Soils*” (ASTM D1587). The samples obtained by this procedure were extruded by a hydraulic ram in the field.

The samples obtained from the test borings were classified in the field, placed in plastic bags, marked according to boring number, depth and any other pertinent field data, and stored in special containers. The samples were delivered to the laboratory for testing at the completion of the drilling operations.

Field Tests and Measurements

Penetration Tests - During the sampling procedures, standard penetration tests (SPT) were performed to obtain the standard penetration value of the soil. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling 30-inches, required to advance the split-barrel sampler 1-foot into the soil. The sampler is lowered to the bottom of the previously cleaned drill hole and advanced by blows from the hammer. The number of blows is recorded for each of three successive 6-inch penetrations.

The "N" value is obtained by adding the second and third 6-inch increment number of blows from the hammer. The results of standard penetration tests indicate the relative density of cohesionless soils and comparative consistency of cohesive soils, thereby providing a basis for estimating the relative strength and compressibility of the soil profile components.

Groundwater Observations - Groundwater observations were made during the test boring operations and are noted on the Logs of Boring provided in the Appendix. The amount of water in an open borehole largely depends on the permeability of the soils encountered at the boring location. In relatively pervious soils, such as sandy soils, the indicated depth is usually a reliable groundwater level. In relatively impervious soils, such as clayey soils, a suitable estimate of the groundwater depth may not be possible, even after several days of observation. Seasonal variations, temperature, land-use, and recent rainfall conditions may influence the depth to groundwater.

Ground Surface Elevations - The ground surface elevations at the test boring locations were not provided. The depths referred to in this report are reported from the actual ground surface elevations at the boring locations during the time of our field investigation. A Preliminary Grading Plan was provided to ROCK by LPA Design Studios.

LABORATORY TESTING PROGRAM

A laboratory-testing program was conducted to supplement the information obtained during the field investigation. The results of the laboratory-testing program provide additional pertinent engineering characteristics of the subsurface materials necessary in analyzing the behavior of the foundation and pavement systems for the proposed project.

The laboratory-testing program included performing supplementary visual classification (ASTM D2487) and moisture content tests (ASTM D2216) on the samples. In addition, selected samples were subjected to Atterberg limits tests (ASTM D4318), percent material finer than the #200 sieve tests (ASTM D1140), and one-dimensional swell tests (ASTM D4546). Estimated soil strengths were obtained using a hand penetrometer.

The laboratory-testing program was conducted in general accordance with applicable ASTM Specifications. The results of these tests are presented on the accompanying Logs of Boring provided in the Appendix.

SUBSURFACE CONDITIONS

General

The types of materials encountered in the test boring locations have been visually classified and are described in detail on the Logs of Boring. The results of the standard penetration tests, strength tests, water level observations and laboratory tests are presented on the Logs of Boring in numerical form. Representative samples of the soils were placed in polyethylene bags and are now stored in the laboratory for further analysis, if desired. Unless notified to the contrary, the samples will be disposed of three months after issuance of this report.

The stratification of the soil, as shown on the Logs of Boring, represents the conditions at the actual boring locations. Variations may occur between, or beyond, the boring locations. Lines of demarcation represent the approximate boundary between different soil types, but the transition may be gradual, or not clearly defined.

It should be noted that, whereas the test borings were drilled and sampled by experienced drillers, it is sometimes difficult to record changes in stratification within narrow limits. In the absence of foreign substances, it is also difficult to distinguish between discolored soils and clean soil fill.

Soil Conditions

The subsurface conditions encountered at the site generally consist of high to very high plasticity fat clay, lean clay, and gravelly lean clay soils with intermediate depth silty clay, silty sand, and clayey sand soils. extending to the deepest boring termination depth of 36-feet. The generalized soil conditions encountered in the building area borings performed at the site have been summarized and are provided in the following tables.

SOIL PROFILE TABLE BORING B-1 & B-2								
D	Description	LL	PI	C	θ	γ_e	-#200	N or P
0-2	Gravelly Lean CLAY	48	31	2,000	0	120	57	N= 8-21
2-18	Fat CLAY Lean CLAY	48-55	32-38	2,500	0	120	58	N= 10-32 P= 3.0-4.5+
18-30	Silty CLAY , Clayey SAND and Silty SAND	22	7	0	35	115	16-71	N= 23-50/3"
30-35	Fat CLAY	90	63	3,000	0	120	100	N= 24-50/3"

Where: D = Depth in feet below existing grade
LL = Liquid Limit (%)
PI = Plasticity Index
C = Average Soil Cohesion, psf (undrained)
θ = Angle of Internal Friction, deg. (undrained)
γ_e = Effective Soil Unit Weight, pcf
-#200 = Percent Material Finer than a #200 Sieve
N = Standard Penetration Value range, blows per foot
P = Hand Penetrometer Value range, tsf

Detailed descriptions of the subsurface materials encountered at the boring locations are provided on the Logs of Boring included in the Appendix.

Seismic Site Class

The field investigation did not include a 100-foot deep boring, therefore, the soil properties are not known in sufficient detail to determine the Site Class per ASCE 7 Chapter 20. This section states that where site-specific data are not available to a depth of 100-feet, appropriate soil properties are permitted to be estimated by the registered design professional preparing the soil investigation report based on known geologic conditions. This site generally has stiff to hard clayey soils and dense to very dense sandy soils extending to the 35-foot depth.

Table 20.3-1 Site Class Definitions of ASCE 7 Chapter 20, indicates that Site Class D materials should have soil undrained shear strengths between 1,000 and 2,000 psf and standard penetration resistances between 15 and 50 blows per foot. The on-site soils extending to the 30-foot depth have strengths similar to Site Class D materials; therefore, ROCK recommends that Site Class D, "stiff soil profile" be assumed.

Groundwater Observations

Groundwater was not encountered during the drilling operations and the borings were dry upon completion of the drilling operations. It should be noted that water levels in open boreholes may require several hours to several days to stabilize depending on the permeability of the subsurface materials and that groundwater levels or zones of seepage may be subject to seasonal conditions, recent rainfall, drought or temperature effects.

FOUNDATION DISCUSSION AND RECOMMENDATIONS

Project Description

Based on the information provided to ROCK, it is understood that the project will consist of the construction of a new community building as well as automobile parking and driveway areas. The building will be a wood framed single-story structure with a footprint on the order of 6,000 square feet. Foundation design loads provided indicate maximum concentrated loads would be on the order of 5 to 60-kips and wall loads will be in the range of ½ to 3-kips per linear foot. Recommendations for a slab-on-grade have been requested for the proposed structure.

The Preliminary Grading Plan provided to ROCK indicates that the slab foundation will have a step down with FFE's set at elevation El. 760.5' and El. 758.5'. The existing grades slope down from an approximate elevation of El. 760.4' to El. 757.3'.

PVR Discussion

The upper fat and lean clay soils encountered in the test borings at this site are high to very high in plasticity. **The calculated total potential vertical rise (PVR) for slab-on-grade construction at this site is approximately 3-inches.** The PVR was calculated using the Texas Department of Transportation Method TEX-124E and took into account the average depth of active zone, estimated to extend to a depth of approximately 15-feet, and the Atterberg limits test results of the soils encountered within the active zone.

It is important to note that the PVR value provided herein was calculated using the Texas Department of Transportation Method TEX-124E and represents the vertical rise that can be experienced by relatively dry subsoils subjected to increases in soil moisture content resulting from capillary effects or rainwater. The TEX-124E method is widely used in Texas for predicting expansive soil movements and has been found to be reasonably accurate for moisture variations resulting from normal seasonal and climatic controlled conditions (environmental conditions). The actual movement of the subsoils is dependent upon their change in moisture content.

Conditions that allow the soils to become saturated or significantly exceed typical moisture variations resulting from environmental conditions or exceed the dry and wet boundary conditions established by the TEX-124E method, such as poor drainage, broken utilities, and variations in subsurface groundwater sources, may result in higher magnitudes of moisture related soil movements than calculated by the PVR method provided herein.

It is anticipated that when completely inundated with water and allowed to become saturated, which would likely be the case if proper drainage around the structure is not provided or if a broken plumbing line was to occur, the subgrade soils could swell 2 or more times the magnitude estimated by the TEX-124E PVR represented herein. Differential vertical movements may occur over a distance equal to the depth of the active zone and can potentially be equal to the expected total movements.

Based on our calculations, to consistently reduce the TEX-124E calculated PVR to approximately 1-inch for slab on grade foundation construction, a minimum of 5½-feet of properly compacted, non-expansive select fill should be placed below the floor slab.

Slab-on-Grade Recommendations

A monolithic, steel reinforced and stiffened slab-on-grade foundation may be used to support the proposed structure planned for construction at the site, provided the subgrade preparation and select fill building pad construction recommendations are followed as outlined in this report to reduce the PVR to approximately 1-inch and provided that 1-inch of differential soil movements can be tolerated. If potential soil-related movements of approximately 1-inch are not acceptable for the structure, a deep foundation system consisting of drilled piers with structurally suspended floor slabs should be utilized.

Interior and exterior grade beams and footings should be founded in compacted select fill building pad materials. All load-bearing grade beams and footings should have a minimum depth of 2-feet below the finished floor slab elevation and perimeter grade beams and footings should have a final embedment depth of 2-feet below the final surface grades surrounding the foundation. **Interior and exterior grade beams and footings may be designed for an allowable unit soil bearing pressure of up to 2,000 psf.** This value incorporates a safety factor of at least 3.0.

The beams should be a minimum of 12-inches wide to reduce the potential for localized shear failure and the beams should be spaced a maximum of 19-feet apart, in both directions. The Structural Engineer may vary beam depths and spacing based on experience designing and constructing similar type structures on sites with similar subsurface soil conditions.

The design criteria in the table below is provided for a conventional rebar reinforced slab-on-grade foundation at this site based on the *"Design of Slab-On-Ground Foundations"* published by the Wire Reinforcement Institute, Inc. (March 1996) for a PVR of approximately 1-inch:

WRI DESIGN PARAMETERS	
Minimum Select Fill Thickness (ft)	5½
Climatic Rating (Cw)	16
Effective Plasticity Index	25
Soil/Climatic Rating Factor (1-C)	0.11
Maximum Beam Spacing (ft)	20

Laboratory test results and VOLFLO Version 1.5 software have been used to develop soil parameters based on the Post-Tensioning Institute 3rd Edition, "*Design and Construction of Post-Tensioned Slabs-On-Ground*" for the boring locations with a PVR value of approximately 1-inch as indicated in the table below:

3rd EDITION POST TENSION DESIGN PARAMETERS	
Minimum Select Fill Thickness (ft)	5½
Moisture Penetration Distance; Em (center lift) (ft)	9.0
Moisture Penetration Distance; Em (edge lift) (ft)	4.6
Differential Movement; Ym (shrink) (center) (in)	-1.10
Differential Movement; Ym (swell) (edge) (in)	1.60

Slight differential movements of slab-on-grade foundations can cause distress to interior wall partitions, brittle floor coverings and rigid exterior facades resulting in cosmetic damage. The magnitude of movement can be reduced with good construction practices including performing the recommended preparation of the subgrade, compaction of the select fill building pad materials and maintaining the integrity of the beam and footing excavations prior to concrete placement. Placement of closely spaced expansion joints in rigid brick exterior walls is recommended to control the location of potential cracks that may occur due to slight differential foundation movements.

The foundation excavations should be observed by a representative of ROCK prior to steel or concrete placement to assess that the foundation materials are capable of supporting the design loads and to identify the acceptability of the select fill materials under the beams and footings.

Soft or loose zones encountered at the bottom of the beam or footing excavations should be removed to the level of competent materials as directed by the Geotechnical Engineer. Cavities formed as a result of excavation of soft or loose zones should be backfilled with properly compacted select fill.

After opening, beam and footing excavations should be observed, and concrete placed as quickly as possible to avoid exposure of the beam and footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. If it is required that beam and footing excavations be left open an extended period, they should be protected to reduce evaporation or entry of moisture.

PAVEMENT CONSIDERATIONS

In designing the proposed parking areas and driveways, the existing subgrade conditions must be considered together with the expected traffic use and loading conditions.

The conditions that influence pavement design can be summarized as follows:

1. Bearing values of the subgrade. These values can be represented by a California Bearing Ratio (CBR) for the design of flexible asphalt pavements, or a Modulus of Subgrade Reaction (K) for rigid concrete pavements.
2. Vehicular traffic, in terms of the number and frequency of vehicles and their range of axle loads.
3. Probable increase in vehicular use over the life of the pavement.
4. The availability of suitable materials to be used in the construction of the pavement and their relative costs.

Specific laboratory testing to define the subgrade strength (i.e. CBR/K values) has not been performed for this analysis. Based upon local experience and the plasticity index values of the in-situ subgrade soils, the CBR and K value for design have been selected as 3 and 100 pci, respectively.

Since traffic counts and design vehicles have not been provided, it is possible to provide a non-engineered pavement section suitable for light and heavy-duty service based on pavement sections that have provided adequate serviceability for other projects in the area.

Automobile parking areas and the driveways can be designed with either a flexible or rigid pavement. It is important that the exposed subgrade is properly prepared prior to pavement installation.

Flexible Pavements

The recommended light and heavy-duty flexible pavement section options, using the locally available base material, are provided in the following tables:

Light Duty Flexible Pavement (Passenger Car Parking Areas)	
Hot Mix Asphaltic Concrete	2"
Limestone Base Material (TxDOT Item 247 Grade 1-2)	8"
TENSAR Geogrid	TX-5
Compacted Subgrade	6"

Heavy Duty Flexible Pavement (Driveways)	
Hot Mix Asphaltic Concrete	2"
Limestone Base Material (TxDOT Item 247 Grade 1-2)	12"
TENSAR Geogrid	TX-5
Compacted Subgrade	6"

Allowances for proper drainage and proper material selection of base materials are most important for performance of asphaltic pavements. Ruts and birdbaths in asphalt pavements allow for quick deterioration of the pavement primarily due to saturation of the underlying base materials and subgrade soils.

Rigid Concrete Pavements

The use of concrete for paving has become more prevalent in recent years due to the long-term maintenance cost benefits of concrete pavement compared to asphalt pavements. Concrete pavement is recommended in areas that receive continuous repetitive traffic such as the parking lot entrances, loading areas and trash dump approach areas. The recommended light and heavy-duty rigid concrete pavement sections are provided in the following table:

Rigid Pavement	Light Duty (Parking Areas)	Heavy Duty (Driveways)
Reinforced Concrete	5½"	6"
Compacted Subgrade	6"	6"

The heavy-duty concrete at the location of the trash dumpster should be 8-inches in thickness and be large enough to accommodate both the front and rear wheels of the vehicles used to pick up the trash dumpsters. Maintenance or operations managers need to stress the importance of placing the trash dumpsters in their proper locations to reduce the distress trash pickup operations place on the pavement.

Pavement Material Recommendations

Compacted Subgrade - The upper 6-inches of exposed subgrade soils should be compacted to at least 95-percent of the maximum dry density as determined by the standard Proctor test (ASTM D698). The moisture content of the subgrade soils should be maintained at or above the optimum moisture content.

General FILL - After subgrade preparation is complete, the placement of properly compacted General FILL soils may begin in the paved areas to raise the grades, where required. General FILL soils could consist of on-site soils free of organics and other deleterious materials or imported soils with a maximum plasticity index of 30. The FILL used to raise the grade where required in the proposed parking and drive areas should be placed in no greater than 8-inch thick loose lifts. Each lift should be compacted to at least 95-percent of the maximum dry density as determined by the Standard Proctor test (ASTM D698). The moisture content of the General FILL soils should be maintained at or above the optimum moisture content value.

Base Material - Base materials should meet the requirements set forth in the Texas Department of Transportation (TxDOT) 2014 Standard Specifications for Construction of Highways, Streets and Bridges; Item 247, Type A, Grade 1-2. The base material should be placed in maximum 8-inch thick loose lifts and compacted to a minimum density of 95-percent of the maximum dry density as determined by the modified Proctor test (ASTM D1557). The moisture content of the base materials should be maintained within 2-percentage points of the optimum moisture content.

Geogrid - It is recommended that geogrid be placed beneath the base material and on top of the compacted subgrade. Geogrid should be Tensar TX-5 and should be overlapped in accordance with the manufacturer's recommendations. Geogrid will significantly improve the long-term performance of the pavements and reduce cracking.

Hot Mix Asphaltic Concrete - Hot mix asphaltic concrete should meet the requirements set forth in TxDOT Item 340 or 341; Type D surface course. The asphaltic concrete should be compacted to between 91.5 and 96.3-percent of the theoretical density.

Rigid Concrete - The concrete pavement should be properly reinforced and jointed, as per ACI, and should have a minimum 28-day compressive strength of 3,000 psi. Expansion joints should be spaced no greater than 60-feet and should be sealed with an appropriate sealant so that moisture infiltration into the subgrade soils and resultant concrete deterioration at the joints is minimized.

Control joint spacing should not exceed 15-feet and preferably less to adequately control cracking. The joints should be thoroughly cleaned, and sealant should be installed without overfilling before the pavement is opened to traffic.

Based on past experience with concrete pavements supported on similar subgrade soils, ROCK recommends that reinforcement for concrete pavement consist of #4 bars (1/2-inch diameter) spaced at 18-inches on center each way. The splice length for #4 bars should not be less than 20-inches.

SITE IMPROVEMENT METHODS

General Considerations

A majority of foundation related problems are attributable, at least in part, to poor drainage. Cohesive soils can expand or shrink by absorbing or losing water, respectively. Reducing the variation in moisture content can reduce the variation in volume. A number of measures may be used to attain a reduction in subsoil moisture content variations, thus reducing the soil's volume change potential. Some of these measures are outlined below:

- During construction, a positive drainage scheme should be implemented to prevent ponding of water on the subgrade in the foundation and pavement areas.
- Positive drainage should be maintained around the structure through a roof/gutter system connected to piping or directed to paved surfaces, transmitting water away from the foundation perimeters and pavement edges.
- Positive grades sloping away from the foundation should be designed and implemented for the area extending at least 10-feet away from the foundation perimeter.
- Utility trenches can serve as aqueducts that transport water beneath the structure and into foundation excavations causing foundation and floor slab distress and/or moisture transmission related problems. Clay plugs or collars should be installed in trenches just outside the building footprint to prevent horizontal migration of groundwater through trenches and into the building pad.
- A minimum 12-inch clay cap should be installed around the perimeter of the foundation in areas not receiving concrete flatwork.
- Vegetation placed in landscape beds that are adjacent to the structures should be limited to plants and shrubs that will not exceed a mature height of 3-feet. Large bushes and trees should be planted away from the foundations at a distance that will exceed their full mature height and canopy width.
- Irrigation in landscape areas adjacent to the foundations and pavements should be held at a minimum and over-watering that will produce significant moisture content changes below a depth of 1-foot should be avoided.

Project features beyond the scope of those discussed above should be planned and designed similarly to attain good drainage and relatively uniform moisture content within the foundation areas. Poor drainage schemes are generally the primary cause of slab-on-grade foundation problems.

Concrete Flatwork

Concrete site flatwork such as sidewalks and driveways will be subject to PVR movements up to approximately 3-inches when constructed over the clay soils. Changes in the moisture content of the supporting plastic clay soils causes volumetric changes, resulting in differential movements of the flatwork. Provisions in the site development should be made in order to maintain relative uniform moisture contents of the supporting soils.

Individual panels of concrete flatwork should be dowelled together to reduce trip hazards as a result of differential movements within the flatwork. Efforts should be made to avoid having situations where site flatwork panels are partially supported on compacted select fill soils and partially supported on natural in-situ plastic fat clay soils. This may result in differential movement and may also result in a negative slope back to the building causing ponding of water next to the structure. **If it is desired to increase the performance level and reduce the PVR for concrete flatwork adjacent to the building, the select fill building pad should be extended to a distance of 2-feet beyond the perimeter flatwork.**

CONSTRUCTION CONSIDERATIONS

Site Preparation

Within the areas of the subject site where engineered improvements are planned, vegetation, roots, objectionable materials, topsoil, and fill materials should be stripped from the surface. The stripped material should either be stockpiled for use in non-structural / landscaped areas or removed from the site. A stripping depth of at least 6-inches is recommended.

In order to reduce the TEX-124E calculated PVR to approximately 1-inch, the upper clay soils should be undercut as required to provide a minimum depth of 5½-feet of compacted select fill. The undercut excavation should extend at least 5-feet beyond the perimeter of the foundation and a minimum of 2-feet beyond any movement sensitive flatwork and stoops adjacent to the foundation.

Upon completion of the stripping and excavation operations, the exposed subgrade should be proof-rolled with a minimum 15-ton rubber-tired dump truck or loader under the supervision of ROCK to detect any soft areas prior to fill placement. If any soft pockets or pumping areas are identified, the soft materials should be removed to expose firm materials and the excavation replaced with compacted fill. The ROCK Geotechnical Engineer must approve the subgrade condition prior to the placement of engineered select fill materials.

Subgrade Preparation

After proofrolling operations are completed, the exposed subgrade soils should be scarified to a depth of 6-inches, moisture conditioned if necessary, and compacted. The subgrade soils should be compacted to at least 95-percent of the maximum dry density as determined by the standard Proctor (ASTM D698). The moisture content of the subgrade soils should be maintained at or above the optimum moisture content.

Engineered Fill Materials

After subgrade preparation is complete, properly compacted fill soils should be used to raise the site to the design subgrade elevations where engineered improvements are planned. Fill soils placed to raise the site to the design subgrade elevations should consist of select fill for the building structure and general fill soils for the remainder of the site.

Select Fill (Building Area) - Select fill material used at this site for the building pad could consist of imported crushed limestone base. Imported crushed limestone base select fill should meet the plasticity and gradation requirements set forth in Texas Department of Transportation (TxDOT) Standard Specifications 2014; Item 247, Type A, Grade 1-2. Alternate pit run select fill soils should have a maximum liquid limit of 40-percent, a plasticity index between 7 and 18, at least 30-percent retained on the #4 sieve. In any event, at least the final 6-inches of select fill material shall be crushed limestone base.

Select fill soils should be placed in no greater than 8-inch thick loose lifts and shall be compacted to at least 95-percent of the maximum dry density as determined by the modified proctor (ASTM D1557). The moisture content of the select fill soils should be maintained within 2-percentage points of the optimum moisture content. The Geotechnical Engineer shall approve select fill utilized at this site.

General Fill - On-site excavated soils free of organics and deleterious materials or imported soils can be used to raise the site grades as necessary. Imported general fill soils should have a maximum plasticity index (PI) of 30.

General fill soils should be placed in maximum 8-inch thick loose lifts and shall be compacted to at least 95-percent of the maximum dry density as determined by the standard Proctor (ASTM D698). The moisture content of the general fill soils should be maintained at or above the optimum moisture content.

Earthwork and Foundation Acceptance

Exposure to the environment may weaken the soils at the foundation bearing level if excavations remain open for long periods of time. Therefore, it is recommended that the foundation excavations be extended to the design subgrade elevation and the foundation be constructed as soon as possible to reduce potential damage to the bearing soils.

The foundation bearing level should be free of loose or soft soil, ponded water or debris and should be observed prior to concreting by the Geotechnical Engineer, or his designated representative. Foundation concrete should not be placed on soils that have been disturbed by seepage. If the bearing soils are softened by water intrusion, the unsuitable soils must be removed from the foundation excavations and be replaced with properly compacted select fill prior to placement of concrete.

The Geotechnical Engineer, or his designated representative, should approve the condition of the exposed subgrade and monitor the placement of all select fill. As a guideline, a minimum of one in-place density test should be performed on the subgrade and each lift of select fill for each 3,000 SF or a minimum of three in-place densities per testing interval. Any areas not meeting the required compaction should be recompact and retested until compliance is met.

Vapor Retarder

A polyolefin vapor retarder with a permeance of less than 0.1 US perms (ASTM E96) and Class A strength should be placed under the concrete floor slab on the select fill building pad or carton forms, as applicable, to reduce the transmission of water vapor from the supporting soil through the concrete slab and to function as a slip sheet to reduce subgrade drag friction. A film thickness of 10 mils (0.25 mm) is typically used for reduced vapor transmission and durability during and after its installation. The vapor retarder should be installed according to ASTM E1643, "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs."

All penetrations through the vapor retarder should be sealed to ensure its integrity. The vapor retarder should be taped around all openings to ensure the effectiveness of the barrier. Grade stakes should not be driven through the barrier and care should be taken to avoid punctures during reinforcement and concrete placement. Placement of slab concrete directly on the vapor retarder increases the risks of surface dusting, blistering and slab curling making good concrete practice critical. A low water to cement ratio concrete mix design combined with proper and adequate curing procedures will help ensure a good quality slab.

Utilities

Utilities that project through building floors or walls should be designed with either some degree of flexibility, or with sleeves, in order to prevent damage to these lines should movement occur.

Expansion/Control Joints

Expansion and/or control joints should be designed and placed in various portions of the structure, especially rigid exterior masonry walls and interior partition walls. Properly planned placement of these joints will assist in controlling the degree and location of material cracking that normally occurs due to material shrinkage, thermal affects, soil movements and other related structural conditions.

GENERAL COMMENTS

If significant changes are made in the character or location of the proposed project, a consultation should be arranged to review any changes with respect to the prevailing soil conditions. At that time, it may be necessary to submit supplementary recommendations.

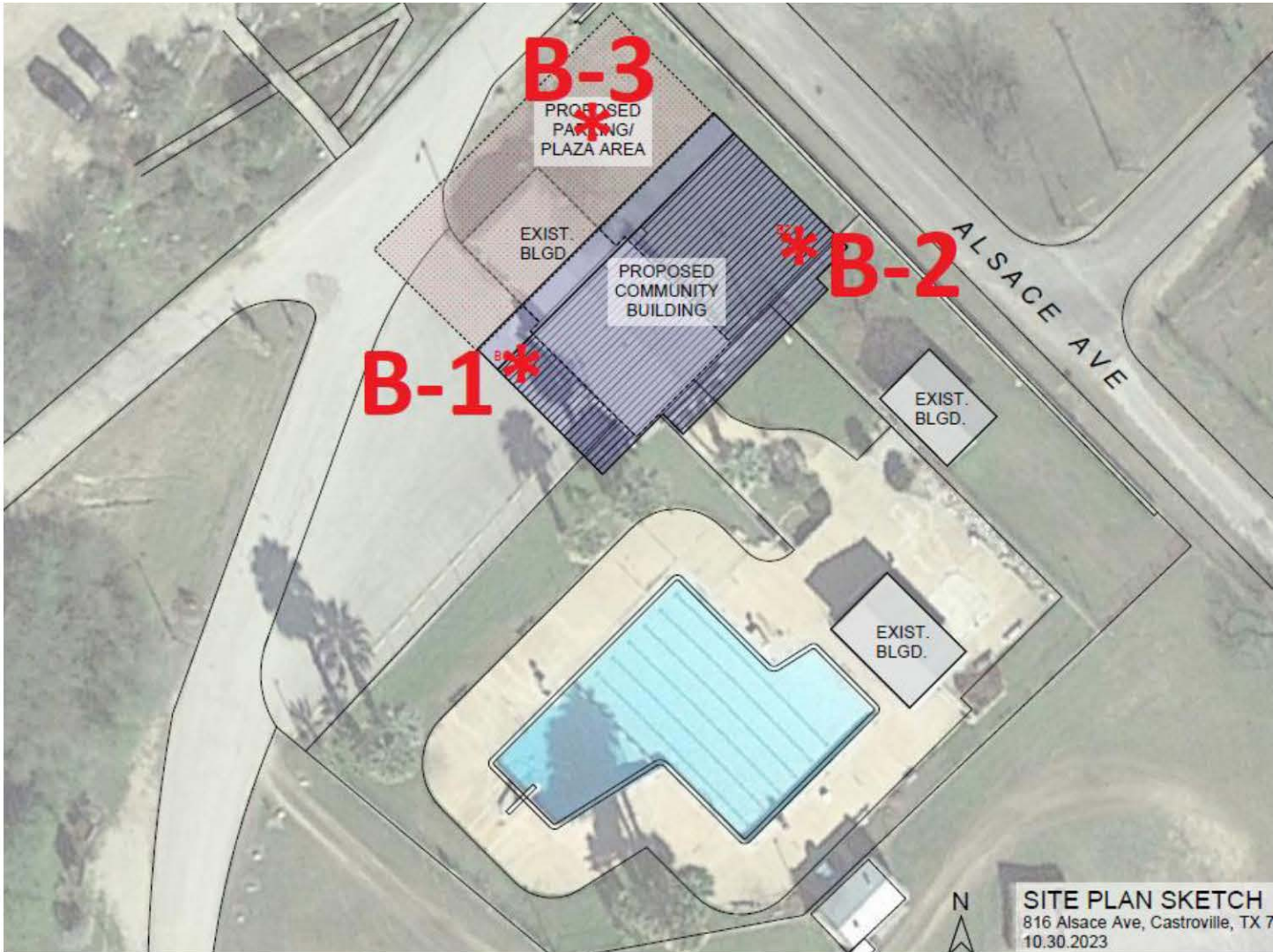
It is recommended that the services of ROCK be engaged to test and evaluate the soils in the undercut excavations prior to placing select fill and in the foundation excavations prior to concreting in order to verify that the bearing soils are consistent with those encountered in the borings. ROCK cannot accept any responsibility for any conditions that deviate from those described in this report, nor for the performance of the foundation and pavements if not engaged to also provide construction observation and testing for this project. If it is required for ROCK to accept any liability, then ROCK must agree with the plans and perform such observation during construction as we recommend.

Sheeting, shoring and bracing of trenches, pits and excavations should be made the responsibility of the contractor and should comply with all current and applicable local, state and federal safety codes, regulations and practices, including the Occupational Safety and Health Administration.

APPENDIX

BORING LOCATION PLAN

L CA CAL
A APP A



February 2, 2023
City of Castroville
C Proiecto G2237 7 1

PAR S AND RECREATION COMM NIT B ILDING
1 Alsace Ave
Castroville e as



ROC ENGINEERING AND TESTING LABORATOR LLC
10 ANDALE STREET
SAN ANTONIO TE AS 7 21
210 000

LOG OF BORING B-1

SHEET 1 of 1



Rock Engineering & Testing Laboratory LLC
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

A UES COMPANY

CLIENT: City of Castroville
PROJECT: Parks & Recreation Community Building
LOCATION: 816 Alsace Ave; Castroville, TX
NUMBER: G223767

DATE(S) DRILLED: 12/12/2023

FIELD DATA					LABORATORY DATA							DRILLING METHOD(S):	
SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTEBERG LIMITS			DRY DENSITY POUNDS/CU. FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	Solid Flight Auger	
						LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX				GROUNDWATER INFORMATION:	
												Groundwater was not encountered during the drilling operations and the boring was dry upon completion of the drilling operations.	
												SURFACE ELEVATION: N/A	
DESCRIPTION OF STRATUM													
ASPHALT= 1/2-INCH, CLAYEY GRAVEL BASE= 4-INCHES													
GRAVELLY LEAN CLAY, brown, moist, stiff. (CL)													
LEAN CLAY, brown, moist, stiff.													
Same as above, very stiff. (CL)													
FAT CLAY, brown, moist, very stiff. (Swell= 1.1%)													
Same as above, stiff.													
Same as above, light brown, very stiff. (CH)													
SILTY CLAY WITH SAND, light brown, moist, firm.													
SILTY SAND WITH GRAVEL, light brown, dry, very dense.													
FAT CLAY, olive-brown, moist, very stiff. (CH)													
Same as above, hard.													
Boring terminated at a depth of 35-feet.													
REMARKS:													
Boring location determined by ROCK. Drilling operations performed by ROCK. GPS Coordinates: N 29.345278°, W -98.882865°													

LOG OF BORING B-2

SHEET 1 of 1



Rock Engineering & Testing Laboratory LLC
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

A UES COMPANY

CLIENT: City of Castroville
PROJECT: Parks & Recreation Community Building
LOCATION: 816 Alsace Ave; Castroville, TX
NUMBER: G223767

DATE(S) DRILLED: 12/12/2023

FIELD DATA				LABORATORY DATA								DRILLING METHOD(S): Solid Flight Auger	
SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS			DRY DENSITY POUNDS/CU. FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Groundwater was not encountered during the drilling operations and the boring was dry upon completion of the drilling operations.		
					LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX				SURFACE ELEVATION: N/A		
					LL	PL	PI				DESCRIPTION OF STRATUM		
		SPT S-1	N=21	6							<u>GRAVELLY LEAN CLAY</u> , brown, dry, very stiff.		
	5	SPT S-2	N=35	10	54	18	36			93	<u>FAT CLAY</u> , brown, moist, hard. (CH)		
		SH S-3	P=4.5+	12							Same as above. (swell= 10.2%)		
		SPT S-4	N=32	12	50	17	33			97	Same as above. (CH)		
	10	SH S-5	P=4.5+	15							Same as above, very stiff.		
		SH S-6	P=4.5+	18							Same as above.		
		SPT S-7	N=23	12	22	15	7			71	<u>SILTY CLAY WITH SAND</u> , light brown, moist, very stiff. (CL-ML)		
	25	SPT S-8	N=25-50/3"	5							<u>CLAYEY SAND WITH GRAVEL</u> , light brown, dry, very dense.		
		SPT S-9	N=29-50/3"	6						39	Same as above.		
	35	SPT S-10	N=34-50/3"	26							<u>FAT CLAY</u> , olive-brown and gray, moist, very hard.		
											Boring terminated at a depth of 35-feet.		
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX P - POCKET PENETROMETER RESISTANCE											REMARKS: Boring location determined by ROCK. Drilling operations performed by ROCK. GPS Coordinates: N 29.345421°, W -98.882575°		

LOG-OF-BORING G223767 LOGS.GPJ ROCK.ETL.GDT 1/11/24

LOG OF BORING B-3

SHEET 1 of 1




Rock Engineering & Testing Laboratory LLC
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

A UES COMPANY

CLIENT: City of Castroville
PROJECT: Parks & Recreation Community Building
LOCATION: 816 Alsace Ave; Castroville, TX
NUMBER: G223767

DATE(S) DRILLED: 12/12/2023

		FIELD DATA			LABORATORY DATA								DRILLING METHOD(S): Solid Flight Auger	
SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS			DRY DENSITY POUNDS/CU. FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	GROUNDWATER INFORMATION: Groundwater was not encountered during the drilling operations and the boring was dry upon completion of the drilling operations.		
						LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX				SURFACE ELEVATION: N/A		
						LL	PL	PI					DESCRIPTION OF STRATUM	
	1	SPT S-1	N=19	4	23	14	9				22	<u>CLAYEY GRAVEL FILL</u> , brown, dry, very stiff. (GC)		
	2											<u>FAT CLAY</u> , brown, dry, very stiff.		
	3	SPT S-2	N=26	7										
	4													
	5	SPT S-3	N=23	14								Same as above, moist.		
	6											Boring terminated at a depth of 6-feet.		
												REMARKS: Boring location determined by ROCK. Drilling operations performed by ROCK. GPS Coordinates: N 29.345526°, W -98.882759°		
N - STANDARD PENETRATION TEST RESISTANCE Qc - STATIC CONE PENETROMETER TEST INDEX P - POCKET PENETROMETER RESISTANCE														

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE



Engineering & Testing Laboratory, LLC

Rock Engineering & Testing Laboratory
10856 Vandale Street
San Antonio, TX 78216
Telephone: 210-495-8000

KEY TO SOIL CLASSIFICATION AND SYMBOLS

UNIFIED SOIL CLASSIFICATION SYSTEM				TERMS CHARACTERIZING SOIL STRUCTURE	
MAJOR DIVISIONS		SYMBOL	NAME		
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW		Well Graded Gravels or Gravel-Sand mixtures, little or no fines	SLICKENSIDED - having inclined planes of weakness that are slick and glossy in appearance FISSURED - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical LAMINATED (VARVED) - composed of thin layers of varying color and texture, usually grading from sand or silt at the bottom to clay at the top CRUMBLY - cohesive soils which break into small blocks or crumbs on drying CALCAREOUS - containing appreciable quantities of calcium carbonate, generally nodular WELL GRADED - having wide range in grain sizes and substantial amounts of all intermediate particle sizes POORLY GRADED - predominantly of one grain size uniformly graded) or having a range of sizes with some intermediate size missing (gap or skip graded)
		GP		Poorly Graded Gravels or Gravel-Sand mixtures, little or no fines	
		GM		Silty Gravels, Gravel-Sand-Silt mixtures	
		GC		Clayey Gravels, Gravel-Sand-Clay Mixtures	
	SAND AND SANDY SOILS	SW		Well Graded Sands or Gravelly Sands, little or no fines	
		SP		Poorly Graded Sands or Gravelly Sands, little or no fines	
		SM		Silty Sands, Sand-Silt Mixtures	
		SC		Clayey Sands, Sand-Clay mixtures	
SILTS AND CLAYS LL < 50	SILTS AND CLAYS LL < 50	ML		Inorganic Silts and very fine Sands, Rock Flour, Silty or Clayey fine Sands or Clayey Silts	
		CL		Inorganic Clays of low to medium plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays	
		OL		Organic Silts and Organic Silt-Clays of low plasticity	
	SILTS AND CLAYS LL > 50	MH		Inorganic Silts, Micaceous or Diatomaceous fine Sandy or Silty soils, Elastic Silts	
		CH		Inorganic Clays of high plasticity, Fat Clays	
		OH		Organic Clays of medium to high plasticity, Organic Silts	
NON USCS MATERIALS			Limestone		
			Marl/Claystone		
			Sandstone		

SYMBOLS FOR TEST DATA	
	— Groundwater Level (Initial Reading)
	— Groundwater Level (Final Reading)
	— Shelby Tube Sample
	— SPT Samples
	— Auger Sample
	— Rock Core
	— Texas Cone Penetrometer
	— Grab Sample

TERMS DESCRIBING CONSISTENCY OF SOIL

COARSE GRAINED SOILS		FINE GRAINED SOILS		
DESCRIPTIVE TERM	NO. BLOWS/FT. STANDARD PEN. TEST	DESCRIPTIVE TERM	NO. BLOWS/FT. STANDARD PEN. TEST	UNCONFINED COMPRESSION TONS PER SQ. FT.
Very Loose	0 - 4	Very Soft	< 2	< 0.25
Loose	4 - 10	Soft	2 - 4	0.25 - 0.50
Medium	10 - 30	Firm	4 - 8	0.50 - 1.00
Dense	30 - 50	Stiff	8 - 15	1.00 - 2.00
Very Dense	over 50	Very Stiff	15 - 30	2.00 - 4.00
		Hard	over 30	over 4.00

Field Classification for "Consistency" of Fine Grained Soils is determined with a 0.25" diameter penetrometer

**SECTION 00 100
BID FORM**

THE PROJECT AND THE PARTIES**1.01 TO**

A City of Castroville
 Cotton
 120 Sorella Street
 Castroville 95007

1.02 FOR

A Project Castroville Community Building
 B Architects Project Number 31522
 1 Alsa Avenue
 Castroville 95007

1.0 DATE BIDDER TO ENTER DATE**1.0 SUBMITTED BY BIDDER TO ENTER NAME AND ADDRESS**

A Bidders Full Name
 1 City State Zip

1.0 OFFER

A BAA P P AL 200 P C May 7 2022 Having examined the Plans of the Project and all matters referred to in the Instructions to Bidders and the Bid Documents prepared by LPA on for the above mentioned project the undersigned hereby offer to enter into a Contract to perform the work for the sum of

dollars

in lawful money of the United States of America All
 Allowances described in Section 01 2100 Allowances are included in Bid sum

B AL A 1 Provide and install appliances included in Section 11 3013 Residential Appliances
 Add the sum of

dollars

to the Base Proposal

C AL A 2 Provide and install some included in L Series sheets and specifications Add the sum of

dollars

to the Base Proposal

AL A 3 Construct other Building Base Proposal shall include associated utilities studied and added for future tie in Add the sum of

dollars

to the Base Proposal

1.0 ACCEPTANCE

A This offer shall be open to acceptance and is irrevocable for ninety (90) days from the bid closing date

B If this bid is accepted by the owner in the time period stated above the following

1 The entire Agreement shall be in seven days of receipt of notice of Award

2 Furnish the required bonds within seven days of receipt of notice of Award

3 Commence work within ten days after written notice to Proceed of this bid

C If this bid is accepted in the time stated and the bidder fails to commence the work or fails to provide the required Bonds the security deposits shall be forfeited as damages to the owner by reason of our failure limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed

In the event our bid is not accepted in the time stated above the required security deposits shall be returned to the undersigned in accordance with the provisions of the Instructions to Bidders unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time

1.07 CONTRACT TIME

- A If this Bid is awarded, the Contractor shall complete the work by April 1, 2025.
- B Not later than the date of the Bid, the Contractor shall provide a completion date. If the Contractor provides an alternate date, the Contractor shall provide a written explanation of the reasons for the alternate date. The Contractor shall be responsible for any delay in completion of the work. The Contractor shall be responsible for any delay in completion of the work.
- 1 The Contractor agrees to a five (5) business day extension of the completion date if the Contractor is notified in writing by the Owner of a change in the scope of work.

1.0 PROPOSAL SECURITY

- A The Contractor shall provide a security in the form of a certified check or cash in the amount of five percent (5%) of the Base Proposal plus all additive alternates if available is attached hereto as a guaranty that the Contractor will unconditionally execute a satisfactory contract and furnish the payment and performance bonds, insurance and satisfy all other requirements for the execution and delivery of the Contract documents and commencement of the work.

1.0 CONTRACTOR'S PERSONNEL

- A The Contractor agrees to employ the following individuals for the entire duration of the work at the positions indicated and agrees not to remove them from the work or re-employ them at other positions or other sites allocated in the Contract documents or approved in writing by the Owner.
- 1 Project Manager
 - 2 Project Superintendent

1.10 REPRESENTATIONS

- A By execution and submission of this Proposal, the Contractor hereby represents and warrants to the Owner as follows:
- 1 The Contractor has no prior experience in construction projects of the same or similar type, nature and class as the work for the Project.
 - 2 The Contractor has read and understands the "Proposal Documents" including the Contract Documents and this Proposal is made in accordance with the "Proposal Documents".
 - 3 The Contractor has carefully inspected the Project site and that from the Contractor's own investigation, the Contractor is satisfied as to the nature and location of the work and the material quality, quantities, materials and difficulties to be encountered, the kind and extent of the equipment and other facilities needed for the performance of the work, the general and local conditions and other items that may in any way affect the work or its performance and the Contractor has correlated the Contractor's site observations with the requirements of the Contract Documents. The Contractor understands and accepts the difficulties and costs associated with the work and the Project site and the potential delays, disruptions in work and costs associated therewith and as included in the considerations in its construction schedule and the Proposal amount.
- The Contractor hereby warrants that the Contractor has no claims, suits, or damages against the Owner, the Consultant, and the Contractor's respective trustees, officers, directors, partners, agents, contractors, consultants, and employees arising out of or in connection with the work or related to the administration, evaluation, ranking, or recommendation of any proposals, any requirements under the "Proposal Documents" or the Contract Documents, any claim, suit, or damages against the Contractor, and the Contractor's respective trustees, officers, directors, partners, agents, contractors, consultants, and employees arising out of or in connection with the work or related to the administration, evaluation, ranking, or recommendation of any proposals, any requirements under the "Proposal Documents" or the Contract Documents.

1.11 ADDENDA

- A The following Addenda have been received, the modifications to the Bid Documents noted below have been considered and all costs are included in the Bid amount.
- 1 Addendum _____
 - 2 Addendum _____
 - 3 Addendum _____

1.12 ATTACHED SCHEDULE AND SELECTION CRITERIA EXHIBITS

- A The following schedules and exhibits are attached to this Proposal form and they are referenced herein.
- 1 Attachment 1 - Conflict of Interest Questionnaire

- 2 Atta ment 2 Certifi ate of nterested Parties
- 3 Atta ment 3 nsuran e Certifi ation
Atta ment Pro osal e urity
- 5 Atta ment 5 Co y of Arti les of n or oration Parterns i Agreements and resolution or oard
minutes em o ering signatory to ind idder attested y an offi er of idder

1.1 BID FORM SIGNAT RE S

- A
- B ull ame of irm
- C Aut ori ed igning ffi er
ame
itle

END OF SECTION

**SECTION 00 200
AGREEMENT FORM**

PART 1 GENERAL

1.01 FORM OF AGREEMENT

1.02 THE AGREEMENT TO BE EXECUTED IS ATTACHED FOLLOWING THIS PAGE.

1.0 RELATED REQUIREMENTS

PART 2 PRODUCTS NOT USED

PART EXECUTION NOT USED

END OF SECTION

CONTRACT AGREEMENT

THIS AGREEMENT is dated as of the _____ day of _____ of the year 20__ by and between the CITY OF CASTROVILLE, TEXAS (Owner) and _____ (Contractor).

Owner and Contractor, in consideration of the mutual covenants set forth herein, agree as follows:

ARTICLE 1 - WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents as listed below:

**Contract Agreement, including all exhibits
Standard General Conditions of the Contract
Supplemental General Conditions
Special Conditions, if any
Technical Specifications
Plans
Performance Bond
Payment Bond**

There are no Contract Documents other than those listed in this Article. The Contract Documents may only be amended, modified, or supplemented as provided in Article 3.3 of the General Conditions.

1.02 The Work is generally described as follows:

- New wood framed building;
- Site improvements including parking, pedestrian pathways, and landscaping; and
- All other appurtenances necessary to complete the Project.

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

The construction of a new 5,245 square foot Community Building and 262 square foot Shower/Toilet Room Building with a multipurpose room, catering space, park director office spaces, pool office, pool concessions, associated storage, mechanical spaces, toilet rooms, showers, and associated mechanical, plumbing, electrical work, and site improvements.

ARTICLE 3 - ARCHITECT

3.01 The Project has been designed by:

LPA, Inc.
1811 South Alamo, Suite 100
San Antonio, Texas 78204
Tel (210) 829-1737
Fax (210) 829-1730

(Architect), who is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Architect in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01 *Time of the Essence*

Time limits stated in the Contract Documents are of the essence of the Contract. In all aspects of the Work, including any time limits for Milestones, Substantial Completion, and Final Completion, time is of the essence of the Contract. Additionally, time limits stated in the Project Schedule are of the essence. By executing this Contract Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

4.02 *Days to Achieve Substantial Completion and Final Payment*

The City of Castroville has established a target commencement date for construction activities no later than **June 1, 2024**. The Work shall be substantially complete within **Three Hundred (300) Calendar Days from the notice to proceed date** and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 30 calendar days after the Substantial Completion date.

4.03 *Liquidated Damages*

Contractor and Owner recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner **Two Hundred Dollars (\$200.00)** per calendar day for each day that expires after the time specified in Paragraph 4.02 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner **Two Hundred Dollars (\$200.00)** per calendar day for each day that expires after the time specified in Paragraph 4.02 for completion and readiness for final payment until the Work is completed and ready for final payment.

4.04 *Special Damages*

A. In addition to the amount provided for in liquidated damages, Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.

B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

4.05 *Potential Impact of COVID-19 Pandemic.*

A. The Parties agree that the COVID-19 virus pandemic does not constitute an event of force majeure. The Contractor expressly recognizes the potential impact of the COVID-19 virus pandemic on completion of the

Work. The Contractor understands and acknowledges that COVID-19 virus may impact the availability of labor or materials critical to the timely completion of the Work, and the Contractor shall reasonably anticipate and account for these potential disruptions related to the Project and completion of the Work. The Contractor may, at its discretion, purchase materials in advance of its incorporation into the Work to secure materials pricing, and submit a pay application for those materials on hand costs in accordance with Article 14 of the General Conditions.

ARTICLE 5 - CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follows, subject to adjustment under the Contract for all Work. The Contract Price shall be _____ Dollars (\$.00), subject to additions and deductions as provided in the Contract Documents. Contractor shall prepare a baseline Project Schedule and Schedule of Values on which the Contract Price is based.

5.02 For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item):

Unit Price Work					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Extended Price
Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 11.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Architect.

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

Contractor shall submit Applications for Payment on the 15th of the month to the Architect. Payment by Owner, following review of the Application for Payment by the Architect, shall be made in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Architect as provided in the General Conditions. Each Application for Payment shall be based on the most recent Schedule of Values submitted by the Contractor in accordance with the Contract Documents.

6.02 Progress Payments; Retainage

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment within 30 days of the City of Castroville's acceptance of the payment application:

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts

as Architect may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions:

- a. 95% (ninety-five percent) of Work completed;
- b. 95% (ninety-five percent) of cost of materials and equipment not incorporated in the Work.

6.03 *Final Payment*

Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price, including any retainage held, as recommended by Architect as provided in said Paragraph 14.07 of the General Conditions.

ARTICLE 7 – CONTRACTOR’S REPRESENTATIONS

7.01 To induce Owner to enter into this Agreement, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has obtained and carefully studied (or assumes responsibility for doing so) all examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto.

E. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

F. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

G. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

H. Contractor has given Architect written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Architect is acceptable to Contractor.

I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 8 - MISCELLANEOUS

8.01 *Terms*

Terms used in this Agreement will have the meanings stated in the General Conditions.

8.02 *Assignment of Contract*

No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents. Should an assignment occur, the terms of this provision survive and control any further assignment by an assignee.

8.03 *Successors and Assigns*

Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

8.04 *Severability*

Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

8.05 *Jurisdiction; Venue*

This Contract shall be subject to and governed under the laws of the State of Texas without regard to its conflict of law principles. Any and all obligations and payments are due and performable and payable in Waller County, Texas. The parties agree that exclusive and mandatory venue for purposes of any and all lawsuits, cause of action, arbitration, or any other dispute(s) shall be in a state district court in Waller County, Texas.

8.06 *Confidentiality*

Any information deemed to be confidential or proprietary by the Contractor should be clearly annotated on the pages where confidential or proprietary information is contained. The City of Castroville cannot guarantee that it will not be required to disclose all or part of any public record under Texas Public Information Act, since information deemed to be confidential or proprietary by the Contractor may not be confidential or proprietary under Texas Law, or pursuant to a Court order. Under the Public Information Act, the City of Castroville must disclose certain contracting information and the law presumes that most contracting information is public. Certain types of contracting information must generally be released under the Public Information Act: overall price; price and description of items or services to be delivered; delivery and service deadlines; remedies for breach of contract; identity of the parties to a contract; execution and effective dates; and information connected to a vendor or contractor's performance on the contract. Additionally, information regarding performance under the contract, including breaches of contract, contract variances, amendments, liquidated damages, and other penalties for non-performance, must generally be released under the Public Information Act.

8.07 *Contracts with Companies Engaged in Business with Iran, Sudan or Foreign Terrorist Organizations Prohibited*

A. The Contractor represents that neither it nor any of its parent company, wholly-or majority-owned subsidiaries, and other affiliates is a company identified on a list prepared and maintained by the Texas Comptroller of Public Accounts under Section 2252.153 or Section 2270.0201, Texas Government Code, as amended, and posted on any of the following pages of such officer's internet website:

<https://comptroller.texas.gov/purchasing/docs/sudan-list.pdf>,
<https://comptroller.texas.gov/purchasing/docs/iran-list.pdf>, or
<https://comptroller.texas.gov/purchasing/docs/fto-list.pdf>.

B. The foregoing representation is made solely to comply with Section 2252.152, Texas Government Code, as amended, and to the extent such Section does not contravene applicable federal or State law and excludes the Contractor and each of its parent company, wholly-or majority-owned subsidiaries, and other affiliates, if any, that the United States government has affirmatively declared to be excluded from its federal sanctions regime relating to Sudan or Iran or any federal sanctions regime relating to a foreign terrorist organization. The Contractor understands “affiliate” to mean an entity that controls, is controlled by, or is under common control with the Contractor and exists to make a profit.

8.08 Prohibition on Contracts with Companies Boycotting Israel

A. The Contractor hereby verifies that it and its parent company, wholly-or majority owned subsidiaries, and other affiliates, if any, does not boycott Israel and, to the extent this Agreement is a contract for goods or services, will not boycott Israel during the term of this Agreement as described in Chapter 2271 of the Texas Government Code, as amended. **[USE IN LIEU OF THE PREVIOUS SENTENCE IF THE CONTRACTOR IS EXEMPT FROM THE ISRAEL BOYCOTT REQUIREMENT—The Contractor hereby declares that it is exempt from Chapter 2271 of the Texas Government Code, as amended, relating to the prohibition on contracts with companies boycotting Israel.]** The foregoing verification is made solely to comply with Chapter 2271.002 of the Texas Government Code, as amended, and to the extent such Section does not contravene applicable federal and State law. As used in the foregoing verification, “boycott Israel” means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes. The Contractor understands “affiliate” to mean an entity that controls, is controlled by, or is under common control with the Contractor and exists to make a profit.

8.09 *Contracts with Companies Engaged in Business with Iran, Sudan or Foreign Terrorist Organizations Prohibited*

A. The Contractor represents that neither it nor any of its parent company, wholly-or majority-owned subsidiaries, and other affiliates is a company identified on a list prepared and maintained by the Texas Comptroller of Public Accounts under Section 2252.153 or Section 2270.0201, Texas Government Code, as amended, and posted on any of the following pages of such officer’s internet website:

<https://comptroller.texas.gov/purchasing/docs/sudan-list.pdf>,
<https://comptroller.texas.gov/purchasing/docs/iran-list.pdf>, or
<https://comptroller.texas.gov/purchasing/docs/fto-list.pdf>.

B. The foregoing representation is made solely to comply with Section 2252.152, Texas Government Code, as amended, and to the extent such Section does not contravene applicable federal or State law and excludes the Contractor and each of its parent company, wholly-or majority-owned subsidiaries, and other affiliates, if any, that the United States government has affirmatively declared to be excluded from its federal sanctions regime relating to Sudan or Iran or any federal sanctions regime relating to a foreign terrorist organization. The Contractor understands “affiliate” to mean an entity that controls, is controlled by, or is under common control with the Contractor and exists to make a profit.

8.10 *Prohibition on Contracts with Companies in China, Iran, North Korea, or Russia*

- A. To the extent this Agreement relates to critical infrastructure in the State of Texas, the Contractor represents the following:
1. it is not owned by or the majority of stock or other ownership interest in the Contractor is not held or controlled by:
 - a. individuals who are citizens of China, Iran, North Korea, Russia, or a country designated by the Governor of Texas as a threat to critical infrastructure under Section 2274.0103 of the Texas Government Code, as amended (“designated country”); or
 - b. a company or other entity, including a governmental entity, that is owned or controlled by citizens of or is directly controlled by the government of China, Iran, North Korea, Russia, or a designated country; or
 2. it is not headquartered in China, Iran, North Korea, Russia, or a designated country.
- B. The foregoing representation is made solely to comply with Chapter 2274 of the Texas Government Code, as amended, and to the extent such Section does not contravene applicable federal or State law. As used in the foregoing verification, “critical infrastructure” means a communication infrastructure system, cybersecurity system, electric grid, hazardous waste treatment system, or water treatment facility.

8.11 *Prohibition on Contracts with Companies Boycotting Energy Companies*

- A. The Contractor hereby verifies that it and its parent company, wholly-or majority owned subsidiaries, and other affiliates, if any, do not boycott energy companies and, to the extent this Agreement is a contract for goods or services, will not boycott energy companies during the term of this Agreement as described in Chapter 2274 of the Texas Government Code, as amended. [USE IN LIEU OF THE PREVIOUS SENTENCE IF THE CONTRACTOR IS EXEMPT FROM THE ENERGY COMPANY BOYCOTT REQUIREMENT—The Contractor hereby declares that it is exempt from Chapter 2274 of the Texas Government Code, as amended, relating to the prohibition on contracts with companies boycotting certain energy companies.]
- B. The foregoing verification is made solely to comply with Section 2274.002 of the Texas Government Code, as amended, and to the extent such Section does not contravene applicable federal and State law. As used in the foregoing verification, “boycott energy companies” has the meaning used in Section 809.001 of the Texas Government Code, as amended. The Contractor understands “affiliate” to mean an entity that controls, is controlled by, or is under common control with the Contractor and exists to make a profit.

8.12 *Prohibition on Contracts with Companies that Discriminate Against Firearm and Ammunition Industries*

- A. The Contractor hereby verifies that it and its parent company, wholly-or majority owned subsidiaries, and other affiliates, if any, do not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association and, to the extent this Agreement is a contract for goods or services, will not discriminate against a firearm entity or firearm trade association during the term of this Agreement as described in Chapter 2274 of the Texas Government Code, as amended. [USE IN LIEU OF THE PREVIOUS SENTENCE IF THE CONTRACTOR IS EXEMPT FROM THE DISCRIMINATE AGAINST FIREARM AND AMMUNITION INDUSTRIES CONTRACT REQUIREMENT—The Contractor hereby declares that it is exempt from Chapter 2274 of the Texas Government Code, as amended, relating to the prohibition on contracts with companies that discriminate against a firearm entity or firearm trade association.]

- B. The foregoing verification is made solely to comply with Section 2274.002 of the Texas Government Code, as amended, and to the extent such Section does not contravene applicable federal and State law. As used in the foregoing verification, “discriminate against a firearm entity or firearm trade association” has the meaning used in Section 2274.001(3) of the Texas Government Code, as amended. The Contractor understands “affiliate” to mean an entity that controls, is controlled by, or is under common control with the Contractor and exists to make a profit.

8.13 *Texas Public Information Act*

A. The Contractor recognizes that this Project is publicly owned, and the Owner is subject to the disclosure requirements of the Texas Public Information Act (the “TPIA”). As part of its obligations within the Contract Documents, the Contractor agrees, at no additional cost to the Owner, to cooperate with the Owner for any particular needs or obligations arising out of the Owner’s obligations under the TPIA. This acknowledgement and obligation are in addition to and complimentary to the Owner’s audit rights.

B. This provision applies if the Agreement has a stated expenditure of at least \$1 million in public funds for the purchase of goods or services by the Owner or results in the expenditure of at least \$1 million in public funds for the purchase of goods or services by the Owner in a fiscal year of the City of Castroville (the Owner).

C. The Contractor must (1) preserve all contracting information related to the Agreement as provided by the records retention requirements applicable to the Owner for the duration of the Agreement; (2) promptly provide to the Owner any contracting information related to the Agreement that is in the custody or possession of the Construction Manager on request of the Owner; and (3) on completion of the Agreement, either:

- i. provide at no cost to the Owner all contracting information related to the Agreement that is in the custody or possession of the Contractor; or
- ii. preserve the contracting information related to the Agreement as provided by the records retention requirements applicable to the Owner.

D. The requirements of Subchapter J, Chapter 552, Texas Government Code, may apply to this Agreement and the Contractor agrees that the Agreement can be terminated if the Contractor knowingly or intentionally fails to comply with a requirement of that subchapter.

ARTICLE 9 - INSURANCE

9.01 *Evidence of Contractor’s Insurance*

When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured, the certificates and other evidence of insurance required to be provided by Contractor in accordance with the Insurance Rider that is Exhibit A to the General Conditions, which is attached hereto and incorporated herein by reference.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement in duplicate. One counterpart each has been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or identified by Owner and Contractor or on their behalf.

This Agreement will be effective on _____, _____ (which is the Effective Date of the Agreement).

OWNER:

CITY OF CASTROVILLE, TEXAS

By:_____

Printed Name:_____

Title:_____

[CORPORATE SEAL]

Attest:_____

Title:_____

Address for giving notices:

(If Owner is a corporation, attached evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Owner-Contractor Agreement.)

CONTRACTOR:

By:_____

Printed Name:_____

Title:_____

[CORPORATE SEAL]

Attest:_____

Title:_____

Address for giving notices:

License No.:_____
(Where Applicable)

Agent for service or process:

(If Contractor is a corporation or a partnership, attach evidence or authority to sign.)

END OF DOCUMENT

**SECTION 00 7200
GENERAL CONDITIONS**

FORM OF GENERAL CONDITIONS

1.01 THE GENERAL CONDITIONS APPLICABLE TO THIS CONTRACT IS ATTACHED FOLLOWING THIS PAGE.

END OF SECTION

Bidding Requirements, Contract Forms & Conditions of the Contract
STANDARD GENERAL CONDITIONS OF THE CONTRACT

**STANDARD
GENERAL CONDITIONS
OF THE
CONTRACT**

**Prepared by
CITY OF CASTROVILLE, TEXAS**

Bidding Requirements, Contract Forms & Conditions of the Contract
STANDARD GENERAL CONDITIONS OF THE CONTRACT

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GENERAL CONDITIONS

ARTICLE 1- DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Request for Bids ("RFB"), Bidding Requirements, other documents included with the published RFB, and the Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids or Proposals which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
2. *Agreement*--The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
3. *Application for Payment*--The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
5. *Change Order*--A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
6. *Change Proposal* -- A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both.
7. *Claim*--A demand or assertion by the Contractor duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
8. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
9. *Engineer*--The individual or entity named as such in the Agreement.
10. *Field Order*--A written order issued by Engineer or Owner which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

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11. *General Requirements*—The General Requirements pertain to all sections of the Specifications.
12. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.
13. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
14. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
15. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.
16. *PCBs*—Polychlorinated biphenyls.
17. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
18. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
19. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
20. *Related Entity* — An officer, director, partner, employee, agent, consultant, subcontractor, subsidiary or affiliate of the referenced entity or party.
21. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
22. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
23. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
24. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.

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25. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.

26. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

27. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

28. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.

B. Defective

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents, or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

C. Furnish, Install, Perform, Provide

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

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D. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

A. Contractor shall deliver to Owner such bonds as Contractor may be required to furnish within ten (10) days of the date on which Contractor signs the Agreement. Contractor shall not be permitted to commence performance until the bonds have been delivered even though the Contract time may have commenced.

B. Evidence of Insurance: Before any Work at the Site may commence, Contractor shall deliver to the Owner certificates of insurance and policy endorsements pages for all insurance policies that may be required of Contractor by the Contract Documents evidencing compliance with the Owner's insurance requirement as required in Article 5 and Exhibit A, Owner's Insurance Requirements, to these General Conditions.

2.02 Copies of Documents

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 Commencement of Contract Times; Notice to Proceed

A. The Contract Times will commence upon issuance of a Notice to Proceed by the Owner.

2.04 Commencement of Performance

A. Contractor may commence performance upon receipt of the Notice to Proceed and in accordance with any terms and dates contained therein.

2.05 Before Starting Construction

A. *Preliminary Schedules:* Within ten (10) days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to the Owner and Engineer:

1. a preliminary Progress Schedule; indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, identifying the critical path for the Work, and including any Milestones specified in the Contract Documents;
2. a preliminary Schedule of Submittals; and
3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

B. Contractor represents that Contractor's preliminary Progress Schedule has been prepared and is based upon Contractor's own knowledge, understanding, and judgment of conditions and hazards, known and anticipated, and does not rely on any representations by Owner.

2.06 Preconstruction Conference

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to

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discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 *Designation of Authorized Representatives*

A. Prior to or within three (3) days of the Notice to Proceed, the Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.08 *Initial Acceptance of Schedules*

A. At least ten (10) days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Owner as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional ten (10) days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Owner.

1. The Progress Schedule will be acceptable to Owner if it provides an orderly progression of the Work to completion within the Contract Times.
2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

2.09 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract Documents, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or accessible digital format, either directly, or through access to a secure Project website.
- B. Contractor and all of Contractor's personnel shall maintain and save said electronic data in a format producible to Owner, if required for an audit as allowed by section 17.10 or otherwise. Said preservation requirement shall apply to all electronic transmittals allowed by this section 2.09, including all text and electronic mail messages.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.

3.02 *Reference Standards*

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A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, or Engineer, or any of, their Related Entities, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.05.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof. Should Contractors perform the Work after discovery of such a conflict without reporting the conflict or before receipt of a clarification or interpretation by Engineer, Contractor will be solely liable for any correction or other measures that may be required to overcome the conflict or bring the Work into compliance with the Contract Documents.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

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A. During the performance of the Work and until final payment, Contractor shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder. Owner shall have sole authority to accept the Work. Action of the Engineer shall not bind Owner to acceptance of the Work, or any part thereof, nor shall any act of the Engineer be relied upon by Contractor as an indicator of acceptance by the Owner.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 10.

D. If the Work required by a Drawing or Specification identifies or requires a specific piece of equipment, such Drawing or Specification shall indicate the manufacturer's part number or reference data. If specific equipment is required, the Drawings or Specifications shall indicate the design dimensions and the minimum and maximum allowable operating tolerances for any such equipment, where applicable.

3.05 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive. No verbal or written communication other than a Change Order or Work Change Directive shall constitute a change to the Contract Documents.

B. The requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;
2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification.

C. The prohibition of this Paragraph will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within sixty (60) days, after which the receiving party shall be deemed to have

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accepted the data thus transferred. Any errors detected within the sixty (60)-day acceptance period will be corrected by the transferring party.

1. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 Availability of Lands

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Times as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

B. Owner shall provide any easements for ingress or egress necessary for access to the Site.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment for which the Site and any Owner-provided easements do not provide.

4.02 Subsurface and Physical Conditions

A. Contractor accepts the responsibility to satisfy itself as to the soil conditions and nature and type of geological formations in and through which this Project will be constructed. Such information as may be obtained from the test borings and accompanying notations shown on the plans is merely for the guidance of the Contractor and is not to be construed in any manner as a guarantee by the Owner that such conditions of sub-surface strata are infallible.

B. Contractor waives any and all rights to make a claim against Owner relating to representations related to geotechnical data provided in the contract documents, plans and specifications. The locations of the test holes, if applicable, are shown in the Geotechnical Report. Logs of these test holes are included in the Geotechnical Report. Test hole information represents subsurface characteristics to the extent indicated and only for the point location of the test hole. Contractor shall make its own interpretation of the character and condition of the materials, which will be encountered. Contractor may, at its own expense, make additional surveys and investigations as it may deem necessary to determine conditions, which will affect performance of the Work.

C. *Reports and Drawings.* The Supplementary or Special Conditions may identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and
2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

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D. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" provided and as contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary or Special Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

Contractor waives and expressly acknowledges that it does not possess and may not maintain any claims against Owner due to the inclusion or omission from the bid documents or the contract documents any data concerning geotechnical, hydrological or other similar data and studies that may be known to the Owner or its Engineer, regardless of whether such data was considered in the design.

4.03 Differing Subsurface or Physical Conditions

A. *Notice:* If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments*

1. The Contract Times will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's time required for performance of the Work; subject, however, such condition must meet any one or more of the categories described in Paragraph 4.03.A.
2. Contractor shall not be entitled to any adjustment in the Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

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3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Times, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities shall not be liable to Contractor for any increase in the Contract Sum or any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with the Project as a result of differing subsurface or physical conditions.

4.04 *Underground Facilities*

A. *Shown or Indicated*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data,
 - b. locating all Underground Facilities, regardless of whether shown or indicated in the Contract Documents,
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the location of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Times, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Times, Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments,

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and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

B. Contractor shall note the location of all reference points and controls on a set of red-lined drawings or exhibits to be maintained at all time on the jobsite or the location of Contractor's project management personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings*: Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer in writing within twenty-four (24) hours of the discovery of such condition. Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs and deduct all costs incurred from the contract balance or if no contract balance, may file a claim for costs.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Times, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, Owner may issue a Work Directive or notify Contractor of its decision and Contractor may make a Claim as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, the

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Contractor may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER AND ITS OFFICIALS, OFFICERS, DIRECTORS, PARTNERS, EMPLOYEES, AGENTS, CONSULTANTS, AND SUBCONTRACTORS OF EACH AND ANY OF THEM FROM AND AGAINST ALL CLAIMS, COSTS, LOSSES, AND DAMAGES (INCLUDING BUT NOT LIMITED TO ALL FEES AND CHARGES OF ENGINEERS, ARCHITECTS, ATTORNEYS, AND OTHER PROFESSIONALS AND ALL COURT OR ARBITRATION OR OTHER DISPUTE RESOLUTION COSTS) ARISING OUT OF OR RELATING TO A HAZARDOUS ENVIRONMENTAL CONDITION CREATED BY CONTRACTOR OR BY ANYONE FOR WHOM CONTRACTOR IS RESPONSIBLE.

H. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

4.07. Hazardous Materials and Waste

A. Where hazardous materials are brought to or otherwise encountered at the site, Contractors shall take necessary precautions and exercise a standard of care sufficient to properly address the hazardous material or waste as may be required. Contractor shall properly containerize, label, and transport such hazardous materials and waste as may be required by Owner or any other governmental or regulatory body having jurisdiction or control over the handling, storage or disposal of such hazardous materials or waste. Upon request by Owner, Contractor shall furnish copies of all manifests and/or bills of lading identifying the generation and ultimate disposal of all materials that may be the subject of referenced regulations.

ARTICLE 5 - BONDS AND INSURANCE

5.01 Performance, Payment, and Other Bonds

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall be in accordance with Texas Government Code Chapters 2253 and 2269.

B. All bonds shall be in the form prescribed by the Owner in the Contract Documents. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements above, Contractor shall promptly notify Owner and Engineer and shall, within twenty (20) days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements above.

D. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 15.

5.02 Licensed Sureties and Insurers

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in

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the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Insurance Rider that is Exhibit A to these General Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured identified in Exhibit A to these General Conditions, certificates of insurance, policy endorsements page (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

5.04 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Insurance Rider to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against all other individuals or entities identified in the Insurance Rider to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

ARTICLE 6—CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. The Contractor shall prosecute the Work in a good and workmanlike manner, continuously and diligently in accordance with generally accepted standards for projects similar to the Project, using qualified, careful, and efficient workers, in conformity with the provisions of the Agreement and in strict compliance with the Contract Documents and with Laws and Regulations.

B. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall perform the Work in strict accordance with the Contract Documents.

C. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written consent of Owner. Such consent shall not be unreasonably withheld. Contractor shall not employ any superintendent on the Project, whether initially or as a replacement, against whom Owner may have reasonable objection. The superintendent shall fluently speak the English language. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

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6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer. Contractor shall notify the Engineer and Owner in writing of such request no less than 3 days prior to the requested work date for performance of Work on Saturday, Sunday, or any legal holiday.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work, regardless whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.08 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for Owner's acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no

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substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items.* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item. For the purposes of this sub-Paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

- a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole,
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
- b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times, and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.
- d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;
 - b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and

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- b) available engineering, sales, maintenance, repair, and replacement services;
- 4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. Engineer's Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination. Use of an unapproved "or-equal" item will render such Work defective and will be subject to Article 13 provisions.

D. Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. Engineer's Cost Reimbursement: Engineer may record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. Contractor's Expense: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

G. Effect of Engineer's Determination: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 6.05.E, by timely submittal of a Change Proposal.

6.06 Concerning Subcontractors, Suppliers, and Others

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection.

B. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

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C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER AND ENGINEER, AND THE OFFICIALS, OFFICERS, DIRECTORS, PARTNERS, EMPLOYEES, AGENTS, CONSULTANTS AND SUBCONTRACTORS OF EACH AND ANY OF THEM FROM AND AGAINST ALL CLAIMS, COSTS, LOSSES, AND DAMAGES (INCLUDING BUT NOT LIMITED TO ALL FEES AND CHARGES OF ENGINEERS, ARCHITECTS, ATTORNEYS, AND OTHER PROFESSIONALS AND ALL COURT OR ARBITRATION OR OTHER DISPUTE RESOLUTION COSTS) ARISING OUT OF OR RELATING TO ANY INFRINGEMENT OF PATENT RIGHTS OR COPYRIGHTS INCIDENT TO THE USE IN THE PERFORMANCE OF THE WORK OR RESULTING FROM THE INCORPORATION IN THE WORK OF ANY INVENTION, DESIGN, PROCESS, PRODUCT, OR DEVICE NOT SPECIFIED IN THE CONTRACT DOCUMENTS.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner may assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Contractor shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

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A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, with the specific exception of compliance with all applicable building codes, Contractor has no responsibility or liability for determining whether the Work as described in the Contract Documents complies with applicable Laws or Regulations.

6.10 Taxes

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

B. The Owner enjoys limited tax-exempt status as a municipality of the State of Texas. To enjoy the cost-savings benefits of its tax-exempt status, the Owner will provide a Tax Exemption Certificate to the Contractor for use on the Project. The Contractor shall use that certificate to exempt any purchases made for the Work from taxes. All savings for the tax-exempt status will be passed on to the Owner by the Contractor. The Contractor agrees to bind all Subcontractors of any tier to the obligation to present and use the Tax Exemption Certificate and pass all savings to the Owner.

6.11 Use of Site and Other Areas

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER, AND ITS OFFICIALS, OFFICERS, DIRECTORS, PARTNERS, EMPLOYEES, AGENTS, CONSULTANTS AND SUBCONTRACTORS OF EACH AND ANY OF THEM FROM AND AGAINST ALL CLAIMS, COSTS, LOSSES, AND DAMAGES (INCLUDING BUT NOT LIMITED TO ALL FEES AND CHARGES OF ENGINEERS, ARCHITECTS, ATTORNEYS, AND OTHER PROFESSIONALS AND ALL COURT OR ARBITRATION OR OTHER DISPUTE RESOLUTION COSTS) ARISING OUT OF OR RELATING TO ANY CLAIM OR ACTION, LEGAL OR EQUITABLE, BROUGHT BY ANY SUCH OWNER OR OCCUPANT AGAINST OWNER, OR ANY OTHER PARTY INDEMNIFIED HEREUNDER TO THE EXTENT CAUSED BY OR BASED UPON CONTRACTOR'S PERFORMANCE OF THE WORK.

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B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 Record Documents

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Owner. Delivery of a complete set of record documents to Owner is a condition precedent to Final Completion.

6.13 Safety and Protection

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall comply with applicable Laws and Regulations regarding safety, and shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;
2. all of the Work as well as all materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance

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with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

E. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.
- B. Contractor shall maintain Material Safety Data Sheets (MSDS), where applicable, for any chemical products. The MSDS(s) shall be made available to Owner or Engineer upon request.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.08). Each submittal will be identified as Engineer may require.

1. Shop Drawings

- a. Submit number of copies specified in the General Requirements.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. Samples: Contractor shall also submit Samples to Engineer for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals.

- a. Submit number of Samples specified in the Specifications.
- b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

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C. Submittal Procedures

1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:
 - a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;
 - c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and
 - d. each Shop Drawing or Sample are coordinated with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample Submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample.
3. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order. Should Contractor seek and adjustment to the Contract Time due to the failure of Engineer to timely review submittals in accordance with the terms contained in the Contract Documents, Contractor must provide information required by and in accordance with articles 10 and 12 of these general conditions. Contractor expressly waives and acknowledges that it shall not be entitled to an adjustment of the Contract Sum, delay damages, or any other type or category of monetary damages due to the Engineer's review.
4. Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall not result in such item becoming a Contract Document.
5. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 6.17.D.2.

E. *Resubmittal Procedures*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's

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time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

A. The Contractor warrants to the Owner 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 strictly conform to the requirements of the Contract Documents and will be performed in a good and workmanlike manner, and will be free from defects. Work, materials, or equipment not conforming to these requirements may be considered defective.

B. Contractor's warranty and guarantee hereunder excludes remedy for defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
2. normal wear and tear under normal usage.

C. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

D. Contractor's obligation to perform and complete the Work in strict accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;
2. recommendation by Engineer or payment by Owner of any progress or final payment;
3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. use or occupancy of the Work or any part thereof by Owner;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

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F. The Contractor warrants and guarantees for one (1) year from Final Completion, or for a longer period if expressly stated in the Contract Documents, the Work. This includes a Warranty and Guarantee against any and all defects. The Contractor must correct any and all defects in material and/or workmanship which may appear during the Warranty and Guarantee period, or any defects that occur within one (1) year of Final Completion even if discovered more than one (1) year after Final Completion, by repairing (or replacing with new items or new materials, if necessary) any such defect at no cost to the Owner, within a reasonable period of time, and to the Owner's satisfaction.

6.20 *Indemnification*

A. TO THE FULLEST EXTENT PERMITTED BY LAWS AND REGULATIONS, CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS OWNER AND ITS OFFICIALS, OFFICERS, DIRECTORS, PARTNERS, EMPLOYEES, AGENTS, AND CONSULTANTS OF EACH AND ANY OF THEM FROM AND AGAINST ALL CLAIMS, COSTS, EXPENSES, LOSSES, AND DAMAGES (INCLUDING BUT NOT LIMITED TO ALL FEES AND CHARGES OF ENGINEERS, ARCHITECTS, ATTORNEYS, AND OTHER PROFESSIONALS AND ALL COURT OR ARBITRATION OR OTHER DISPUTE RESOLUTION COSTS REGARDLESS OF WHETHER SUCH FEES, COSTS OR EXPENSES ARE INCURRED PRIOR TO OR DURING THE PENDENCY OF LITIGATION) ARISING OUT OF OR RELATING TO THE PERFORMANCE OF THE WORK. SUCH INDEMNITY OBLIGATIONS SHALL INCLUDE, BUT ARE NOT LIMITED TO A CLAIM, COST, EXPENSE, LOSS, OR DAMAGE THAT IS ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE, OR DEATH, OR TO INJURY TO OR DESTRUCTION OF TANGIBLE PROPERTY, INCLUDING THE LOSS OF USE RESULTING THEREFROM. ALL INDEMNITY OBLIGATIONS OF CONTRACTOR SHALL BE LIMITED TO THE EXTENT CAUSED BY ANY NEGLIGENT ACT OR OMISSION OF CONTRACTOR, ANY SUBCONTRACTOR, ANY SUPPLIER, OR ANY INDIVIDUAL OR ENTITY DIRECTLY OR INDIRECTLY EMPLOYED BY, OR UNDER THE SUPERVISION OF, ANY OF THEM TO PERFORM ANY OF THE WORK OR ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed 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 Engineer.

C. Owner shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings

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and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for, nor warrant, the adequacy of the design, performance criteria, or design criteria required by the Contract Documents, Plans, and Specifications, except for such portions of the design as may have been delegated to Contractor pursuant to this section 6.21.

ARTICLE 7 - OTHER WORK AT THE SITE

7.01 Related Work at Site

A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and
2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 Coordination

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
2. the specific matters to be covered by such authority and responsibility will be itemized; and
3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 Legal Relationships

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A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.

C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 Communications to Contractor

A. For all Project and performance of Work matters, Owner will issue all communications to Contractor through Engineer. However, Owner may, at its discretion, issue communications related to the Project directly to Contractor. In all such direct communications, Owner will endeavor to copy Engineer.

8.02 Replacement of Engineer

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer, whose status under the Contract Documents shall be that of the former Engineer.

8.03 Furnish Data

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 Pay When Due

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

8.05 Lands and Easements; Reports and Tests

A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 Insurance

A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 Change Orders

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 Inspections, Tests, and Approvals

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A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer. Engineer shall not have the authority to bind the Owner as that authority lies with the Owner's representative designated in Paragraph 2.07 or the city council of the City of Castroville, but Engineer may communicate on behalf of Owner in all Project matters. Where in these Contract Documents actions are designated to the Engineer for performance, to the extent said actions do not involve technical matters, the Owner may act for itself and shall not be bound to an action by Engineer as a condition precedent.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of

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construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary or Special Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary or Special Conditions.

9.04 *Authorized Variations in Work*

A. Owner and Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work that Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Contractor, subject to the provisions of

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Paragraph 10.05. Engineer will make a recommendation to Owner for payment of such Unit Price Work, but Owner shall make the final determination thereof.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within thirty (30) days of the event giving rise to the question

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph, Engineer will not show partiality to Owner or Contractor.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Engineer's authority, responsibility, or actions as Owner's representative shall not give rise to any liability to Contractor. Contractor expressly waives any claims it has against Engineer for the performance of its responsibilities as Owner's representative.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto.

C. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.

D. The limitations upon authority and responsibility set forth in this Paragraph shall also apply to, the Resident Project Representative, if any, and assistants, if any.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

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B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.05, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, or (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09;
2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Contractor Change Requests*

A. Whenever it determines the Work depicted in or required by the Contract Documents should be modified, altered or changed to address unforeseen conflicts, changed conditions, or if, in the Contractor's opinion and evaluation, the change would benefit and improve the Project or reduce costs to the Owner, the Contractor may submit a Change Order request to the Engineer in any format the Contractor deems appropriate. The Engineer will consider such change and issue a recommendation to the Owner. The Contractor shall not delay or prevent continuation of other Work during the pendency of a Change Order request submitted by Contractor. Contractor shall not be entitled to any adjustment of the Contract Time or Contract Price due the submission of a Change Order request.

10.05 *Claims*

A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Paragraph:

1. Appeals by Contractor of Engineer's decisions regarding Change Proposals;
2. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

The parties agree the Owner is not obliged to submit a Claim as provided in this Article 10.05 to assert its rights under the Contract Documents.

B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly, but in no event later than thirty (30) days, after the start of the event giving rise thereto; in the case

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of appeals regarding Change Proposals within thirty (30) days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim.

C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation:*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
2. If Owner and Contractor agree to mediation, then after sixty (60) days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process in writing, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined in writing by the mediator.
3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Denial of Claim:* If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If, after receipt of the written notice of denial, the receiving party does not (1) take action on the Claim within ninety (90) days or (2) specifically reserves rights to pursue the claim, subject to controlling Laws and Regulations, then the party asserting the Claim shall be deemed to have expressly waived such Claim.

F. *Final and Binding Results:* If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; then the agreement shall be memorialized in a writing signed by both parties and results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 11 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, vacation and holiday pay applicable thereto.

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2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, and surveyors) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations, subject to Paragraph 6.10.
 - e. The cost of utilities, fuel, and sanitary facilities at the Site.
 - f. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's employees, agents and other personnel not included in Paragraph 11.01.A.1 whether at the Site or in Contractor's principal or branch office for general administration of the Work, all of which are to be considered administrative costs covered by the Contractor's fee.
2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with

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generally accepted accounting practices and submit in a form acceptable to Owner and Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

A. Contingency Allowance

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

B. Prior to final payment, to the extent prior Change Orders have not been executed allocated contingency allowances, an appropriate Change Order will be issued to reflect actual amounts due Contractor on account of Work covered by allowances, and the balance of any unused contingency shall revert to Owner unless allocated differently elsewhere in the Contract Documents.

11.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determination of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the Bid price of a particular item of Unit Price Work amounts to five (5) percent or more of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than twenty-five (25) percent from the estimated quantity of such items indicated in the Agreement;
2. there is no corresponding adjustment with respect any other item of Work; and
3. Contractor believes that Contractor has incurred additional expense and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 Change of Contract Price

A. The Contract Price may only be changed by a Change Order. Any Claim by the Contractor for an adjustment in the Contract Price shall be based on written notice submitted to the Engineer and the Owner in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

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1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee*: The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, weather conditions, or acts of God.

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B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times and Contractor's ability to demonstrate effect on Contractor's then established critical path.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, pandemic, unusually severe and abnormal weather conditions such as tropical storms, hurricanes, or tornados, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times and Contractor's ability to demonstrate effect on Contractor's then established critical path. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this sub-Paragraph. The occurrence of flooding or other effects of storms or severe weather such as thunderstorms or ordinarily experienced rain events shall not trigger an adjustment of the Contract Time pursuant to this section. Rain events and other anticipated weather that may result in delays to Contractor's performance are addressed in the following paragraphs D and E.

D. The procedure for the determination of time extensions for unusually severe weather. In order for the Owner to award a time extension under this clause, the following conditions must be satisfied:

1. The weather experienced at the Project site during the Contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the Project location during any given month; and
2. The unusually severe weather must actually cause a delay to the completion of the Project.

The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the Project location and will constitute the base line for monthly weather time evaluations. The Contractor's activity durations provided in the progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY
WORK DAYS BASED ON FIVE (5) DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
(5)	(5)	(5)	(4)	(5)	(6)	(6)	(5)	(5)	(5)	(6)	(5)

E. For the duration of the Contract, the Contractor shall maintain in its daily reports an accurate and contemporaneous record of the occurrence of adverse weather and resultant impact to normally scheduled Work. Delay from adverse weather shall not qualify as an adverse weather delay unless Work on the overall Project's critical activities is prevented for 50 percent or more of the Contractor's scheduled work day. The number of actual adverse weather days shall be calculated monthly. If the number of actual adverse weather delay days in a month exceeds the number of days for that month as referenced above, the Owner upon notification by the Contractor, will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and a Modification shall be issued in accordance with the Contract.

F. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys,

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and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with the Project or any other project or anticipated project.

G. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

H. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

I. Contractor must submit any Change Proposal seeking an adjustment in Contract Times under this Paragraph 12.03 within thirty (30) days of the commencement of the delaying, disrupting, or interfering event.

J. Contractor expressly waives any right to an adjustment in Contract Price for any event of delay. Contractor's sole remedy for any delay shall be limited to an adjustment in Contract Time.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK OR PERFORMANCE

13.01 Notice of Defects

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 Access to Work

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 Tests and Inspections

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and
3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to

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be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely written notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such written notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered at Contractor's expense for Engineer's observation and thereafter replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price through issuance of a deductive Change Order. If the parties are unable to agree as to the amount thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of notice, Contractor shall correct all defective Work, or, if the Work has been rejected by Engineer or Owner, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

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B. When correcting defective Work under the terms of this Paragraph or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within a one year period after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
2. correct such defective Work; or
3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph are in addition to any other obligation or warranty. The provisions of this Paragraph shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the Contractor does not agree as to the amount of the

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deductive Change Order, Contractor may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work, Deficient Performance or Contractor Default*

A. If Contractor fails within a reasonable time after written notice from Engineer or Owner to correct defective Work or to remove and replace rejected Work as required by Owner in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven (7) days written notice to Contractor to cure such default, make demand on Contractor's surety to perform as required in the performance bond issued for the Work, utilize its own forces, or hire a supplemental or replacement contractor to correct or remedy any such deficiency. In electing to exercise any remedy allowed under this Paragraph, Owner is not required to terminate Contractor's rights of continued performance for the entirety of the Work but may eliminate such scope of work from Contractor as may be necessary to exercise its rights under this section.

B. In exercising the rights and remedies under this Paragraph, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and all or part of the tools, appliances, equipment, machinery and materials stored or maintained at the Site or for which Owner has paid Contractor but which are stored elsewhere, and suspend Contractor's services related thereto. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the Contractor does not agree as to the amount of the adjustment, Contractor may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Time because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.08 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Owner and Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments*

1. If a date is established in the Agreement for each progress payment then at least 20 days before the date established for each progress payment, or if no date is specific then not more often than once a

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month, Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. Review of Applications

1. Engineer will, within ten (10) days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
- b. the quality of the Work is generally in accordance with the Contract Documents; and
- c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
- b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. the Contract Price has been reduced by Change Orders;
- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due

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1. Thirty (30) days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. Reduction in Payment

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work; or
 - b. there are other items entitling Owner to a set-off against the amount recommended; or
 - c. Owner has actual knowledge of the occurrence of any of the events enumerated in sub-Paragraphs 14.02.B.4.a through 14.02.B.4.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

14.03 Contractor's Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 Substantial Completion

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. At that inspection, Owner and Engineer will review, supplement, and edit the initial punch list prepared by Contractor or prepare an additional punch list if Contractor has not yet provided a punch list. If Owner or Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Owner and Engineer consider the Work substantially complete; Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven (7) days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within fourteen (14) days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If Owner does not object to the provisions of the certificate, Engineer will within said fourteen (14) days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly

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Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work that Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work, and follow the procedures of Paragraphs 14.04.A through E for that part of the Work.
2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Owner or Engineer do not consider that part of the Work to be substantially complete, Engineer will notify Contractor in writing giving the reasons therefor. If Owner or Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work.
4. No use or occupancy or separate operation of part of the Work will relieve Contractor of its insurance obligations under these Contract Documents.

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. Application for Payment

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and

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d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten (10) days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due

1. Thirty (30) days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off will become due and will be paid by Owner to Contractor.

14.08 Final Completion Delayed

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

A. The making and acceptance of final payment will constitute a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 Owner May Suspend Work

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than ninety (90) consecutive days by notice in writing to Contractor and Engineer which will fix the

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date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.08 as adjusted from time to time pursuant to Paragraph 6.04);
2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
3. Contractor's disregard of the authority of Owner or Engineer; or
4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven (7) days' written notice of its intent to terminate the services of Contractor:

1. declare Contractor to be in default and give Contractor (and any surety) notice that the Contract is terminated; and
2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work and all materials, equipment, and tools maintained or stored at the Site, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient. Owner shall have the right with respect to Contractor and Contractor's surety to demand performance of said surety within ten (10) days following termination. Further, Owner shall have the right to determine and/or approve and replacement contractor desired by Surety to correct and complete the Work.

D. If Owner proceeds as provided in Paragraph 15.02.C, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed nor shall Owner be required to publicly bid any completion work should Owner exercise its right to complete the Work on its own as completion work shall be deemed by the Owner, Contractor, Contractor's surety, and Engineer to qualify for an exemption to public bidding as found in the Texas Government Code chapter 252.

E. Contractor's services will not be terminated pursuant to Paragraph 15.02.B if Contractor begins within seven (7) days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

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15.03 *Owner May Terminate for Convenience*

A. Upon seven (7) days' written notice to Contractor, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for:

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination;
2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work;
3. demobilization expenses; and
4. overhead and profit on unperformed work.

B. Contractor shall not be paid for any economic loss arising out of or resulting from such termination, except for those costs expressly identified above.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than ninety (90) consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within thirty (30) days after it is submitted, or (iii) Owner fails for sixty (60) days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven (7) days' written notice to Owner and Engineer, and provided Owner or Engineer do not begin within that time to remedy such suspension or failure, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within thirty (30) days after it is submitted, or Owner has failed for sixty (60) days to pay Contractor any sum finally determined to be due, Contractor may, seven (7) days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A Disputes Subject to Final Resolution: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made; and
3. Reserved claims of Owner or Contractor under these Contract Documents, including Article 10.

B Final Resolution of Disputes.

1. For any disputes subject to this article, Owner and Contractor shall endeavor to resolve their Claims by mediation. 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.

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2. For any claim not resolved by mediation, the parties agree to submit such claims to the jurisdiction of the District Court of Waller County, Texas, which is the exclusive venue for all claims arising out of this agreement, for final dispute resolution.

ARTICLE 17 - MISCELLANEOUS

17.01 Giving Notice

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended,
2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice, or
3. delivered by electronic means with a corresponding confirmation of delivery or read receipt to the individual or to a member of the firm or to an officer of the corporation for whom it is intended.

17.02 Computation of Times

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 Cumulative Remedies

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 Survival of Obligations

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 Controlling Law

A. This Contract is to be governed by the law of the state of Texas without regarding to its conflict of laws principles.

17.06 Headings

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

17.07 Limitation of Damages

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A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officials, officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

B. The Contractor and Owner waive claims against each other for the following enumerated consequential damages arising out of or relating to this Contract. This mutual waiver includes and is expressly limited to the following:

1. damages incurred by the Owner for lost revenue, profit, financing costs, 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, bonding capacity, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

17.08 *No Waiver*

A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

17.09 *Prevailing Wage*

A. Contractor shall comply with chapter 2258 of the Texas Government Code governing prevailing wage. The Contractor shall provide and pay for labor in accordance with the prevailing wage in the locality and shall not pay less than the prevailing wage. The Owner has not independently performed a wage determination in accordance with controlling state and federal statutes. Accordingly, the Contractor must utilize the wage determinations and rates published by the U.S. Department of Labor pursuant to the Davis-Bacon Act.

B. Certified payrolls demonstrating compliance with the prevailing wage requirements shall be maintained by the Contractor and all Subcontractors performing the Work. The Contractor is required to submit to the Owner a copy of all certified payrolls for any pay period with each Pay Application. Failure to provide certified payrolls may be grounds for withholding of funds and default.

17.10 *Right to Audit:*

A. Whenever the Owner enters into any type of contractual arrangement with the Contractor, then the Contractor's "records" shall upon reasonable notice be open to inspection and subject to audit and/or reproduction during normal business working hours. The Owner's representative, or an outside representative engaged by the Owner, may perform such audits. The Contractor shall maintain all records relating to this Agreement for four (4) years from the date of final payment under this Agreement.

B. The Owner shall have the exclusive right to examine the records of the Contractor. The term "records" as referred to herein shall include any and all information, materials and data of every kind and character, including without limitation books, papers, documents, contracts, schedules, commitments, arrangements, notes, daily diaries, reports, drawings, receipts, vouchers and memoranda, and any and all other agreements, sources of information and matters that may, in the Owner's judgment, have any bearing on or pertain to any matters, rights, duties or obligations under or covered by any contract document. Such records shall include (hard copy, as well as computer-readable data if it can be made available), written policies and procedures, time sheets, payroll registers, cancelled checks, personnel file data, correspondence (including letters and emails), general ledger entries, and any other record in the

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Contractor's possession which may have a bearing on matters of interest to the Owner in connection with the Contractor's dealings with the Owner (all of the foregoing are hereinafter referred to as "records"). In addition, the Contractor shall permit interviews of employees as well as agents, representatives, vendors, subcontractors and other third parties paid by the Contractor to the extent necessary to adequately permit evaluation and verification of the following:

1. The Contractor's compliance with contract requirements;
2. The Contractor's compliance with the Owner's business ethics policies; and
3. If necessary, the extent of the Work performed by the Contractor at the time of contract termination.

C. The Contractor shall require all payees (examples of payees include subcontractors, insurance agents, material suppliers, etc.) to comply with the provisions of this Article 17.10 by securing the requirements hereof in a written agreement between the Contractor and payee. Such requirements include a flow-down right of audit provision in contracts with payees that also apply to subcontractors and sub-subcontractors, material suppliers, etc. The Contractor shall cooperate fully and shall require Related Parties and all of the Contractor's subcontractors to cooperate fully in furnishing or in making available to the Owner from time to time whenever requested, in an expeditious manner, any and all such information, materials, and data.

D. The Owner's authorized representative or designee shall have reasonable access to the Contractor's facilities, shall be allowed to interview all current or former employees to discuss matters pertinent to the performance of this Agreement, and shall be provided adequate and appropriate work space in order to conduct audits in compliance with this Article 17.10.

E. If an audit inspection or examination in accordance with this Article 17.10 discloses overpricing or overcharges of any nature by the Contractor to the Owner in excess of one-half of one percent (.5%) of the total contract billings, then the reasonable actual cost of the Owner's audit shall be reimbursed to the Owner by the Contractor. Any adjustments and/or payments, which must be made as a result of any such audit or inspection of the Contractor's invoices and/or records, shall be made within a reasonable amount of time (not to exceed ninety (90) days) from presentation of the Owner's findings to the Contractor.

17.11 *Trust Funds*

A. This Project is subject to the Texas Trust Fund Statute, chapter 162 of the Texas Property Code, and the Parties acknowledge that the payment obligations contained herein for the Contractor to receive funds from the Owner and then use those funds to pay such Subcontractors, Suppliers, Vendors, Consultants, and the like, are subject to the Trust Fund Statute and the Owner's audit rights outlined in this article 17.

17.12 *Severability*

A. If any provision or any part of a provision of the Contract Documents shall be finally determined to be superseded, invalid, illegal, or otherwise unenforceable pursuant to any applicable Legal Requirements, such determination shall not impair or otherwise affect the validity, legality, or enforceability of the remaining provision or parts of the provision of the Contract Documents, which shall remain in full force and effect as if the unenforceable provision or part were deleted.

17.13 *Amendments*

A. The Contract Documents may not be changed, altered, or amended in any way except in writing signed by a duly authorized representative of each party.

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STANDARD GENERAL CONDITIONS OF THE CONTRACT

17.14 *Assignment*

A. Contractor shall not, without the written consent of the Owner assign, transfer or sublet any portion or part of the Work or the obligations required by the Contract Documents, other than to an affiliate. An assignment to an affiliate shall not relieve the assignor of its obligations under this Agreement.

17.15 *Confidential Information*

A. Confidential Information is defined as information which is determined by the transmitting party to be of a confidential or proprietary nature and: (a) the transmitting party identifies as either confidential or proprietary; (b) the transmitting party takes steps to maintain the confidential or proprietary nature of the information; and (c) the document is not otherwise available in or considered to be in the public domain. The receiving party agrees to maintain the confidentiality of the Confidential Information and agrees to use the Confidential Information solely in connection with the Project.

B. A party receiving Confidential Information may disclose the Confidential Information as required by law or court order, including a subpoena or other form of compulsory legal process issued by a court or governmental entity. A party receiving Confidential Information may also disclose the Confidential Information to its employees, consultants or contractors in order to perform services or work solely and exclusively for the Project, provided those employees, consultants and contractors are subject to the restrictions on the disclosure and use of Confidential Information as set forth in this Contract.

17.16 *Texas Public Information Act*

A. The Contractor recognizes that this Project is publicly owned, and the Owner is subject to the disclosure requirements of the Texas Public Information Act (the "PIA"). As part of its obligations within the Contract Documents, the Contractor agrees, at no additional cost to the Owner, to cooperate with the Owner for any particular needs or obligations arising out of the Owner's obligations under the TPIA. This acknowledgement and obligation are in addition to and complimentary to the Owner's audit rights in section 17.10.

B. This provision applies if the Agreement has a stated expenditure of at least \$1 million in public funds for the purchase of goods or services by the Owner or results in the expenditure of at least \$1 million in public funds for the purchase of goods or services by the Owner in its fiscal year.

C. The Contractor must (1) preserve all contracting information related to the Agreement as provided by the records retention requirements applicable to the Owner for the duration of the Agreement; (2) promptly provide to the Owner any contracting information related to the Agreement that is in the custody or possession of the Contractor on request of the Owner; and (3) on completion of the Agreement, either:

1. provide at no cost to the Owner all contracting information related to the Agreement that is in the custody or possession of the Contractor; or
2. preserve the contracting information related to the Agreement as provided by the records retention requirements applicable to the Owner.

D. The requirements of Subchapter J, Chapter 552, Texas Government Code, may apply to this Agreement and the Contractor agrees that the Agreement can be terminated if the Contractor knowingly or intentionally fails to comply with a requirement of that subchapter.

17.17 *Conflicts*

A. Notwithstanding anything herein to the contrary, if the Technical Specifications conflict with the Standard General Conditions, the Standard General Conditions control.

END OF DOCUMENT

Build America, Buy America Act (BABAA)

This project is subject to Build American, Buy America Act and the provisions below apply:

Build America, Buy America Act (BABAA) – Requirements instituted by the Bipartisan Infrastructure Law of 2021 mandating domestic preference that all iron and steel, manufactured products, and construction materials are produced in the United States.

Construction Materials – Those articles, materials, or supply – other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives – that are or consist primarily of: non-ferrous metals, plastic and polymer-based products, glass, lumber or drywall.

Manufactured Product – Items assembled out of components, or otherwise made or processed from raw materials into finished products. Manufactured products must be manufactured (assembled) in the United States, and the cost of components that were mined, produced, or manufactured in the United States must be greater than 55 percent of the total cost of all components of the project.

Manufacturer's Certification – Documentation provided by a Manufacturer, certifying that the items provided by Manufacturer meet the domestic preference requirements of BABAA.

The Contractor shall comply with the Federal Requirement for Domestic Preference: Iron and steel products, Manufactured Products, and Construction Materials used in this project shall comply with the Build America, Buy America Act (BABAA) requirements mandated by Title IX of the Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. 177-58. Installation of materials or products that are not compliant with BABAA requirements shall be considered defective work.

The Contractor shall be responsible for:

.1 Providing costs and revisions thereof that reflect compliance with BABAA requirements.

.2 Providing only iron, steel, construction materials and manufactured products that meet BABAA requirements. Installation of materials or products that are not compliant with BABAA requirements shall be considered defective work.

.3 Including manufacturer's certification for BABAA requirements with all applicable submittals. If a specific manufacturer is used in the bidding, a statement that the manufacturer will comply with BABAA requirements must be included with the bid submission. Contractor shall comply with BABAA requirements, including coordination with manufacturers, distributors, and suppliers to correct deficiencies in any BABAA documentation.

.4 Providing manufacturer's certification for BABAA requirements with any change order for any new construction materials or manufactured products required by the change.

.5 Certifying by submitting an application for payment, based in whole or in part on furnishing construction materials or manufactured products; that such materials and products, to the Contractor's knowledge, are compliant with BABAA requirements.

.6 Ensuring that the Architect / Engineer has been provided an approved manufacturer's certification or waiver prior to items being delivered to the project site.

.7 Certifying upon completion that all work and materials are in compliance with BABAA requirements.

END OF DOCUMENT

PERFORMANCE BOND

THE STATE OF TEXAS §
 § KNOW ALL BY THESE PRESENTS:
COUNTY OF _____ §

That we, _____, as Principal herein, and _____, a corporation organized and existing under the laws of the State of _____ and who is authorized and admitted to issue surety bonds in the State of Texas, Surety herein, are held and firmly bound unto the **City of Castroville, Texas**, located in **Medina County, Texas**, Obligees herein, in the sum of _____ Dollars (\$_____) for the payment of which sum we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has entered into a certain written contract with the Obligees dated the ____ day of _____, 20____, which contract is hereby referred to as “the Contract” and is incorporated herein and made a part hereof for all purposes to the same extent as if copied at length, for the following project: _____

NOW, THEREFORE, the condition of this obligation is such, if the said Principal shall faithfully perform the work in accordance with the plans, specifications, and other Contract Documents and shall fully indemnify and hold harmless the Obligees from all costs and damages which Obligees may suffer by reason of Principal’s failure to perform the Work in conformity with the Contract Documents, and reimburse and repay Obligees for all outlay and expense that Obligees may incur in making good such default, then this obligation shall be void; otherwise, to remain in full force and effect.

Whenever Principal shall be declared by Obligees to be in default under the Contract, the Surety shall, upon request of Obligees and within ten (10) calendar days from receipt of Obligees’ notice of Principal’s default, commence and thereafter complete performance of Principal’s obligations under the Contract. Surety acknowledges that its obligations under this bond and as detailed herein and in the Contract Documents are not conditioned on a termination of the Principal by the Obligees. Surety further acknowledges and agrees that Surety shall obtain the Obligees’ approval and consent with respect to the contractor(s) that Surety may retain to replace defaulted Principal or otherwise honor the obligations under this Bond.

This Bond covers all contractual obligations of Principal under the Contract, including, without limitation, the indemnity, warranty and guaranty obligations. The Surety stipulates and agrees that no change, extension of time, alteration, omission, addition or other modification to the terms of the Contract will affect its obligations on this bond, and it hereby waives notice of any such changes, extensions of time, alterations, omissions, additions, or other modifications, to the Contract or to related subcontracts, purchase orders, or other obligations, and any notices provided in such regard shall not create as to any party a duty related thereto. The penal limit of this bond shall automatically be increased by the amount of any change order, supplemental agreement, or amendment which increases the price of the Contract.

PROVIDED, HOWEVER, that this bond is executed pursuant to Chapter 2253 of the Texas Government Code, as amended, and all rights and liabilities on this bond shall be determined in accordance with the provisions of such statute, to the same extent as if it were copied at length herein. All notices shall be delivered in writing to the addresses shown below or to addresses provided in the Contract.

IN WITNESS WHEREOF, the duly authorized representatives of the Principal and the Surety have executed this instrument.

SIGNED and SEALED this _____ day of _____, 20____.

The date of bond shall not be prior to date of the Contract.

ATTEST:

(Principal) Secretary

(S E A L)

Witness as to Principal

PRINCIPAL

By: _____

Name: _____

Title: _____

Address: _____

Telephone Number: _____

ATTEST:

Secretary

(S E A L)

Witness as to Surety

SURETY

By: _____

Name: _____
Attorney in Fact

Address: _____

Telephone Number: _____

An original copy of Power of Attorney shall be attached to Bond by the Attorney-in-Fact.

Approved as to Form:

City of Castroville, Texas
1209 Fiorella Street
Castroville, TX 78009

By: _____

Title: _____

Date: _____

PAYMENT BOND

THE STATE OF TEXAS §
 § KNOW ALL BY THESE PRESENTS:
COUNTY OF _____ §

That we, _____, as Principal herein, and _____, a corporation organized and existing under the laws of the State of Texas and who is authorized and admitted to use surety bonds in the State of Texas, as surety, are held and firmly bound unto the **City of Castroville, Texas**, located in **Medina County, Texas**, Obligee herein, in the sum of _____ Dollars (\$_____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents:

WHEREAS, Principal has entered into a certain written contract with the Obligee dated the ____ day of _____, 20____, which contract is hereby referred to as “the Contract” and incorporated herein and made a part hereof for all purposes to the same extent as if copied at length, for the following project: _____

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall directly or indirectly timely make payment to each and every claimant (as defined in Chapter 2253, Texas Government Code, as amended) supplying labor or materials in the prosecution of the work under the Contract, then this obligation shall be void; otherwise, to remain in full force and effect. *This obligation may be enforced by the Obligee in the event of bankruptcy or default by Principal in payments to suppliers of labor or materials in the prosecution of the work under the Contract, in either of which events the Surety shall make such payments as Principal has failed to pay and as may be required to complete the work under the contract.* The Surety stipulates and agrees that no change, extension of time, alteration, omission, addition or other modification to the terms of the Contract will affect its obligations on this bond, and it hereby waives notice of any such changes, extensions of time, alterations, omissions, additions, or other modifications, to the Contract or to related subcontracts, purchase orders or other obligations, and any notices provided in such regard shall not create as to any party a duty related thereto.

PROVIDED, HOWEVER, that this bond is executed pursuant to Chapter 2253 of the Texas Government Code, as amended, and all right and liabilities on this bond shall be

determined in accordance with the provisions of said statute, to the same extent as if it were copied at length herein. All notices shall be delivered in writing to the addresses shown below or to addresses provided in the Contract.

IN WITNESS WHEREOF, the duly authorized representatives of the Principal and the Surety have executed this instrument.

SIGNED and SEALED this _____ day of _____, 20__.

The date of bond shall not be prior to date of the Contract.

ATTEST:

(Principal) Secretary

(S E A L)

Witness as to Principal

ATTEST:

Secretary

(S E A L)

Witness as to Surety

PRINCIPAL

By: _____

Name: _____

Title: _____

Address: _____

Telephone Number: _____

SURETY

By: _____

Name: _____

Attorney in Fact

Address: _____

Telephone Number: _____

An original copy of Power of Attorney shall be attached to Bond by the Attorney-in-Fact.

Approved as to Form:

City of Castroville, Texas
1209 Fiorella Street
Castroville, TX 78009

By: _____

Title: _____

Date: _____

Exhibit A to Contract Agreement
Owner's Insurance Requirements of Contractor

1. Specific Insurance Requirements

The following insurance shall be maintained in effect with limits not less than those set forth below at all times during the term of this Agreement and thereafter as required:

Insurance	Coverage/Limits	Other Requirements
Commercial General Liability (Occurrence Basis)	<p>Amounts of coverage shall be no less than:</p> <ul style="list-style-type: none"> ▪ \$1,000,000 Per Occurrence ▪ \$2,000,000 General Aggregate ▪ \$2,000,000 Products/Completed Operations Aggregate ▪ \$1,000,000 Personal And Advertising Injury ▪ Designated Construction Project(s) General Aggregate Limit 	<ul style="list-style-type: none"> ▪ Current ISO edition of CG 00 01 ▪ Additional insured status shall be provided in favor of Owner Parties on a combination of ISO forms CG 20 10 04 13 and CG 20 37 04 13. ▪ This coverage shall be endorsed to provide primary and non-contributing liability coverage. It is the intent of the parties to this Agreement that all insurance coverage required herein shall be primary to and will not seek contribution from any other insurance held by Owner Parties, with Owner Parties' insurance being excess, secondary and non-contributing. ▪ Stop Gap coverage shall be provided if any work is to be performed in a monopolistic workers' compensation state. ▪ The following exclusions/limitations (or their equivalent(s)), are prohibited: <ul style="list-style-type: none"> ○ Contractual Liability Limitation CG 21 39 ○ Amendment of Insured Contract Definition CG 24 26 ○ Limitation of Coverage to Designated Premises or Project, CG 21 44 ○ Exclusion-Damage to Work Performed by Subcontractors On Your Behalf, CG 22 94 or CG 22 95 ○ Exclusion-Explosion, Collapse and Underground Property Damage Hazard, CG 21 42 or CG 21 43 ○ Any Classification limitation ○ Any Construction Defect Completed Operations exclusion ○ Any endorsement modifying the Employer's Liability exclusion or deleting the exception to it ○ Any endorsement modifying or deleting Explosion, Collapse or Underground coverage ○ Any Habitational or Residential exclusion applicable to the Work ○ Any "Insured vs. Insured" exclusion except Named Insured vs. Named Insured

		<ul style="list-style-type: none"> ○ Any Punitive, Exemplary or Multiplied Damages exclusion ○ Any Subsidence exclusion
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Business Auto Liability	<p>Amount of coverage shall be no less than:</p> <ul style="list-style-type: none"> ▪ \$1,000,000 Per Accident 	<ul style="list-style-type: none"> ▪ Current ISO edition of CA 00 01 ▪ Arising out of any auto (Symbol 1), including owned, hired and non-owned
Workers' Compensation and Employer's Liability	<p>Amounts of coverage shall be no less than:</p> <ul style="list-style-type: none"> ▪ Statutory Limits ▪ \$1,000,000 Each Accident and Disease ▪ Alternate Employer endorsement ▪ USL&H must be provided where such exposure exists. 	<ul style="list-style-type: none"> ▪ The State in which work is to be performed must listed under Item 3.A. on the Information Page ▪ Such insurance shall cover liability arising out of the Contractor's employment of workers and anyone for whom the Contractor may be liable for workers' compensation claims. Workers' compensation insurance is required, and no "alternative" forms of insurance shall be permitted. ▪ Where a Professional Employer Organization (PEO) or "leased employees" are utilized, Contractor shall require its leasing company to provide Workers' Compensation insurance for said workers and such policy shall be endorsed to provide an Alternate Employer endorsement in favor of Contractor and Owner. Where Contractor uses leased employees with Workers' Compensation insurance provided by a PEO or employee leasing company, Contractor is strictly prohibited from subletting any of its work without the express written agreement of Owner.
Excess Liability (Occurrence Basis)	<p>Amounts of coverage shall be no less than:</p> <ul style="list-style-type: none"> ▪ \$5,000,000 Each Occurrence ▪ \$5,000,000 Annual Aggregate 	<ul style="list-style-type: none"> ▪ Such insurance shall be excess over and be no less broad than all coverages described above. ▪ Drop-down coverage shall be provided for reduction and/or exhaustion of underlying aggregate limits and shall include a duty to defend any insured.
Professional Liability	<p>Amounts of coverage shall be no less than:</p> <ul style="list-style-type: none"> ▪ \$1,000,000 Each Occurrence ▪ \$2,000,000 Annual Aggregate ▪ If a combined Contractor's Pollution Liability and Professional Liability policy is utilized, the limits shall be \$3,000,000 Each Loss and Aggregate. ▪ Such insurance shall cover all services rendered by the Contractor and its consultants under the Agreement, including but not limited to design or design/build services. 	<ul style="list-style-type: none"> ▪ Such insurance shall cover all services rendered by the Contractor and its subcontractors under the Agreement. ▪ This insurance is not permitted to include any type of exclusion or limitation of coverage applicable to claims arising from: <ul style="list-style-type: none"> ○ bodily injury or property damage where coverage is provided in behalf of design professionals or design/build contractors ○ habitation or residential operations ○ mold and/or microbial matter and/or fungus and/or biological substance ○ punitive, exemplary or multiplied damages.

	<ul style="list-style-type: none"> ▪ Policies written on a Claims-Made basis shall be maintained for at least two years beyond termination of the Agreement. 	<ul style="list-style-type: none"> ▪ Any retroactive date must be effective prior to beginning of services for the Owner. ▪ Policies written on a Claims-Made basis shall have an extended reporting period of at least two years beyond termination of the Agreement. Vendor shall trigger the extended reporting period if identical coverage is not otherwise maintained with the expiring retroactive date.
Contractors Pollution Liability	<p>Amounts of coverage shall be no less than:</p> <ul style="list-style-type: none"> ▪ \$1,000,000 Each Loss ▪ \$2,000,000 Annual Aggregate ▪ If a combined Contractor's Pollution Liability and Professional Liability policy is utilized, the limits shall be \$3,000,000 Each Loss and Aggregate. ▪ The policy must provide coverage for: <ul style="list-style-type: none"> ○ the full scope of the named insured's operations (on-going and completed) as described within the scope of work for this Agreement ○ loss arising from pollutants including but not limited to fungus, bacteria, biological substances, mold, microbial matter, asbestos, lead, silica and contaminated drywall ○ third party liability for bodily injury, property damage, clean up expenses, and defense arising from the operations; ○ diminution of value and Natural Resources damages ○ contractual liability ○ claims arising from non-owned disposal sites utilized in the performance of this Agreement. 	<ul style="list-style-type: none"> ▪ The policy must insure contractual liability, name Owner Parties as an Additional Insured, and be primary and noncontributory to all coverage available to the Additional Insured. ▪ This insurance is not permitted to include any type of exclusion or limitation of coverage applicable to claims arising from: <ul style="list-style-type: none"> ○ Insured vs. insured actions. However exclusion for claims made between insured within the same economic family are acceptable. ○ impaired property that has not been physically injured ○ materials supplied or handled by the named insured. However, exclusions for the sale and manufacture of products are allowed. Exclusionary language pertaining to materials supplied by the insured shall be reviewed by the certificate holder for approval. ○ property damage to the work performed by the contractor ○ faulty workmanship as it relates to clean up costs ○ punitive, exemplary or multiplied damages ○ work performed by subcontractors ▪ If coverage is provided on a Claims Made basis, coverage will at least be retroactive to the earlier of the date of this Agreement or the commencement of contractor services relation to the Work. ▪ The policy will offer an extended discovery or extended reporting clause of at least three (3) years. ▪ Completed Operations coverage shall be maintained through the purchase of renewal policies to protect the insured and additional insured for at least two (2) years after the property owner accepts the project or this contract is terminated. The purchase of an extended discovery period or an extended reporting period on a Claims Made policy or

		the purchase of occurrence based Contractors Environmental Insurance will not be sufficient to meet the terms of this provision.
--	--	--

2. General Insurance Requirements

A. Definitions. For purposes of this Agreement:

- i. "ISO" means Insurance Services Office.
- ii. "Contractor" shall include the Builder and its subcontractors of any tier.
- iii. "Owner Parties" means (a) the City of Prairie View, Texas (collectively referred to as "Owner"), (b) the Project, (c) any lender whose loan is secured by a lien against the Work, (d) their respective shareholders, members, partners, joint venturers, affiliates, subsidiaries, successors and assigns, (e) any directors, officers, employees, or agents of such persons or entities, and (f) others as required by the Contract Documents.

B. Policies.

- i. Contractor shall maintain such Excess Liability, Professional and Pollution insurance in identical coverage, form and amount, including required endorsements, for at least two (2) years following Date of Substantial Completion of the Work to be performed under this Agreement. Contractor shall maintain such General Liability insurance in identical coverage, form and amount, including required endorsements, for at least ten (10) years following Date of Substantial Completion of the Work to be performed under this Agreement. Contractor shall provide written representation to Owner stating Work completion date.
- ii. All policies must:
 - a. Be written through insurance companies authorized to do business in the State in which the work is to be performed and rated no less than A-: VII in the most current edition of A. M. Best's Key Rating Guide at all times Work is to be performed.
 - b. Provide a waiver of subrogation in favor of Owner Parties on all insurance coverage carried by Contractor, whether required herein or not.
 - c. Contain an endorsement providing for thirty (30) days prior written notice of cancellation to Owner.
 - d. Be provided to the Owner Parties in compliance with the requirements herein and shall contain no endorsements that restrict, limit, or exclude coverage required herein in any manner without the prior express written approval of the Owner.
- iii. Failure of any Owner Party to demand such certificate or other evidence of full compliance with these insurance requirements or failure of any Owner Party to identify a deficiency from evidence that is provided shall not be construed as a waiver of the Contractor's obligation to maintain such insurance.
- iv. Contractor shall provide to the Owner a certified copy of all insurance policies required herein within ten (10) days of any such request. Renewal policies, if necessary, shall be delivered to the Owner prior to the expiration of the previous policy.
- v. Commencement of Work without provision of the required certificate of insurance, evidence of insurance and/or required endorsements, or without compliance with any other provision of this Agreement, shall not constitute a waiver by any Owner Party of any rights. The Owner shall have the right, but not the obligation, of prohibiting the Contractor or any subcontractor from performing any Work until such certificate of insurance, evidence of insurance and/or required endorsements are received and approved by the Owner.

C. Limits, Deductibles and Retentions

- i. The limits of liability may be provided by a single policy of insurance or by a combination of primary and excess policies, but in no event shall the total limits of liability available for any one occurrence or accident be less than the amount required herein.
- ii. No deductible or self-insured retention shall exceed \$25,000 without prior written approval of the Owner, except as otherwise specified herein. All deductibles and/or retentions shall be paid by, assumed by, for the account of, and at the Contractor's sole risk. The Contractor shall not be reimbursed for same

D. Forms

- i. If the forms of policies, endorsements, certificates or evidence of insurance required by this Exhibit are superseded or discontinued, Owner will have the right to require other equivalent forms.
- ii. Any policy or endorsement form other than a form specified in this Exhibit must be approved in advance by Owner.

E. Evidence of Insurance. Insurance must be evidenced as follows:

- i. ACORD Form 25 Certificate of Liability Insurance for liability coverages.
- ii. ACORD Form 28 Evidence of Commercial Property Insurance for property coverages.
- iii. Evidence shall be provided to Owner prior to commencing Work and prior to the expiration of any required coverage.
- iv. ACORD Forms specify:
 - a. Owner as certificate holder at Owner's mailing address;
 - b. Insured's name, which must match that on this Agreement;
 - c. Insurance companies producing each coverage and the policy number and policy date of each coverage;
 - d. Producer of the certificate with correct address and phone number and have the signature of the authorized representative of the producer;
 - e. Additional Insured status in favor of Owner Parties;
 - f. Amount of any deductible or self-insured retention in excess of \$25,000;
 - g. Designated Construction Project(s) General Aggregate Limit;
 - h. Primary and non-contributory status;
 - i. Waivers of subrogation; and
 - j. All exclusions and limitations added by endorsement to the General Liability coverage. This can be achieved by attachment of the Schedule of Forms and Endorsements page.
- v. Copies of the following shall also be provided:
 - a. General Liability Additional insured endorsement(s);
 - b. General Liability Schedule of Forms and Endorsements page(s); and
 - c. 30 Day Notice of Cancellation endorsement applicable to all required policies.

F. Contractor Insurance Representations to Owner Parties

- i. It is expressly understood and agreed that the insurance coverages required herein (a) represent Owner Parties' minimum requirements and are not to be construed to void or limit the Contractor's indemnity obligations as contained in this Agreement nor represent in any manner a determination of the insurance coverages the Contractor should or should not maintain for its own protection; and (b) are being, or have been, obtained by the Contractor in support of the Contractor's liability and indemnity obligations under this Agreement. Irrespective of the requirements as to insurance to be carried as provided for herein, the insolvency, bankruptcy or failure of any insurance company carrying insurance of the Contractor, or the failure of any insurance company to pay claims accruing, shall not be held to affect, negate or waive any of the provisions of this Agreement.
- ii. Failure to obtain and maintain the required insurance shall constitute a material breach of, and default under, this Agreement. If the Contractor shall fail to remedy such breach within five (5) business days after notice by the Owner, the Contractor will be liable for any and all costs, liabilities, damages and penalties resulting to the Owner Parties from such breach, unless a written waiver of the specific insurance requirement(s) is

provided to the Contractor by the Owner. In the event of any failure by the Contractor to comply with the provisions of this Agreement, the Owner may, without in any way compromising or waiving any right or remedy at law or in equity, on notice to the Contractor, purchase such insurance, at the Contractor's expense, provided that the Owner shall have no obligation to do so and if the Owner shall do so, the Contractor shall not be relieved of or excused from the obligation to obtain and maintain such insurance amounts and coverages.

- iii. This Exhibit is an independent contract provision and shall survive the termination or expiration of the Contract Agreement.

G. Insurance Requirements of Contractor's Subcontractors

- i. Insurance similar to that required of the Contractor shall be provided by all subcontractors (or provided by the Contractor on behalf of subcontractors) to cover operations performed under any subcontract agreement. The Contractor shall be held responsible for any modification in these insurance requirements as they apply to subcontractors. The Contractor shall maintain certificates of insurance from all subcontractors containing provisions similar to those listed herein (modified to recognize that the certificate is from subcontractor) enumerating, among other things, the waivers of subrogation, additional insured status, and primary liability as required herein, and make them available to the Owner upon request.
- ii. The Contractor is fully responsible for loss and damage to its property on the site, including tools and equipment, and shall take necessary precautions to prevent damage to or vandalism, theft, burglary, pilferage and unexplained disappearance of property. Any insurance covering the Contractor's or its subcontractor's property shall be the Contractor's and its subcontractor's sole and complete means or recovery for any such loss. To the extent any loss is not covered by said insurance or subject to any deductible or co-insurance, the Contractor shall not be reimbursed for same. Should the Contractor or its subcontractors choose to self-insure this risk, it is expressly agreed that the Contractor hereby waives, and shall cause its subcontractors to waive, any claim for damage or loss to said property in favor of the Owner Parties.

H. Use of the Owners Equipment

The Contractor, its agents, employees, subcontractors or suppliers shall use the Owners equipment only with express written permission of the Owners designated representative and in accordance with the Owners terms and condition for such use. If the Contractor or any of its agents, employees, subcontractors or suppliers utilize any of the Owners equipment for any purpose, including machinery, tools, scaffolding, hoists, lifts or similar items owned, leased or under the control of the Owner, the Contractor shall defend, indemnify and be liable to the Owner Parties for any and all loss or damage which may arise from such use.

I. Release and Waiver

The Contractor hereby releases, and shall cause its subcontractors to release, the Owner Parties from any and all claims or causes of action whatsoever which the Contractor and/or its subcontractors might otherwise now or hereafter possess resulting in or from or in any way connected with any loss covered by insurance, whether required herein or not, or which should have been covered by insurance required herein, including the deductible and/or uninsured portion thereof, maintained and/or required to be maintained by the Contractor and/or its subcontractors pursuant to this Agreement. **THE FOREGOING RELEASE AND WAIVER APPLY EVEN IF THE LOSS OR DAMAGE IS CAUSED IN WHOLE OR IN PART BY THE FAULT OR NEGLIGENCE OR STRICT LIABILITY OF THE OWNER PARTIES.**

**SECTION 01 1000
SUMMARY****PART 1 GENERAL****1.01 PROJECT**

- A. Project Name: Castroville Community Building
- B. Owner's Name: City of Castroville.
- C. Architect's Name: LPA, Inc..
- D. The Project consists of the construction of a new 5,245 sf Community Building and 262 sf Shower/Toilet Room Building with a multipurpose room, catering space, park director office spaces, pool office, pool concessions, and associated storage, mechanical spaces, toilet rooms, showers, and associated mechanical, plumbing, electrical work, and site improvements.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

1.03 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Owner intends to occupy the public swimming pool prior to the completion date for the conduct of normal operations.
- C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- D. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas approved by Owner and Architect.
 - 1. Limit use of the premises to work in areas indicated. Confine apparatus, operations of workmen and storage of materials to areas within contract phase limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
- B. Arrange use of site and premises to allow:
 - 1. Owner occupancy.
 - 2. Work by Others.
 - 3. Work by Owner.
 - 4. Use of site and premises by the public.
 - 5. Use of site for the disabled. Maintain accessibility to the degree it was available prior to the start of construction activities.
- C. 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.
- D. Additional Requirements for Contractor's Use of Premises and Adjacent Facilities:
 - 1. All building materials shall be stored within setback lines inside locked construction fencing.
 - 2. All debris, trash and garbage shall be stored in enclosed containers inside locked construction fencing and shall be removed at least once a week.
- E. Provide access to and from site as required by law and by Owner:
 - 1. Required Exits: Keep required exits serving all occupied portions of the building clear and functional at all times. Where required exits must of necessity be obstructed during actual execution of the work, provide alternate means of exiting and provide lighted exit signs as required by applicable codes and ordinances.
 - 2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- F. Time Restrictions:
 - 1. Limit conduct of especially noisy, malodorous, and dusty exterior work during periods coordinated with Owner.

G. Utility Outages and Shutdown:

1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
2. Prevent accidental disruption of utility services to other facilities.

1.05 WORK SEQUENCE AND SCHEDULE

- A. Coordinate construction schedule and operations with Owner.

1.06 OWNER-FURNISHED PRODUCTS

- A. The Owner may furnish mechanical or electrical equipment, fixtures, or furniture to the Project. The Work of this contract includes providing support systems as indicated in the Contract Documents to receive Owner's equipment, and mechanical and electrical connections.
1. The Owner will arrange for and deliver necessary shop drawings, product data and samples to the Contractor.
 2. The Owner will arrange and pay for delivery of Owner-furnished items according to the Contractor's Construction Schedule.
 3. Following delivery, the Owner will inspect items delivered for damage.
 4. If Owner-furnished items are damaged, defective, or missing, the Owner will arrange for replacement.
 5. The Owner will arrange for manufacturer's field services and for the delivery of manufacturer's warranties to the appropriate Contractor.
 6. The Contractor shall designate delivery dates of Owner-furnished items in the Contractor's Construction Schedule.
 7. The Contractor shall review shop drawings, product data and samples and return them to the Architect noting discrepancies or problems anticipated in use of the product.
 8. The Contractor is responsible for receiving, unloading, and handling Owner-furnished items at the site.
 9. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements. The Contractor shall repair or replace items damaged as a result of his operations.

END OF SECTION

**SECTION 01 2000
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 7200 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.
- B. Section 01 2100 - Allowances: Payment procedures relating to allowances.

1.03 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- F. Include in each line item, the amount of Allowances specified in this section.
- G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 WAIVERS OF MECHANICS LIEN:

- A. With each Application for Payment, submit waivers of mechanics lien from every entity who is lawfully entitled to file a mechanics lien arising out of the Contract and related to the Work covered by the payment.
 - 1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
 - 2. Submit final Applications for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 - 3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 4. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to the Owner.

1.05 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- 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-copy of each Application for Payment.
- I. Include the following with the application:
 - 1. Transmittal letter as specified for submittals in Section 01 3000.

2. Construction progress schedule, revised and current as specified in Section 01 3000.
 3. Partial release of liens from major subcontractors and vendors.
 4. Affidavits attesting to off-site stored products.
- 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.

1.06 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Owner 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 Price 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. Contractor shall prepare and submit a fixed price quotation within 14 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 Price and Contract Time with full documentation and a statement describing the effect on work by separate or other contractors. 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 as approved by A/E and Owner.
 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 Price.
- 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.

1.07 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

- A. Following issuance of the Certificate of Substantial Completion, submit an Application for Payment

- B. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- C. Administrative actions and submittals that shall precede or coincide with this application include:
 - 1. Certificate of Occupancy and similar approvals.
 - 2. Warranties (guarantees) and maintenance agreements.
 - 3. Record Documents.
 - 4. Test/adjust/balance records.
 - 5. Maintenance instructions.
 - 6. Meter readings.
 - 7. Startup performance reports.
 - 8. Changeover information related to Owner's occupancy, use, operation and maintenance.
 - 9. Final cleaning.
 - 10. Advice on shifting insurance coverages.
 - 11. List of incomplete Work (punch list), recognized as exceptions to Architect's Certificate of Substantial Completion.

1.08 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, 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 7000.
 - 2. Completion of items specified for completion after Substantial Completion.
 - 3. Ensure that unsettled claims will be settled.
 - 4. Ensure that incomplete Work is not accepted and will be completed without undue delay.
 - 5. Transmittal of required project construction records to the Owner
 - 6. Proof that taxes, fees and similar obligations were paid.
 - 7. Removal of temporary facilities and services.
 - 8. Removal of surplus materials, rubbish and similar elements.
 - 9. Change of door locks to Owner's access.

END OF SECTION

**SECTION 01 2100
ALLOWANCES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Contingency allowance.
- B. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

- A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CONTINGENCY ALLOWANCE

- A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- B. Use the Contingency Allowance only as directed for the Owner's purposes.
- C. Funds will be drawn from the Contingency Allowance only by Change Order.
- D. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 ALLOWANCES SCHEDULE

- A. Contingency Allowance: Include a Betterment/Contingency allowance of \$50,000 to be used at the Owner's discretion.

END OF SECTION

**SECTION 01 2300
ALTERNATES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Description of Alternates.
- B. Procedures for pricing Alternates.
- C. Documentation of changes to Contract Price and Contract Time.

1.02 RELATED REQUIREMENTS

- A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.
- B. Document 00 4323 - Alternates Form: List of Alternates as supplement to Bid Form.
- C. Document 00 5200 - Agreement Form: Incorporating monetary value of accepted Alternates.

1.03 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 - Provide and install appliances included in Section 11 3013 - Residential Appliances.
- B. Alternate No. 2 - Provide and install scope include in L-Series sheets and specifications.
- C. Alternate No. 3 - Construct Shower Building (Base Proposal shall include associated utilities stubbed up and capped for future tie in.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED****END OF SECTION**

SECTION 01 2500 SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 01 6001: Request for Substitution Form.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.

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 coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. 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.
 - 1. Note explicitly any non-compliant characteristics.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms indicated and included 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 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
 - 1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.03 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

**SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Construction progress schedule.
- D. Progress photographs.
- E. Coordination drawings.
- F. Submittals for review, information, and project closeout.
- G. Number of copies of submittals.
- H. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 00 7200 - General Conditions: Dates for applications for payment.
- B. Section 00 7200 - General Conditions: Duties of the Construction Manager.
- C. Section 01 1000 - Summary: Stages of the Work, Work Covered by each Contract, Occupancy
- D. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.
- E. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- F. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

- A. AIA G810 - Transmittal Letter; 2001.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.01 PRECONSTRUCTION MEETING**

- A. Architect and Architect will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor with key personnel.
- 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 <1|A/E|>.
 - 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 copies to Architect, Contractor, 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. Consultants as appropriate to agenda topics.
5. Contractor's superintendent.
6. Major subcontractors as appropriate to agenda topics.

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. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.
14. Other business relating to work.

- E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Contractor, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 3216

- 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. Take photographs as evidence of existing project conditions.

3.05 COORDINATION DRAWINGS

- A. Provide information required by Project Coordinator for preparation of coordination drawings.
- B. Review drawings prior to submission to Architect.

3.06 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 conformance with information given and the design concept expressed in the 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 7800 - Closeout Submittals.

3.07 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.

3.08 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 conformance to requirements of Section 01 7800 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Video recorded training sessions submitted digitally.
 - 6. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.09 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size, with bookmarks and right-side up; illegible files will be rejected.
- B. Documents for Review: Submit one hard copy in addition to electronic copy of Structural Steel Framing and Decking Shop Drawings. Marked up PDF will be returned.
- C. Extra Copies at Project Closeout: See Section 01 7800.
- D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.10 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Transmit using approved form.
 - a. Use Form AIA G810.
 - 2. Sequentially identify each item. For revised submittals use original number and a sequential numerical 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. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 - 6. Provide space for Contractor and Architect review stamps.
 - 7. When revised for resubmission, identify all changes made since previous submission.
 - 8. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 - 9. 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.
- C. Shop Drawing Procedures:
 - 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related work.
 - 2. Do not reproduce the 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. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.11 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.
 1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- 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 3216
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 1000 - Summary: Work sequence.

1.03 REFERENCE STANDARDS

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.
- B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2015.

1.04 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule.
- 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. Submit updated schedule with each Application for Payment.
- E. Submit the number of opaque reproductions that Contractor requires, plus two copies which will be retained by Architect.

1.05 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with five 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.
- B. Contractor's Administrative Personnel: five years' minimum experience in using and monitoring CPM schedules on comparable projects.

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.
- B. Scale and Spacing: To allow for notations and revisions.

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. Provide sub-schedules for each stage of Work identified in Section 01 1000 - Summary.
- E. Provide sub-schedules to define critical portions of the entire schedule.
- F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- G. 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.

3.04 NETWORK ANALYSIS

- A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.
- B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
- C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
 - 1. Preceding and following event numbers.
 - 2. Activity description.
 - 3. Estimated duration of activity, in maximum 15 day intervals.
 - 4. Earliest start date.
 - 5. Earliest finish date.
 - 6. Actual start date.
 - 7. Actual finish date.
 - 8. Latest start date.
 - 9. Latest finish date.
 - 10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
 - 11. Monetary value of activity, keyed to Schedule of Values.
 - 12. Percentage of activity completed.
 - 13. Responsibility.
- D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.
- E. Required Reports: List activities in sorts or groups:
 - 1. By preceding work item or event number from lowest to highest.
 - 2. By amount of float, then in order of early start.

3.05 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.

3.06 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.

3.07 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 4000
QUALITY REQUIREMENTS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Submittals.
- B. Quality assurance.
- C. Testing and inspection agencies and services.
- D. Contractor's construction-related professional design services.
- E. Contractor's design-related professional design services.
- F. Control of installation.
- G. Mock-ups.
- H. Tolerances.
- I. Manufacturers' field services.
- J. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Document 00 3100 - Available Project Information: Soil investigation data.
- B. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.
- C. Section 01 3000 - Administrative Requirements: Submittal procedures.
- D. Section 01 4219 - Reference Standards.
- E. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 DEFINITIONS

- A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
 - 1. Design Services Types Required:

1.04 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

1.05 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.
- C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
 - 1. Structural Design of Metal Framing: As described in Section 05 4000 - Cold-Formed Metal Framing.
 - 2. Structural Design: Include physical characteristics, engineering calculations, and resulting dimensional limitations as described in Section 08 4313 - Aluminum-Framed Storefronts.

1.06 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
 - 1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
 - a. Full name.
 - b. Professional licensure information.
 - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C. Design Data: Submit for Architect's knowledge as contract administrator or for the Contractor, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.07 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.08 REFERENCES AND STANDARDS- SEE SECTION 01 4219**1.09 TESTING AND INSPECTION AGENCIES AND SERVICES**

- A. Owner will employ and pay for services of an independent testing agency to perform other specified testing.
- 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. Owner Employed Agency:
 - 1. Testing agency: Comply with requirements of ASTM E 329, ASTM E 543, ASTM C 1021, ASTM C 1077, ASTM C 1093, and ASTM D3740.
 - 2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 - 3. Laboratory: Authorized to operate in the State in which the Project is located.
 - 4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 - 5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

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. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, materials, flashings, seals, and finishes. Block and brace as required for safety.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. 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. See individual specification sections for testing required.
- B. 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-conformance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Attend progress meetings where applicable.
 - 7. Submit reports of all tests/inspections specified.
- C. 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.
- D. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used which 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.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. Payment for re testing will be charged to the Contractor by deducting testing charges from the Contract Price.

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 of equipment and systems as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
 - 1. Observer subject to approval of Architect.
 - 2. Observer subject to approval of Owner.
- C. 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 conforming to specified requirements.

- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4219 REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements relating to referenced standards.
- B. Reference standards full title and edition date.

1.02 DEFINITIONS

- A. General: Basic contract definitions are included in the Conditions of the Contract.
- B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.
- D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project except where individual specifications sections provide more stringent criteria; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - 2. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
 - 3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.
 - a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.
- J. "Project site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
- K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- L. Not-In-Contract (NIC) - Work not included in this Contract.

1.03 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents unless date of referenced standard is indicated.
- C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the Architect for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following abbreviations and acronyms, as referenced in the Contract Documents, mean the associated names. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

1.04 QUALITY ASSURANCE

- A. For products or 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. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

1.05 GOVERNING REGULATIONS AND AUTHORITIES

- A. Copies of Regulations: Obtain copies of required regulations and retain at the Project site to be available for reference by parties who have a reasonable need.

1.06 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS**2.01 AA -- ALUMINUM ASSOCIATION, INC.****2.02 AABC -- ASSOCIATED AIR BALANCE COUNCIL****2.03 AAMA -- AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION**

- 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).
- C. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2015.

- 2.04 AASHTO -- AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS**
- 2.05 AATCC -- AMERICAN ASSOCIATION OF TEXTILE CHEMISTS & COLORISTS**
- 2.06 ABMA -- AMERICAN BEARING MANUFACTURERS ASSOCIATION, INC.**
- 2.07 ACGIH -- AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS**
- 2.08 ACI -- AMERICAN CONCRETE INSTITUTE INTERNATIONAL**
- 2.09 ACPA -- AMERICAN CONCRETE PIPE ASSOCIATION**
- 2.10 ACT**
- 2.11 ADC -- AIR DIFFUSION COUNCIL**
- 2.12 AFPA -- AMERICAN FOREST AND PAPER ASSOCIATION**
- 2.13 AGA -- AMERICAN GALVANIZERS ASSOCIATION, INC.**
- 2.14 AGA -- AMERICAN GAS ASSOCIATION**
- 2.15 AGC -- ASSOCIATED GENERAL CONTRACTORS OF AMERICA**
- 2.16 AHA -- AMERICAN HARDBOARD ASSOCIATION**
- 2.17 AI -- THE ASPHALT INSTITUTE**
- 2.18 AIHA - AMERICAN INDUSTRIAL HYGIENE ASSOCIATION**
- 2.19 AISC -- AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.**
- 2.20 AISI -- AMERICAN IRON AND STEEL INSTITUTE**
- 2.21 AITC -- AMERICAN INSTITUTE OF TIMBER CONSTRUCTION**
- 2.22 ALSC -- AMERICAN LUMBER STANDARDS COMMITTEE**
- 2.23 AMCA -- AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.**
- 2.24 ANSI -- AMERICAN NATIONAL STANDARDS INSTITUTE**
 - A. ANSI A208.1 - American National Standard for Particleboard; 2009.
- 2.25 AOSA -- ASSOCIATION OF OFFICIAL SEED ANALYSTS**
- 2.26 APA -- APA - THE ENGINEERED WOOD ASSOCIATION**
- 2.27 APHA -- AMERICAN PUBLIC HEALTH ASSOCIATION**
- 2.28 API -- AMERICAN PETROLEUM INSTITUTE**
- 2.29 API -- ALLIANCE FOR THE POLYURETHANES INDUSTRY, AMERICAN PLASTICS COUNCIL**
- 2.30 ARI -- AIR-CONDITIONING AND REFRIGERATION INSTITUTE**
- 2.31 ARRA -- ASPHALT RECYCLING AND RECLAIMING ASSOCIATION**
- 2.32 ASA -- ACOUSTICAL SOCIETY OF AMERICA**
- 2.33 ASCA -- ARCHITECTURAL SPRAY COATERS ASSOCIATION**
- 2.34 ASCE -- AMERICAN SOCIETY OF CIVIL ENGINEERS**
- 2.35 ASHRAE -- AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.**
- 2.36 ASME -- THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS**
- 2.37 ASPA -- AMERICAN SOD PRODUCERS ASSOCIATION (SEE TURFGRASS PRODUCERS INTERNATIONAL)**
- 2.38 ASSE -- AMERICAN SOCIETY OF SANITARY ENGINEERING**
- 2.39 ASTM A SERIES -- AMERICAN SOCIETY FOR TESTING AND MATERIALS**
 - A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
 - B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a (Reapproved 2016).
 - C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

2.40 ASTM B SERIES -- AMERICAN SOCIETY FOR TESTING AND MATERIALS

- A. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2012.

2.41 ASTM C SERIES -- AMERICAN SOCIETY FOR TESTING AND MATERIALS

- A. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.
- C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

2.42 ASTM D SERIES -- AMERICAN SOCIETY FOR TESTING AND MATERIALS

- A. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2012.

2.43 ASTM E SERIES -- AMERICAN SOCIETY FOR TESTING AND MATERIALS**2.44 ASTM F SERIES -- AMERICAN SOCIETY FOR TESTING AND MATERIALS****2.45 ASTM G SERIES -- AMERICAN SOCIETY FOR TESTING AND MATERIALS****2.46 AWCI -- ASSOCIATION OF THE WALL AND CEILING INDUSTRIES INTERNATIONAL****2.47 AWI -- ARCHITECTURAL WOODWORK INSTITUTE****2.48 AWPA -- AMERICAN WOOD-PRESERVERS' ASSOCIATION****2.49 AWPB -- AMERICAN WOOD PRESERVERS BUREAU****2.50 AWS -- AMERICAN WELDING SOCIETY**

- A. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

2.51 AWWA -- AMERICAN WATER WORKS ASSOCIATION**2.52 BHMA -- BUILDERS HARDWARE MANUFACTURERS ASSOCIATION**

- A. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.

2.53 BIA -- BRICK INDUSTRY ASSOCIATION**2.54 BIFMA - BUSINESS AND INDUSTRY FURNITURE MANUFACTURERS ASSOCIATION****2.55 BOCA -- BUILDING OFFICIALS & CODE ADMINISTRATORS INTERNATIONAL, INC.****2.56 BS - BRITISH STANDARDS INSTITUTION****2.57 CAN -- STANDARDS COUNCIL OF CANADA (NATIONAL STANDARDS OF CANADA)****2.58 CBMA -- CERTIFIED BALLAST MANUFACTURERS ASSOCIATION****2.59 CCMC -- CANADA CONSTRUCTION MATERIALS CENTRE****2.60 CDA -- COPPER DEVELOPMENT ASSOCIATION, INC.****2.61 CGA -- CANADIAN GAS ASSOCIATION**

- 2.62 CGA -- COMPRESSED GAS ASSOCIATION**
- 2.63 CGSB -- CANADIAN GENERAL STANDARDS BOARD**
- 2.64 CISCA -- CEILINGS & INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION**
- 2.65 CISPI -- CAST IRON SOIL PIPE INSTITUTE**
- 2.66 CLFMI -- CHAIN LINK FENCE MANUFACTURERS INSTITUTE**
- 2.67 CRA -- CALIFORNIA REDWOOD ASSOCIATION**
- 2.68 CRI -- CARPET AND RUG INSTITUTE**
- 2.69 CRSI -- CONCRETE REINFORCING STEEL INSTITUTE**
- 2.70 CSA -- CSA INTERNATIONAL (FORMERLY CANADIAN STANDARDS ASSOCIATION)**
- 2.71 CSFM -- CALIFORNIA STATE FIRE MARSHAL**
- 2.72 CSSB -- CEDAR SHAKE AND SHINGLE BUREAU**
- 2.73 CTI -- CERAMIC TILE INSTITUTE**
- 2.74 CTI -- COOLING TECHNOLOGY INSTITUTE**
- 2.75 DASMA -- DOOR & ACCESS SYSTEMS MANUFACTURERS' ASSOCIATION, INTERNATIONAL**
- 2.76 DHI -- DOOR AND HARDWARE INSTITUTE**
- 2.77 DIN -- DEUTSCHES INSTITUT FUR NORMUNG**
- 2.78 EC -- EUROPEAN COMMISSION**
- 2.79 EIA -- ELECTRONIC INDUSTRIES ALLIANCE**
- 2.80 EIMA -- EXTERIOR INSULATION MANUFACTURERS ASSOCIATION**
- 2.81 EJMA -- EXPANSION JOINT MANUFACTURERS ASSOCIATION**
- 2.82 ESD - ELECTROSTATIC DISCHARGE ASSOCIATION**
- 2.83 ETL -- ETL TESTING LABORATORY**
- 2.84 FBC - FLORIDA BUILDING CODE**
- 2.85 FM -- FACTORY MUTUAL GLOBAL**
- 2.86 FRSA - FLORIDA ROOFING, SHEET METAL AND AIR CONDITIONING CONTRACTORS ASSOCIATION**
- 2.87 GA -- GYPSUM ASSOCIATION**
- 2.88 GANA -- GLASS ASSOCIATION OF NORTH AMERICA**
- 2.89 GRI -- GEOSYNTHETIC RESEARCH INSTITUTE**
- 2.90 HI -- THE HYDRONICS INSTITUTE**
- 2.91 HPVA -- HARDWOOD PLYWOOD VENEER ASSOCIATION**

A. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2020.

- 2.92 HPW -- H.P. WHITE LABORATORY, INC.**
- 2.93 IAPMO -- INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS**
- 2.94 ICBO -- INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS**
- 2.95 ICBO-ES -- ICBO EVALUATION SERVICE, INC.**
- 2.96 ICC -- INTERNATIONAL CODE COUNCIL, INC.**
- 2.97 ICC-ES -- ICC EVALUATION SERVICE, INC.**
- 2.98 ICEA -- INSULATED CABLE ENGINEERS ASSOCIATION**
- 2.99 ICPA - INTERNATIONAL CAST POLYMERS ALLIANCE OF THE COMPOSITES FABRICATORS ASSOCIATION**
- 2.100 ICRI - INTERNATIONAL CONCRETE REPAIR INSTITUTE**
- 2.101 IEC -- INTERNATIONAL ELECTROTECHNICAL COMMISSION**
- 2.102 IEEE -- INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS**
- 2.103 IES/IESNA -- ILLUMINATING ENGINEERING SOCIETY**
- 2.104 IGCC -- INSULATING GLASS CERTIFICATION COUNCIL**
- 2.105 IGMA -- INSULATING GLASS MANUFACTURERS ALLIANCE**
- 2.106 IGSHPA -- INTERNATIONAL GROUND SOURCE HEAT PUMP ASSOCIATION**
- 2.107 IIR -- INTERNATIONAL INSTITUTE OF AMMONIA REFRIGERATION**
- 2.108 ILI -- INDIANA LIMESTONE INSTITUTE OF AMERICA, INC.**
- 2.109 IMIABC -- INTERNATIONAL MASONRY INDUSTRY ALL-WEATHER COUNCIL**
- 2.110 ISA -- INSTRUMENT SOCIETY OF AMERICA**
- 2.111 ISDI -- INSULATED STEEL DOOR INSTITUTE**
- 2.112 ISS -- IRON AND STEEL SOCIETY**
- 2.113 ISSFA - INTERNATIONAL SOLID SURFACE FABRICATORS ASSOCIATION**
- 2.114 ISO -- INTERNATIONAL STANDARDS ORGANIZATION**
- 2.115 ITS -- INTERTEK TESTING SERVICES NA, INC.**
- 2.116 IWCA - INTERNATIONAL WINDOW CLEANING ASSOCIATION**
- 2.117 KCMA -- KITCHEN CABINET MANUFACTURERS ASSOCIATION**
- 2.118 LGSEA - LIGHT GAUGE STEEL ENGINEERS ASSOCIATION**
- 2.119 LIA -- LEAD INDUSTRIES ASSOCIATION, INC.**
- 2.120 LPI -- LIGHTNING PROTECTION INSTITUTE**
- 2.121 MBMA -- METAL BUILDING MANUFACTURERS ASSOCIATION**
- 2.122 M-H -- MCGRAW-HILL BOOK COMPANY**
- 2.123 MFMA -- MAPLE FLOORING MANUFACTURERS ASSOCIATION**
- 2.124 MFMA -- METAL FRAMING MANUFACTURERS ASSOCIATION**
- 2.125 MIA -- MARBLE INSTITUTE OF AMERICA, INC.**
- 2.126 MICA -- MIDWEST INSULATION CONTRACTORS ASSOCIATION**
- 2.127 ML/SFA -- METAL LATH/STEEL FRAMING ASSOCIATION - SEE NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS**
- 2.128 MPI -- MASTER PAINTERS INSTITUTE (MASTER PAINTERS AND DECORATORS ASSOCIATION)**
- 2.129 MMSA -- MATERIALS AND METHODS STANDARDS ASSOCIATION**
- 2.130 MSS -- MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY, INC.**
- 2.131 NAA -- NATIONAL ARBORIST ASSOCIATION**
- 2.132 NAAMM -- THE NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS**

2.133 NACE -- NACE INTERNATIONAL**2.134 NAGDM -- NATIONAL ASSOCIATION OF GARAGE DOOR MANUFACTURERS****2.135 NAIMA - NORTH AMERICAN INSULATION MANUFACTURERS ASSOCIATION****2.136 NAMM -- NATIONAL ASSOCIATION OF MIRROR MANUFACTURERS****2.137 NBGQA -- NATIONAL BUILDING GRANITE QUARRIES ASSOCIATION, INC.****2.138 NCMA -- NATIONAL CONCRETE MASONRY ASSOCIATION****2.139 NCWPB - NATIONAL CERTIFIED PIPE WELDING BUREAU****2.140 NCRP -- NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS****2.141 NEBB -- NATIONAL ENVIRONMENTAL BALANCING BUREAU****2.142 NECA -- NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION****2.143 NEII -- NATIONAL ELEVATOR INDUSTRY, INC.****2.144 NELMA -- NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION, INC.****2.145 NEMA -- NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION****2.146 NETA -- INTERNATIONAL ELECTRICAL TESTING ASSOCIATION****2.147 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION**

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

2.148 NFRC -- NATIONAL FENESTRATION RATING COUNCIL, INC.**2.149 NGA -- NATIONAL GAS ASSOCIATION****2.150 NHLA -- NATIONAL HARDWOOD LUMBER ASSOCIATION****2.151 NLA -- NATIONAL LIME ASSOCIATION****2.152 NLGA -- NATIONAL LUMBER GRADES AUTHORITY****2.153 NOFMA -- NATIONAL OAK FLOORING MANUFACTURERS ASSOCIATION****2.154 NPA -- NATIONAL PARTICLEBOARD ASSOCIATION****2.155 NPCA -- NATIONAL PAINT AND COATINGS ASSOCIATION****2.156 NATIONAL SPA AND POOL AND SPA INSTITUTE****2.157 NRCA -- NATIONAL ROOFING CONTRACTORS ASSOCIATION****2.158 NSF -- NSF INTERNATIONAL (THE PUBLIC HEALTH AND SAFETY ORGANIZATION)****2.159 NSWMA -- NATIONAL SOLID WASTES MANAGEMENT ASSOCIATION****2.160 NTMA -- NATIONAL TERRAZZO AND MOSAIC ASSOCIATION, INC., THE****2.161 NTMA -- NATIONAL TILE AND MARBLE ASSOCIATION**

- 2.162 NWWDA -- NATIONAL WOOD WINDOW AND DOOR ASSOCIATION (NAME CHANGED TO WDMA)**
- 2.163 OWMA -- OPERABLE WALL MANUFACTURERS ASSOCIATION**
- 2.164 PCA -- PORTLAND CEMENT ASSOCIATION**
- 2.165 PCI -- PRECAST/PRESTRESSED CONCRETE INSTITUTE**
- 2.166 PDCA -- PAINTING AND DECORATING CONTRACTORS OF AMERICA**
- 2.167 PDI -- PLUMBING AND DRAINAGE INSTITUTE**
- 2.168 PECI - PORTLAND ENERGY CONSERVATION, INC.**
- 2.169 PEI -- PORCELAIN ENAMEL INSTITUTE**
- 2.170 PIMA -- POLYISOCYANURATE INSULATION MANUFACTURERS ASSOCIATION**
- 2.171 PPI -- PLASTICS PIPE INSTITUTE**
- 2.172 PTI -- POST-TENSIONING INSTITUTE**
- 2.173 RIS -- REDWOOD INSPECTION SERVICE**
- 2.174 RFCI -- RESILIENT FLOOR COVERING INSTITUTE**
- 2.175 RTI - ROOF TILE INSTITUTE**
- 2.176 SBCCI -- SOUTHERN BUILDING CODE CONGRESS INTERNATIONAL, INC.**
- 2.177 SCMA -- SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION**
- 2.178 SDI -- STEEL DOOR INSTITUTE**
- 2.179 SDI -- STEEL DECK INSTITUTE, INC.**
- 2.180 SEFA -- SCIENTIFIC EQUIPMENT AND FURNITURE ASSOCIATION**
- 2.181 SGCC -- SAFETY GLAZING CERTIFICATION COUNCIL**
- 2.182 SIGMA -- SEALED INSULATING GLASS MANUFACTURERS ASSOCIATION (SEE IGMA)**
- 2.183 SJI -- STEEL JOIST INSTITUTE**
- 2.184 SMA -- SCREEN MANUFACTURERS ASSOCIATION**
- 2.185 SMA -- STUCCO MANUFACTURERS ASSOCIATION, INC.**
- 2.186 SMACNA -- SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC.**
- 2.187 SPFA - SPRAY POLYURETHANE FOAM ALLIANCE**
- 2.188 SPIB -- SOUTHERN PINE INSPECTION BUREAU, INC.**
- 2.189 SPRI -- SINGLE PLY ROOFING INDUSTRY**
- 2.190 SSINA - SPECIALTY STEEL INDUSTRY OF NORTH AMERICA**
- 2.191 SSPC -- SOCIETY FOR PROTECTIVE COATINGS**
- 2.192 SSPMA -- SUMP AND SEWAGE PUMP MANUFACTURERS ASSOCIATION**
- 2.193 STI -- STEEL TANK INSTITUTE**
- 2.194 SWI -- STEEL WINDOW INSTITUTE**
- 2.195 SWRI -- SEALANT, WATERPROOFING AND RESTORATION INSTITUTE**
- 2.196 TAPPI (TEXTILE ASSOCIATION OF THE PULP AND PAPER INDUSTRIES)**
- 2.197 TCNA -- TILE COUNCIL OF NORTH AMERICA, INC.**
- 2.198 TEMA -- TUBULAR EXCHANGER MANUFACTURERS ASSOCIATION, INC.**
- 2.199 TIA -- TELECOMMUNICATIONS INDUSTRY ASSOCIATION**
- 2.200 TIMA -- TIMA**
- 2.201 TPI -- TRUSS PLATE INSTITUTE**
- 2.202 TPI -- TURFGRASS PRODUCERS INTERNATIONAL**
- 2.203 TRI - TILE ROOFING INSTITUTE**
- 2.204 UL -- UNDERWRITERS LABORATORIES INC.**
- 2.205 ULC -- UNDERWRITERS' LABORATORIES OF CANADA**

2.206 USG -- UNITED STATES GYPSUM

2.207 VSI -- VINYL SIDING INSTITUTE, A DIVISION OF THE SOCIETY OF THE PLASTICS INDUSTRY, INC.

2.208 WASTEC -- WASTE EQUIPMENT TECHNOLOGY ASSOCIATION

2.209 WCLB -- WEST COAST LUMBER INSPECTION BUREAU

2.210 WCMA - WINDOW COVERING MANUFACTURERS ASSOCIATION

2.211 WDMA - WINDOW AND DOOR MANUFACTURERS ASSOCIATION (FORMERLY NWWDA)

2.212 WI -- WOODWORK INSTITUTE

2.213 WILEY -- JOHN WILEY AND SONS (PUBLISHERS)

2.214 WMMPA -- WOOD MOULDING AND MILLWORK PRODUCERS ASSOCIATION

2.215 WRCLA -- WESTERN RED CEDAR LUMBER ASSOCIATION

2.216 WWPA -- WESTERN WOOD PRODUCTS ASSOCIATION

PART 3 UNITED STATES GOVERNMENT AND RELATED AGENCIES DOCUMENTS

3.01 UNITED STATES CODE

3.02 CFR -- CODE OF FEDERAL REGULATIONS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

3.03 CPSC -- CONSUMER PRODUCTS SAFETY COMMISSION

3.04 EPA -- ENVIRONMENTAL PROTECTION AGENCY

3.05 FS -- FEDERAL SPECIFICATIONS AND STANDARDS (GENERAL SERVICES ADMINISTRATION)

3.06 GSA -- U.S. GENERAL SERVICES ADMINISTRATION

3.07 NIJ -- NATIONAL INSTITUTE OF JUSTICE (DEPT. OF JUSTICE)

3.08 NILECJ - NATIONAL INSTITUTE OF LAW ENFORCEMENT AND CRIMINAL JUSTICE (DEPT. OF JUSTICE)

3.09 PS -- PRODUCT STANDARDS

3.10 USGS -- UNITED STATES GEOLOGICAL SURVEY

END OF SECTION

**SECTION 01 5000
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 TEMPORARY UTILITIES

- A. Contractor will provide the following:
 - 1. Electrical power and metering, consisting of connection to existing facilities.
 - 2. Water supply, consisting of connection to existing facilities.
- B. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- C. Existing facilities may be used.
- D. New permanent facilities may be used.
- E. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TELEPHONE SERVICE

- A. Provide, maintain, and pay for telephone service to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Telephone Land Lines: One line, minimum; one handset per line.
 - 2. Internet Connections: Minimum of one; DSL modem or faster.
 - 3. Email: Account/address reserved for project use.

1.04 INTERNET SERVICE

- A. Provide, maintain and pay for internet service to field office at time of project mobilization. Service must be DSL or cable.

1.05 TEMPORARY SANITARY FACILITIES

- A. Sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
 - 1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.
- B. Toilets: Use of the Owner's existing toilet facilities is expressly prohibited.
- C. Sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
- D. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- E. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
 - 1. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
- F. Drinking-Water Fixtures: Provide drinking-water dispensers including paper cup supply.

- G. Maintain daily in clean and sanitary condition.

1.06 TEMPORARY FIRE PROTECTION

- A. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
 2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
 4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- B. At the earliest feasible date in each area of the Project, complete installation of the permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

1.07 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.08 FENCING

- A. Existing Fencing: Maintain existing perimeter as much as possible.
- B. Construction: Commercial grade chain link fence.
- C. Where required to supplement existing perimeter fence, provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.
- D. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.

1.09 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. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.10 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.
- C. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.
- D. 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.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

- A. Provide project identification banner with project rendering and project team. Banner shall be 4' x 8' mesh-vinyl with a sewn hem and grommets, printed in full color. Architect shall provide vector graphics.

- B. Install on site at location established by Architect and approved by Owner.
- C. No other signs are allowed without Owner permission except those required by law.

1.12 FIELD OFFICES

- 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 ten (10) persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.13 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. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.
- E. 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 5100 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 5000 - Temporary Facilities and Controls: Telephone service for administrative purposes.

1.03 TEMPORARY UTILITY INSTALLATION

- A. General: Engage the appropriate local utility company to install temporary service. Pay all fees or deposits necessary to obtain the use of such utilities and pay for utility consumed.
1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
 4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.

1.04 TEMPORARY ELECTRIC POWER SERVICE

- A. Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
1. Install electric power service underground, except where overhead service must be used.
 2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
 3. Verify with Owner's Representative, duplex outlets that may be used during construction. Do not use "Dedicated Outlets" during construction for any reason. Verify with Owner's Representative local designation for "Dedicated Outlets."

1.05 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Maintain lighting and provide routine repairs.
- D. Permanent building lighting may be utilized during construction.

1.06 TEMPORARY HEATING

- A. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- B. Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
- C. Except where the Owner authorizes use of the permanent system, provide vented, self-contained, LP-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.
- D. Existing facilities shall not be used.

1.07 TEMPORARY COOLING

- A. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

1.08 TEMPORARY WATER SERVICE

- A. Provide and maintain suitable quality water service for construction operations at time of project mobilization.
- B. Connect to existing water source.
 - 1. Exercise measures to conserve water.
 - 2. 1. Provide backflow preventers where existing water service is tapped in such a manner that contamination of service is possible.
- C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

1.09 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
- C. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- D. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- E. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
 - 2. Immediately prior to Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace significantly worn parts and parts subject to unusual operating conditions.
 - c. Replace lamps burned out or noticeably dimmed by hours of use.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED**

END OF SECTION

**SECTION 01 5500
VEHICULAR ACCESS AND PARKING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Access roads.
- B. Parking.
- C. Existing pavements and parking areas.
- D. Permanent pavements and parking facilities.
- E. Construction parking controls.
- F. Flag persons.
- G. Haul routes.
- H. Maintenance.
- I. Removal, repair.
- J. Mud from site vehicles.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: For access to site, work sequence, and occupancy.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Temporary Construction: Contractor's option contingent upon approval by Owner and Architect.

2.02 SIGNS, SIGNALS, AND DEVICES

- A. Flag Person Equipment: As required by local jurisdictions.

PART 3 EXECUTION**3.01 PREPARATION**

- A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

3.02 ACCESS ROADS

- A. Use of existing on-site streets and driveways for construction traffic is permitted.
- B. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.
- C. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.
- D. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.
- E. Provide and maintain access to fire hydrants free of obstructions.

3.03 PARKING

- A. Use of designated areas of existing parking facilities by construction personnel is permitted.
- B. Do not allow heavy vehicles or construction equipment in parking areas.
- C. When site space is not adequate, provide additional off-site parking. Coordinate with the owner and authorities with the local jurisdiction.

3.04 PERMANENT PAVEMENTS AND PARKING FACILITIES

- A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.
- B. Avoid traffic loading beyond paving design capacity.

3.05 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.
- B. Prevent parking on or adjacent to access roads or in non-designated areas.

3.06 FLAG PERSONS

- A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.07 HAUL ROUTES

- A. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.08 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
- B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.09 REMOVAL, REPAIR

- A. Repair existing facilities damaged by use, to original condition.
- B. Remove equipment and devices when no longer required.
- C. Repair damage caused by installation.

3.10 MUD FROM SITE VEHICLES

- A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION

**SECTION 01 5719
TEMPORARY ENVIRONMENTAL CONTROLS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Construction procedures to promote adequate indoor air quality after construction.
- B. Building flush-out after construction and before occupancy.
- C. Testing indoor air quality after completion of construction.

1.02 PROJECT GOALS

- A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
 - 1. Cleaning of ductwork is not contemplated under this Contract.
 - 2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
 - 3. Establish condition of existing ducts and equipment prior to start of alterations.
- B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
 - 1. Furnish products meeting the specifications.
 - 2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 129 - Measuring Air-Change Effectiveness.; 1997 (Reaffirmed 2002).
- B. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

1.04 DEFINITIONS

- A. Absorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
 - 1. Submit not less than 60 days before enclosure of building.
 - 2. Identify potential sources of odor and dust.
 - 3. Identify construction activities likely to produce odor or dust.
 - 4. Identify areas of project potentially affected, especially occupied areas.
 - 5. Evaluate potential problems by severity and describe methods of control.
 - 6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
 - 7. Describe cleaning and dust control procedures.
- C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.
- D. Duct and Terminal Unit Inspection Report.
- E. Air Contaminant Test Plan: Identify:
 - 1. Testing agency qualifications.
 - 2. Locations and scheduling of air sampling.
 - 3. Test procedures, in detail.
 - 4. Test instruments and apparatus.
 - 5. Sampling methods.

- F. Air Contaminant Test Reports: Show:
 - 1. Location where each sample was taken, and time.
 - 2. Test values for each air sample; average the values of each set of 3.
 - 3. HVAC operating conditions.
 - 4. Certification of test equipment calibration.
 - 5. Other conditions or discrepancies that might have influenced results.
- G. Ventilation Effectiveness Test Plan: Identify:
 - 1. Testing agency qualifications.
 - 2. Description of test spaces, including locations of air sampling.
 - 3. Test procedures, in detail; state whether tracer gas decay or step-up will be used.
 - 4. Test instruments and apparatus; identify tracer gas to be used.
 - 5. Sampling methods.
- H. Ventilation Effectiveness Test Reports: Show:
 - 1. Include preliminary tests of instruments and apparatus and of test spaces.
 - 2. Calculation of ventilation effectiveness, E.
 - 3. Location where each sample was taken, and time.
 - 4. Test values for each air sample.
 - 5. HVAC operating conditions.
 - 6. Other information specified in ASHRAE Std 129.
 - 7. Other conditions or discrepancies that might have influenced results.

1.06 QUALITY ASSURANCE

- A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

- A. Prevent the absorption of moisture and humidity by adsorptive materials by:
 - 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
 - 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
 - 3. Provide sufficient ventilation for drying within reasonable time frame.
- B. Begin construction ventilation when building is substantially enclosed.
- C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.
- D. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.
- E. Use of HVAC equipment and ductwork for ventilation during construction is not permitted:
 - 1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
 - 2. Exhaust directly to outside.
 - 3. Seal HVAC air inlets and outlets immediately after duct installation.
- F. Do not store construction materials or waste in mechanical or electrical rooms.
- G. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
 - 1. Inspect duct intakes, return air grilles, and terminal units for dust.
 - 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
 - 3. Clean tops of doors and frames.
 - 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 - 5. Clean return plenums of air handling units.

6. Remove intake filters last, after cleaning is complete.
- H. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
- I. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

3.02 BUILDING FLUSH-OUT

- A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.
- B. Perform building flush-out before occupancy.
- C. Do not start flush-out until:
 1. All construction is complete.
 2. HVAC systems have been tested, adjusted, and balanced for proper operation.
 3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
 4. New HVAC filtration media have been installed.
- D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air for at least 14 consecutive days.
 1. Obtain Owner's concurrence that construction is complete enough before beginning flush-out.
 2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.
 3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start 14 day period over.
 4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:
 - a. Begin ventilation at least three hours prior to daily occupancy.
 - b. Continue ventilation during all occupied periods.
 - c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.
- E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.03 AIR CONTAMINANT TESTING

- A. Contractor's Option: Either full continuous flush-out, or satisfactory air contaminant testing is required, not both.
- B. Perform air contaminant testing before starting construction, as base line for evaluation of post-construction testing.
- C. Perform air contaminant testing before occupancy.
- D. Do not start air contaminant testing until:
 1. All construction is complete.
 2. HVAC systems have been tested, adjusted, and balanced for proper operation.
 3. New HVAC filtration media have been installed.
- E. Indoor Air Samples: Collect from spaces representative of occupied areas:
 1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally, and the building is unoccupied.
 2. Collect samples from spaces in each air handler zone.
 3. Collect samples from height from 48 inches to 84 inches above floor.
 4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
 5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
 6. When retesting the same building areas, take samples from at least the same locations as in first test.
- F. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.
- G. Analyze air samples and submit report.

END OF SECTION

SECTION 01 6000 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. Spare parts and maintenance materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Lists of products to be removed from existing building.
- B. Section 01 2500 - Substitution Procedures: Substitutions made during and after the Bidding/Negotiation Phase.
- C. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.03 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.
 - 1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
 - b. "Foreign Products," as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign products.
 - 2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
 - 3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.
 - 4. "Substitution" is a change in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor. The following are not considered to be requests for substitutions:
 - a. Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
 - b. Revisions to the Contract Documents requested by the Owner or Architect.
 - c. Specified options of products and construction methods included in the Contract Documents.
 - d. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.04 SUBMITTALS

- A. 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.
- B. 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.

- C. 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.
- D. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. Refer to Section 01300, 3.10 and 3.11 for Architect's action.

1.05 VERIFICATION OF NON-CONTAMINATION

- A. For each of the following materials provided, submit a letter from the manufacturer certifying that products are totally free of all forms of polychlorinated biphenyl (PCB) or asbestos, including actinolite, amosite, anthophyllite, chrysotile, crocidolite, and tremolite.
 - 1. Fireproofing.
 - 2. Dampproofing.
 - 3. Waterproofing.
 - 4. Sealants.
 - 5. Prefabricated wall panels or siding.
 - 6. Vinyl composition flooring.
 - 7. Mechanical cooling tower liners.
 - 8. Mechanical insulation.
 - 9. Electrical isolators.
 - 10. Other products indicated in the specification.
- B. Do not use products containing lead in any form in the manufacture of any component or for installation of the potable water supply.
- C. Construction Manager to provide certificate of Non Asbestos containing materials used in construction.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
 - 1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
 - 2. Store materials, over and beyond those are immediately required for construction, outside of the existing Owner buildings unless otherwise approved by the Owner.
 - 3. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 4. Do not schedule delivery and do not receive material or equipment at the job site until there is suitable space provided to properly protect equipment from dust, humidity and deterioration from humidity or moisture, and physical impact damage.
 - 5. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - a. When special makes or grades of material are specified or approved, such materials shall be delivered to the project site in their original packages or cans with seals unbroken and labels attached and shall not be opened until inspected and approved by the Owner.
 - 6. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 - 7. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
 - 8. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
 - 9. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.
 - 10. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
 - 11. Store inflammable or combustible materials with care. Store paint, paint supplies, brushes, rollers, drops and related painting materials that are combustible in a manner to prevent spontaneous combustion, in well ventilated areas and in a neat and clean condition. Limit storage with Owner

property to maximum of 24 hours.

- B. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

PART 2 PRODUCTS

2.01 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
 - 1. All materials, unless otherwise specified, shall be of current U.S. (United States) manufacture, new, free from all defects, and of the best quality of their respective kinds. Foreign goods specifically approved for use by the Architect prior to bidding may be furnished.
 - 2. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
 - 3. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 4. On projects involving remodeling, where existing products will be retained, match existing products as closely as possible with new materials.
 - 5. All equipment installed on this project shall have local (within 125 miles) representation, local factory authorized service, and a local stock of repair parts. This requirement is essential and will be strictly reviewed prior to concurrence with the Contractor's approval for all submittals.
- B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:
 - 1. Proprietary Specification Requirements: Wherever in these specifications or drawings an article or material is defined by describing a proprietary product, or by using a trade name, or the name of the manufacturer or vendor, the term "or equal" if not inserted therewith shall be implied.
 - 2. Semiproprietary Specification Requirements: Where Specifications name 2 or more products or manufacturers, provide 1 of the products indicated. No substitutions will be permitted.
 - a. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" or "or approved equal," or "or equivalent," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 - 3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 - 4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
 - 5. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
 - 6. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
 - a. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.
 - 7. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.
 - 8. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.
 - a. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.
 - 9. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

2.02 EXISTING PRODUCTS

- A. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- B. 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.
- C. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is not prohibited.

2.03 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. DO NOT USE products having any of the following characteristics:
 - 1. Made of wood from newly cut old growth timber.
 - 2. Containing lead, cadmium, asbestos.

2.04 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.

PART 3 EXECUTION**3.01 SUBSTITUTION LIMITATIONS**

- A. See Section 01 2500 - Substitution Procedures.
- B. Architect will consider requests for substitutions only within 30 days after date of Agreement. Requests received more than 30 days after commencement of the Work may be considered or rejected at the discretion of the Architect.
- C. A request for substitution constitutes a representation that the submitter:
 - 1. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Architect.
 - 2. Waives claims for additional costs or time extension which may subsequently become apparent.
- D. Substitution Submittal Procedure (after contract award):
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution. Request for substitution must be accompanied by Substitution Request form available from Architect.
 - 2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
 - 3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors, that will be necessary to accommodate the proposed substitution.
 - b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
 - c. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 - f. Cost information, including a proposal of the net change, if any in the Contract Sum.
 - g. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
 - h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
 - 4. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within two weeks of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection of the substitution within 2 weeks of receipt of the request, or

one week of receipt of additional information or documentation, whichever is later. Acceptance will be in the form of a change order if a change in cost or time for construction is required, otherwise acceptance will be in the form of written acceptance.

- a. Use the product specified if the Architect cannot make a decision on the use of a proposed substitute within the time allocated.
5. Should a substitution be approved and subsequently prove to be defective or otherwise unsatisfactory for the service for which it was intended, the Contractor shall without cost to the Owner, and without obligation on the part of the Architect, replace the same with the material originally specified.
6. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer. The Architect's decision of approval or disapproval or a proposed substitution shall be final.

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. 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.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide off-site storage and protection when site does not permit on-site storage or protection.
- 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. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

3.05 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's printed instructions and recommendations for preparing, assembling, installing, erecting, and cleaning manufacturer materials or equipment, unless otherwise indicated. Anchor each product securely in place, accurately located and aligned with other Work.
- B. Promptly notify the Architect in writing of any conflict between the requirements of the Contract Documents and the manufacturers' instructions. Obtain clarification from the Architect before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or such clarification by the Owner's Representative, he shall bear all costs arising in connection with the correction of the deficiencies.
- C. All work shall be executed by mechanics skilled in their respective trades. Install in a neat, precise manner with a finished appearance.
- D. Protect materials and equipment from damage from the time of delivery until the completion of the work. Erect required temporary shelters and supports to adequately protect any items stored in the open on the site from the weather, the ground and surrounding work. Provide cribbing of any items above the floor of the construction. Cover items in the uncompleted building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above will be sufficient cause for the rejection of the items in question.
- E. Protect equipment and materials from rust both before and after installation. Clean materials of any rust discovered, treat and repaint as specified elsewhere in specification.
- F. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion. Clean in conformance with requirements of Section 01700.

END OF SECTION

SECTION 01 6001
REQUEST FOR SUBSTITUTION

PROJECT: Castroville Community Building
SUBMITTAL NO.:
CONTRACTOR:
SPECIFIED PRODUCT/SPECIFICATION SECTION:
REASON FOR CHANGE:
CONSTRUCTION COST CHANGES:
CONSTRUCTION TIME CHANGES:

Contractor has thoroughly investigated and coordinated this substitution and certifies that it meets or exceeds original product/manufacturer called for in the contract documents

Contractor verifies that the substitute's performance and operation meets or exceeds original called for in the contract documents

Contractor verifies that substitute can be incorporated into project without affecting any other aspect of the project

Contractor understands that additional time will be required for architect / engineer processing and owner's consideration of substitution.

_____	_____
CONTRACTOR'S AUTHORIZED REPRESENTATIVE	DATE

Enclosed are two copies of a submittal which includes a product or manufacturer that was not specified in the contract documents. The contractor is requesting that this product be accepted as a substitute in lieu of the product / manufacturer specified

The contractor's statement with back-up documentation for this substitution is attached and includes reasons for the substitution and any time or cost change.

We have reviewed the material and based upon the contractor's statement justifying this substitution, there is is not sufficient reason for us to recommend this substitution to you.

_____	_____
ARCHITECT	DATE

RECOMMENDED NOT RECOMMENDED

It is our policy to have the owner review and approve changes to this project. Please check the appropriate box to indicate your approval or disapproval.

_____	_____
OWNER	DATE

APPROVED NOT APPROVED

END OF SECTION

**SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 5000 - Temporary Facilities and Controls: Temporary interior partitions.
- F. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

1.03 SUBMITTALS

- A. See Section 01 3000 - 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 conformance 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.
 - 4. Submit completed Demolition/Renovation Notification form to Texas Department of Health. Copy Owner/Architect. Form located at end of section.
- D. Cutting and Patching: Submit written request in advance of cutting or alteration which 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.
 - 6. Include in request:
 - a. Identification of Project.
 - b. Location and description of affected work.
 - c. Necessity for cutting or alteration.
 - d. Description of proposed work and products to be used.
 - e. Alternatives to cutting and patching.
 - f. Effect on work of Owner or separate Contractor.

- g. Written permission of affected separate Contractor.
- h. Date and time work will be executed.

E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 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 survey work, employ a land surveyor registered in Texas and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.
- C. 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.

1.05 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. 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.
- E. 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.
- F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- G. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. 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.

1.06 COORDINATION

- A. See Section 01 1000 for occupancy-related requirements.
- B. 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.
- C. Notify affected utility companies and comply with their requirements.
- D. 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.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown 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.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.

- H. 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 6000 - 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 a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- I. 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.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.
- L. 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 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 alterations work constitutes acceptance of existing conditions.
- B. Separate areas in which alterations are being conducted from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 and as required.
 - 2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
 - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
 - 3. Relocate items indicated on drawings.
 - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.

2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. 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.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. See Section 01 1000 for other limitations on outages and required notifications.
 - c. Provide temporary connections as required to maintain existing systems in service.
 4. Verify that abandoned services serve only abandoned facilities.
 5. 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; patch holes left by removal using materials specified for new construction.
- F. 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.
- G. Adapt existing work to fit new work:
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
 3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
 4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- I. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
 3. Patch as specified for patching new work.
- J. Clean existing systems and equipment.
- K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- L. Do not begin new construction in alterations areas before demolition is complete.
- M. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. 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-conforming work.
- D. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to

remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.

- E. Execute work by methods to avoid damage to other work, and which 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, 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.
- L. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- M. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.
- N. Patch or replace surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest finish as approved by Architect.

3.08 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from roofs.
- 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.

3.09 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. When possible prohibit traffic from landscaped areas.
- I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEMS STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. 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.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 7900 - Demonstration and Training.

3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 01 4000.

3.13 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. Replace filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- 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.
- J. Clean Owner-occupied areas of work.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- B. Accompany A/E and Owner 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. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- F. Accompany A/E and Owner on Contractor's preliminary final inspection.

- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

END OF SECTION

**SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

PART 1 GENERAL**1.01 WASTE MANAGEMENT REQUIREMENTS**

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- E. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitability, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitability, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

PART 3 EXECUTION**2.01 WASTE MANAGEMENT PLAN IMPLEMENTATION**

- A. Manager: Designate an on-site person or persons responsible for instructing workers in regards to the Waste Management Plan.

- B. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- C. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- D. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- E. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

**SECTION 01 7800
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 00 7200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. 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:
- 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. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.
- E. 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.
- F. 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.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.

- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- O. Include test and balancing reports.
- P. 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 x 11 inch three D side ring binders with durable plastic covers; 2 inch 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 24 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.
 - 4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

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. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

**SECTION 01 7900
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. Conveying systems.
 - 6. Landscape irrigation.
 - 7. 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.

1.02 RELATED REQUIREMENTS

- A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

1.03 SUBMITTALS

- A. See Section 01 3000 - 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 preferred.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Architect for transmittal to Owner.
 - 2. Submit to Commissioning Authority for review and inclusion in overall training plan.
 - 3. Submit not less than four weeks prior to start of training.
 - 4. Revise and resubmit until acceptable.
 - 5. Provide an overall schedule showing all training sessions.
 - 6. 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: Flash Drive.
 2. Label each drive 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 02 4100
DEMOLITION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Selective demolition of built site elements.
- B. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

- A. Section 00 3100 - Available Project Information: Existing building survey conducted by Owner; information about known hazardous materials.
- B. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- C. Section 01 1000 - Summary: Description of items to be removed by Owner.
- D. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
- E. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- F. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- G. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- H. Section 01 7419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.03 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; 2013.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
 - 1. Vegetation to be protected.
 - 2. Areas for temporary and permanent placement of removed materials.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Fill Material: As specified in Division 31.

PART 3 EXECUTION**3.01 SCOPE**

- A. Remove paving and curbs as required to accomplish new work.
- B. Remove concrete slabs on grade as indicated on drawings.
- C. Remove fences and gates.
- D. Remove other items indicated, for salvage, relocation, and recycling.
- E. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Division 31.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with other requirements specified in Section 01 7000.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.

2. 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.
 3. Provide, erect, and maintain temporary barriers and security devices.
 4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 6. Do not close or obstruct roadways or sidewalks without permit.
 7. 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.
 8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- 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.
1. Cover haul trucks with a tarp or other suitable cover.
 2. Cargo compartments shall be maintained so that no spillage and loss of bulk material will occur from holes or other openings in the floor, side and/or tailgate.
 3. Cease dust generating activities when wind speeds exceed 25mph.
 4. Apply water or dust suppressants of sufficient quantity and frequency to ensure mitigation of construction dust at the site.
- 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. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 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.

3.04 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 03 0516
UNDERSLAB VAPOR BARRIER**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Sheet vapor barrier under concrete slabs on grade.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

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; 2011.
- B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products.
- C. Samples: Submit samples of underslab vapor barrier to be used.
- D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Underslab Vapor Barrier:
 - 1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
 - 2. Complying with ASTM E1745 Class A.
 - 3. Thickness: 10 mils.
 - 4. Basis of Design:
 - a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- B. Accessories:
 - 1. Seams:
 - a. Stego Tape by Stego Industries or approved equal.
 - 2. Sealing Penetrations of Vapor Barrier:
 - a. Stego Mastic by Stego Industries or approved equal.
 - b. Stego Tape by Stego Industries or approved equal.
 - 3. Perimeter/Edge Seal:
 - a. Stego Crete Claw by Stego Industries or approved equal.
 - b. Stego Term Bar by Stego Industries or approved equal.
 - c. StegoTack Tape (double-sided sealant tape) by Stego Industries or approved equal.
 - 4. Penetration Prevention:
 - a. Beast Foot by Stego Industries or approved equal.
 - 5. Vapor Barrier-Safe Screed System:
 - a. Beast Screed by Stego Industries or approved equal.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

- A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.
- B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.
- C. Lap joints minimum 6 inches.

- D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.
- E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.
- F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

**SECTION 03 1000
CONCRETE FORMING AND ACCESSORIES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.02 RELATED REQUIREMENTS

- A. Section 03 2000 - Concrete Reinforcing.
- B. Section 03 3000 - Cast-in-Place Concrete.
- C. Section 04 2000 - Unit Masonry: Reinforcement for masonry.
- D. Section 05 1200 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.03 REFERENCE STANDARDS

- A. The applicable version of the standards listed below shall be the most current adopted version of the standard or as referenced by other standards.
 - 1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
 - 2. ACI 301 - Specifications for Structural Concrete.
 - 3. ACI 318 - Building Code Requirements for Structural Concrete.
 - 4. ACI 347R - Guide to Formwork for Concrete.
 - 5. ASTM D1621 – Test Method for Compressive Properties of Rigid Cellular Plastics.
 - 6. ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics
 - 7. ASTM D6817/D6817M – Standard Specification for Rigid Cellular Polystyrene Geofoam
 - 8. U.S. Department of Commerce Product Standard:
 - a. PS 1 - Structural Plywood.
 - 9. West Coast Lumber Inspection Bureau (WCLIB):
 - a. Grading and Dressing Rules No. 17

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.
 - 1. Indicate location of form ties on exposed concrete walls.
 - 2. Include locations and placement of steel embeds.
 - 3. Indicate proposed locations of constructions joint.
- C. Designer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Neither the Architect nor the Architect's consultants have been retained to design formwork, nor to determine the means and methods by which such operations are accomplished.
- B. Prior to erecting formwork, coordinate locations of plumbing, mechanical, and electrical blockouts in concrete slabs.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.
- B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.
- C. Protect plastic foam products from damage and exposure to sunlight.

PART 2 PRODUCTS**2.01 FORMWORK - GENERAL**

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

- B. Design and construct concrete forms that complies with design with respect to shape, lines, and dimensions.
- C. Limit deflections to 1/8" between supports after placement of concrete.
- D. Chamfer outside corners of beams, joists, columns, and walls.
- E. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
- F. Formwork design shall comply with ACI 347R, ACI 301, and ACI 318.
- G. Erect formwork in a manner that will ensure the safety of construction personnel and the public.

2.02 WOOD FORM MATERIALS

- A. Plywood: PS 1, Grade B-B, Class I.
 - 1. Douglas Fir species; solid one side grade; sound undamaged sheets with clean, true edges.
- B. Lumber: Douglas species; structural grade; with grade stamp clearly visible.

2.03 PERMANENT PREFABRICATED FOAM PANEL FORMWORK

- A. Floor/Roof Deck Forms: Pre-engineered expanded polystyrene foam plastic deck and beam/joist forms with factory installed metal channel furring strips flush with face of panel and field installed form stiffener slots.
 - 1. Structural Performance: In accordance with applicable code.
 - 2. Form Cross Section: As indicated on drawings; flat-bottomed solid foam blocks with voids only for stiffeners and beam/joist cross-section; interlocking long edges.
- B. Expanded Polystyrene (EPS) Insulation Board: ASTM C578, Type VIII.
 - 1. Density: 1.15 pounds per cubic foot.
 - 2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.

2.04 METAL FORM MATERIALS

- A. Metal: Min 16 ga sheet steel, tight fitting, and stiffened to support weight of concrete such that tolerances are maintained.

2.05 FORMWORK ACCESSORIES

- A. Form Ties: Removable or snap-off type, galvanized metal or glass-fiber-reinforced plastic, fixed length, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.
 - 1. Ties should leave no corrodible metal closer than 1 inch to exposed concrete surface.
 - 2. Ties shall be designed to resist lateral pressure of concrete on forms and prevent spalling of concrete on removal.
- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
 - 1. Composition: Colorless reactive, mineral oil-based, soy-based, or vegetable-oil based compound.
 - 2. VOC Content: In compliance with applicable local, State, and federal regulations.
 - 3. Products:
 - a. SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com/#sle.
 - b. W. R. Meadows, Inc; Duogard: www.wrmeadows.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
- C. Dowel Sleeves: Plastic sleeve and nailable plastic base for smooth, round, steel load-transfer dowels.
- D. Filler Strips for Chamfered Corners: Rigid plastic or wood type; size per contract drawings; maximum possible lengths.
- E. Flashing Reglets: Galvanized steel, at least 22 gage, 0.0299 inch thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
- F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- G. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 1200.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

- A. Earth Forms may be used if compacted fill or natural soil can be accurately cut and maintained.
- B. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.03 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members that are not indicated on drawings.
- F. Coordinate this section with other sections of work that require attachment of components to formwork.
- G. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply non-staining, rust-preventative form oil or other means of protection against rusting to steel forms.
 - 1. Rust-stained steel formwork is not acceptable for use.
- C. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- D. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.
- F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.

3.07 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.
- B. Construct permanent insulated foam panel formwork to maintain tolerances required by ACI 301.
- C. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.

3.08 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.
- C. Do not reuse formwork without Architect's approval. When approved, do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.
 - 1. Reused formwork shall meet appearance requirements of new formwork.
 - 2. Reused formwork shall be free of splaying, fraying, delamination or other damage.
 - 3. Follow all requirements as for new formwork.

3.09 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after curing at not less than 50 degrees F for 72 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- C. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements may not be removed until concrete has attained 28-day minimum design compressive strength, but in no case less than 21 days for standard reinforced concrete and 7 days for post-tensioned concrete. Determine potential compressive strength of in- place concrete by testing representative field-cured concrete specimens of concrete in question.
- D. Form facing material may be removed 7 days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.
- E. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- F. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.
- G. If accelerated form removal is desired, submit methods to Architect for review. Review by Architect does not alleviate contractor of responsibility for means and methods of construction and protection of structure during construction.
- H. Reshore members as required in section below.

END OF SECTION

**SECTION 03 2000
CONCRETE REINFORCING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.
- C. Reinforcing steel for masonry work.

1.02 RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories.
- B. Section 03 3000 - Cast-in-Place Concrete.
- C. Section 04 2000 - Unit Masonry: Reinforcement for masonry.

1.03 REFERENCE STANDARDS

- A. The applicable version of the standards listed below shall be the most current version of the standard or as referenced by other standards.
 - 1. ACI 301 - Specifications for Concrete Construction.
 - 2. ACI 315 - Details and Detailing of Concrete Reinforcement.
 - 3. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
 - 4. ACI MNL-66 - ACI Detailing Manual.
 - 5. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
 - 6. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 7. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
 - 8. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
 - 9. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - 10. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination
 - 11. AWS A5.1 - Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
 - 12. AWS A5.5 - Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding
 - 13. AWS D1.1/D1.1M - Structural Welding Code - Steel.
 - 14. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars.
 - 15. AWS D1.8/D1.8M - Structural Welding Code - Seismic Supplement.
 - 16. CRSI (DA4) - Manual of Standard Practice.
 - 17. CRSI (P1) - Placing Reinforcing Bars.

1.04 GENERAL

- A. Coordination: Refer to Section 01 7419 - Construction Waste Management and Disposal regarding procedures for implementing construction waste management requirements.
- B. Coordination: Coordinate Work specified in this Section with other Sections which require placement of embedded products and provision of openings and recesses. If formwork is placed after reinforcing, resulting in insufficient concrete cover over reinforcing, request instructions from Architect (Structural Engineer) before proceeding.
- C. Refer to Section 01 3000 - Administrative Requirements for RFI requirements.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Reinforcing Shop Drawings:
 - 1. Prepare Shop Drawings in accordance with the applicable requirements of ACI 318 and the CRSI Manual.
 - 2. Provide scaled, dimensioned reinforcing plans for each floor level indicating size and spacing of reinforcing. Coordinate additional bars with locations of slab openings, penetrations, depressions and steps. Shop drawing shall be coordinated with concrete shop drawings. Ensure penetrations

- from affected trades for utilities are coordinated.
3. Provide scaled, dimensioned reinforcing elevations for each wall line indicating size and spacing of reinforcing. Coordinate additional bars with locations of openings, penetrations, and recesses. Shop drawing shall be coordinated with concrete shop drawings. Ensure penetrations from affected trades for utilities are coordinated.
 4. Indicate welds in accordance with AWS D1.4/D1.4M and AWS A2.4.
 5. Indicate type of corrosion resistant reinforcing proposed and locations, if applicable.
 6. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
- C. Test Reports: Submit certified laboratory test reports confirming physical characteristics of materials used in the performance of the work of this Section.
1. Where reinforcing is subject to welding, submit carbon equivalent determination reports in accordance with requirements of Source Quality Control.
- D. Certificates: Submit copies of steel producer's certificates of mill analysis, tensile, and bend tests for reinforcing steel. Transmit copy to installer for welded splices.
- E. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- F. Sustainable Design Submittals:
1. Materials & Resources Submittals: Refer to Section 018113 for additional information on LEED Submittals.

1.06 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 318, ACI 301, CRSI and IBC Chapter 19.
- B. Fabricator's Qualifications:
1. When required, show evidence of approval by governmental agencies having jurisdiction.
- C. Welding of reinforcing shall be in conformance with AWS D1.1/D1.1M, AWS D1.4/D1.4M, AWS D1.8/D1.8M and IBC Chapter 19.
- D. Qualification of Welds, Welding operators, and welders:
1. Comply with applicable building code standard. Perform welding procedure qualification, except for prequalified procedures, as required by AWS D1.4/D1.4M, prior to executing any welding of reinforcing steel.
 2. Only AWS Certified Welding Inspectors shall be used for tests and qualifications associated with welding of reinforcing steel.
 3. Only AWS qualified welders or welding operators shall perform welding of reinforcing steel.
 4. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months and in accordance with AWS D1.4/D1.4M.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage. Deliver reinforcing materials bundled and with identifying labels or tags affixed and legible.
1. Bundle reinforcing, tag with identification, and transport and store so as not to damage any material. Use metal tags indicating size, length and other marking shown on placement drawings. Maintain tags after bundles are broken.
- B. The Inspector and/or Architect reserves the right to observe deliveries, to review bills of lading, and to reject the following:
1. Reinforcing not accompanied by required mill certificates.
 2. Reinforcing exhibiting rusting or other contamination which might prohibit or inhibit bonding of concrete.
- C. Store materials off ground and under cover.
1. Store reinforcement to avoid excessive rusting or fouling with grease, oil, dirt or other bond-weakening contaminants.
 2. Store welding electrodes in accordance with AWS standards.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Provide deformed-type reinforcing conforming to ASTM Standards and material Grades as noted on Structural Contract Drawings.

1. When welding is indicated, provide reinforcing conforming to the requirements of ASTM A 706, Grade 60.
- B. Steel Welded Wire Reinforcement (WWR): Plain type; ASTM A1064/A1064M.
 1. Form: Flat Sheets.
 2. WWR Style: As indicated on drawings.
- C. Reinforcement Accessories:
 1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch, conforming to ASTM A1064/A1064M , Grade 60.
 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 3. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 MECHANICAL REBAR SPLICING:

- A. Coupler Systems: For use where indicated on drawings, mechanical devices for splicing reinforcing bars; designed to develop minimum 1.25F_y or F_u of the reinforcing bars in both tension and compression, conforming to ACI 318 Type II coupler. Splicing system shall be listed by the International Code Council (ICC) or by the International Association of Plumbing and Mechanical Officials Evaluation Service (IAPMO-ES)
 1. Mechanically Locked Sleeves: Steel sleeves with internal gripping rails and external shear bolts, designed to positively engage the unaltered ends of butted reinforcing bars.
 - a. Products: Dayton Superior "Bar-Lock" System.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
 2. Dowel Bar Splicers: Integral forged bar end, female-threaded, with nailing flange on one bar and integral matching male threads on the other bar. Provide specially forged bar ends, such that the cut male threads do not diminish the original bar cross section dimension.
 - a. Products: Dayton Superior; "DBDI" System.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 FABRICATION

- A. Do not fabricate reinforcing until shop drawings have been reviewed by Architect.
- B. Fabricate concrete reinforcing in accordance with ACI MNL-66: Detailing Manual, ACI 318, and CRSI Manual of Standard Practice.
- C. In case of fabrication errors, do not rebend or straighten reinforcing in a manner that will injure or weaken the material.
- D. Do not heat reinforcing to facilitate bending.
- E. Welding of reinforcement is not permitted.
- F. Welding of reinforcement is permitted only where shown on drawings using ASTM A706 reinforcing. Perform welding in accordance with AWS D1.4/D1.4M.
 1. Protect joints from drafts during cooling process. Accelerated cooling is prohibited.
 2. Do not tack weld reinforcing.
 3. Fusion welding is not permitted unless approved by Engineer of Record.
- G. Locate reinforcing splices not indicated on drawings at point of minimum stress.
- H. Comply with tolerances per ACI 117 and CRSI Manual.
- I. Reinforcing with any of the following defects will not be permitted:
 1. Lengths, depths, and bends not conforming to the specified fabrication tolerances.
 2. Bends or kinks not indicated in the drawings.
 3. Reinforcing with reduced cross-section due to excessive rusting or other causes.

2.04 SOURCE QUALITY CONTROL

- A. Tests: Materials for which physical characteristics have been stipulated shall have had such characteristics independently confirmed by laboratory tests employing industry recognized procedures.
- B. Reinforcing to be welded:
 1. Submit a copy of the mill test report to the Architect prior to placement of reinforcing steel in concrete members.
 2. If mill test reports are not available, perform a chemical analysis of reinforcing representative of the reinforcing to be welded. The carbon equivalent (CE) shall not exceed 0.55.

3. Special inspection is required for welding of steel reinforcing.
- C. Source Quality Control: Testing Laboratory shall test samples of reinforcing, ties, and stirrups from the material at the site or from place of distribution. Each sampling shall include at least two 18-inch long pieces. Perform the following tests according to ASTM A615:
 1. Identified Reinforcing: Samples shall be obtained from bundles delivered from the mill, identified by heat number and accompanied by mill analyses and mill test reports. Reinforcing shall be properly tagged with Identification Certificate so as to be readily identified. Then perform one tensile and one bend test for each 10 tons or fraction thereof of each size of reinforcing per CBC Section 1909.2.4. Submit mill reports when samples are selected.
 2. Unidentified reinforcing is not permitted.
 3. Refer to Section 014500 for general requirements and "Quality Assurance" in Part 1 for specific procedures.

PART 3 EXECUTION

3.01 PREPARATION

- A. Surface Preparation: Clean reinforcing to remove loose rust and mill scale, earth, and other materials which might reduce or destroy bond with concrete.

3.02 PLACEMENT

- A. General: Comply with the CRSI Manual of Standard Practice and CRSI Placing Reinforcing Bars, 10th edition, for details and methods of placing reinforcing and supports.
 1. Do not displace or damage vapor barrier while placing concrete reinforcing. If damage occurs, repair vapor barrier before placing concrete.
 - a. Provide for movement which equals joint width plus 1/2-inch.
 2. Expansion Joints in Slab-on-grade: Interrupt reinforcing at expansion joints. Provide No. 5 by 24-inch long dowelled joints at 18 inches on centers with one end of dowel set in capped dowel sleeve.
 3. Construction Joints: Allow reinforcing to run through without interruption, unless otherwise noted on Contract Structural Drawings.
- B. Support: Position, support, and secure reinforcing against displacement by formwork, construction or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers as required and as indicated on Contract Drawings.
 1. Provide sufficient numbers and sizes of supports to carry reinforcing.
 - a. Do not place reinforcing more than 2 inches beyond the last leg of any continuous reinforcing support.
 - b. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
 - c. Provide additional reinforcing for support where required to support reinforcing shown on Contract Drawings.
 2. Repair and resupport reinforcing which may have moved during concrete placement operations.
- C. Securing in Place:
 1. Accurately place reinforcing and wire tie in precise position where reinforcing cross. Bend ends of wire ties away from the forms. Wire tie reinforcing to corners of ties and stirrups.
 2. Support reinforcing according to the current edition of CSRI Recommended Practice for Placing Reinforcing Supports using approved accessories and chairs.
 3. Place precast concrete cubes with embedded wire ties to support reinforcing steel in concrete placed on grade and in footings. Precast concrete cubes are not acceptable in elevated concrete slabs, beams, or concrete filled metal deck.
 4. Use care not to damage vapor barriers where they occur.
 5. Dowel Bar Couplers:
 - a. Attach flanged, internally threaded end of dowel bar coupler to inside of formwork, using nails or screws.
- D. Coverage: Place reinforcing to obtain minimum coverages for concrete protection in accordance with ACI 318 Chapter 20.5.1.3, or as indicated on Contract Structural Drawings. Securely tie reinforcing and related supports together with tie wire to hold reinforcing accurately in position during concrete placement operations. Place wire ties so that twisted ends are directly away from exposed concrete surfaces.
- E. Clearance Between Reinforcing: Per ACI 318 and as indicated on Contract Drawings.
- F. Splicing:

1. Provide standard reinforcing splices by lapping ends and tying securely with tie wire. Comply with details indicated on Contract Structural Drawings.
 - a. Unless noted otherwise on Contract Drawings, comply with requirements of ACI 318 for minimum lap of Class B spliced reinforcing, including ACI 318 as amended by CBC.
2. Provide 1-1/2-inch minimum clearance between sets of splices. Stagger horizontal reinforcing so that adjacent splices are greater than 4 feet apart, unless noted otherwise on Structural Contract Drawings.
3. Field Welding: Comply with the requirements of AWS D1.4 where field welding is required. Prior to field welding, determine the weldability of reinforcing in accordance with section "Source Quality Control" in Part 2. Only steel conforming to the chemical requirements of AWS D1.4 may be welded.
4. Splices: Do not splice reinforcing at the points of maximum stress except where indicated. Lap splices as shown or required to develop the full strength of reinforcing. Stagger splices in horizontal wall reinforcing at least 24" longitudinally in alternate reinforcing and opposite faces.
5. Mechanical Couplers:
 - a. Mechanically Locked Sleeves:
 - 1) During installation, ensure no damage or misalignment occurs to gripping rails; discard sleeve if damage occurs.
 - 2) Insert first reinforcing bar completely, until it contacts internal divider.
 - 3) Holding bar in position, hand-tighten all bolts.
 - 4) Repeat above procedure for second bar.
 - 5) In random, alternating order, tighten all bolts to 50% of the specified torque.
 - 6) In random, alternating order, tighten all bolts to 75% of the specified torque
 - 7) In random, alternating order, drive each bolt until head shears off.
 - b. Dowel Bar Couplers:
 - 1) Splice open end of dowel bar to internal reinforcing steel.
 - 2) After concrete has set up, thread externally threaded dowel bar into internally threaded dowel bar; hand tighten.
 - 3) Then, attempt to rotate coupler further 1/4 turn by hand-tightening.
 - 4) Splice open end of dowel bar to internal reinforcing steel.
- G. Wire Fabric: Install welded wire fabric in longest lengths practicable. Lap adjoining pieces at least 12 inches minimum, and lace splices with tie wire. Offset end laps in adjacent widths to prevent continuous laps.
 1. Extend fabric to within 1 inch of edge at slabs.
- H. Slab on Grade Reinforcing: Do not displace or damage vapor retarder at slab on grade.
- I. Dowels: Secure tie dowels in place before depositing concrete. Provide No. 3 reinforcing for securing dowels where no other reinforcing is provided
- J. Maintaining Reinforcing in Position: Provide adequate means to ensure that reinforcing position and spacing is maintained during placement of concrete.
- K. Adjustment and Inspection: Do not bend or straighten reinforcing in a manner injurious to material. Do not use reinforcing with kinks or bends not shown on Drawings and reviewed shop drawings or reinforcing with reduced cross-section due to corrosion or other cause.
- L. Tolerances: Placement tolerances shall conform to CRSI Manual of Standard Practice and ACI 117.

3.03 MASONRY REINFORCING

- A. Refer to section 04 2000 - Unit Masonry for installation of masonry reinforcing.
- B. Splice reinforcing in masonry with laps as indicated on Contract Drawings.
- C. Position vertical reinforcing in masonry walls and tie in position top and bottom, and at intervals not exceeding 192 bar diameters, unless noted otherwise on the Contract Drawings.
- D. Provide dowels between footings and walls of the same grade, size, and spacing as vertical wall reinforcing, unless noted otherwise on the Contract Drawings.

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency, as specified in Section 01 4000 - Quality Requirements, will inspect installed reinforcement for conformance to contract documents before concrete placement.
- B. Inspection and Tests of Welds: Provide special inspection of shop and field welding in accordance with IBC Section 1704, 1705, 1903, and Structural Contract Drawings.

1. Tests will be made by testing laboratory for reinforcing welds, as follows:
 - a. Qualification of welders engaged in electric-arc welding of reinforcing.
 - b. Verification of location of reinforcing for accuracy.
 - c. Inspection of reinforcing welds by certified welding inspectors.
 - d. X-ray test of one of the first three arc-welds made by each welder.
 2. Tensile tests of sample welds of the largest size reinforcing for each type of welding.
 3. When welds are judged to be deficient, provide and pay for such additional X-rays and tests as directed by the Architect. Defective welds shall be repaired, replaced, and retested.
- C. Placing: Provide special inspection as required by IBC 1705.
1. Placement of Grade 60 or higher reinforcing steel for concrete above grade requires special inspection.
 2. Schedule inspecting of reinforcing steel for conduit, sleeves, and embedded items to allow for correction, if necessary, before placement of overlying grids on reinforcing steel.

3.05 ADJUSTING

- A. Defective Reinforcing Work: The following shall be considered defective and may be ordered removed and reconstructed at no change in Contract Time or Contract Sum:
1. Reinforcing with kinks or bends not shown on Contract Drawings.
 2. Reinforcing injured due to bending or straightening.
 3. Reinforcing heated or bent.
 4. Reinforcing not placed in accordance with Contract Documents.
 5. Reinforcing that is rusty or oily.
 6. Reinforcing exposed in surface of concrete

END OF SECTION

**SECTION 03 3000
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floors and slabs on grade.
- B. Concrete foundation walls.
- C. Concrete foundations.
- D. Joint devices associated with concrete work.
- E. Site Concrete Elements, including, but not limited to light pole bases and their foundations.
- F. Miscellaneous concrete elements, including equipment pads.
- G. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 03 2000 - Concrete Reinforcing.
- C. Section 03 3511 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.
- D. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.
- E. Section 32 1313 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

- A. The applicable version of the standards listed below shall be the most current adopted version of the standard or as referenced by other standards.
 - 1. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.
 - 2. ACI 211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide.
 - 3. ACI 301 - Specifications for Concrete Construction.
 - 4. ACI 302.1R - Guide to Concrete Floor and Slab Construction.
 - 5. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - 6. ACI 305R - Guide to Hot Weather Concreting.
 - 7. ACI 306R - Guide to Cold Weather Concreting.
 - 8. ACI 308R - Guide to External Curing of Concrete.
 - 9. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
 - 10. ACI 347R - Guide to Formwork for Concrete.
 - 11. ACI 360R - Guide to Design of Slabs-on-Ground
 - 12. ACI MNL-15 - Field Reference Manual
 - 13. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 14. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
 - 15. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
 - 16. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 17. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
 - 18. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens).
 - 19. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
 - 20. ASTM C150/C150M - Standard Specification for Portland Cement.
 - 21. ASTM C157/C157M - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
 - 22. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
 - 23. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete.
 - 24. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - 25. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.

26. ASTM C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
 27. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 28. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
 29. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 30. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements.
 31. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 32. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.
 33. ASTM C755 - Standard Practice for Selection of Water Vapor Retarders for Thermal Insulation.
 34. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars.
 35. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
 36. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 37. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
 38. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
 39. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 40. ASTM D1709 - Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
 41. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating.
 42. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 43. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
 44. 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.
 45. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
 46. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 47. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- B. ICC Evaluation Service, Inc. (ICC ES), a subsidiary corporation of the International Code Council:
1. ICC ES Evaluation Reports (ESR) for Materials, Products, Methods, and Types of Construction with current report conforming to the applicable building code.

1.04 GENERAL

- A. Identify finish flooring manufacturers' concrete slab vapor emission and alkalinity requirements and coordinate concrete slab mixing and installation procedures to achieve desired results. Concrete slab requirements for finish flooring may be more restrictive than general requirements of the Contract Documents, and may require additional materials, means, or methods. Additional materials, means, or methods shall be included as part of the work.
- B. Coordinate method of securing reinforcing and other embedded items in concrete slabs on grade without penetrating vapor barriers.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions, along with agency approvals (ICC, IAPMO, etc.) where applicable.
- C. Embodied Carbon Footprint Submittals
1. Plant specific Environmental Product Declaration (EPD) for each concrete mixture proposed for the project accompanying each concrete mixture submittal.
- D. Mix Design: Submit proposed concrete mix design for approval.

1. Submit design mix data for each type of concrete and each compressive strength required on the Contract Drawings. Submittal of mix designs shall not relieve Contractor of its responsibility to furnish concrete of proper consistency and specified strengths. Where used for concrete subject to special inspections, submit mix designs to testing laboratory for review and written acceptance.
 - a. Indicate proposed mix design complies with requirements of ACI 301, Section 4 and ACI 318 26.4.3.
 - b. For each material, including admixtures and water, state water-cement ratio and maximum allowable water content.
 - c. For each material, state manufacturer's name, designation, and source.
 - d. For each mix design:
 - 1) Consider concrete cover and clear distances between reinforcing bars as indicated on the Contract Drawings in determining the aggregate size for mix designs. This may result in an aggregate size smaller than specified elsewhere in this Specification.
 - 2) Submit a schedule which identifies the locations within the structure where each mix design is proposed for use.
- E. Shop Drawings. Concrete shop drawings shall be coordinated with shop drawings requirements for reinforcement and formwork. Submit the following items for review:
 1. Layout drawings showing locations of slab-on-grade joints.
 2. Scaled, dimensioned plans for each floor level indicating size and location of slab openings, penetrations, depressions, and steps. Shop drawing shall be coordinated with reinforcing shop drawings. Ensure penetrations from affected trades for utilities are coordinated.
 - a. Provided review stamp, with signature and date, of each trade proposed to work within the opening or penetration.
 3. Proposed Construction Joints.
 4. Scaled, dimensioned concrete elevations for each wall line indicating size and location of openings, penetrations, and recesses. Shop drawing shall be coordinated with reinforcing shop drawings. Ensure penetrations from affected trades for utilities are coordinated.
 - a. Provided review stamp, with signature and date, of each trade proposed to work within the opening or penetration.
- F. Concrete Placement Schedule: Submit the proposed concrete placement schedule to the Architect for review prior to start of concrete placement.
- G. Test Reports: Submit report for each test or series of tests specified.
 1. Submit certified laboratory test reports to Architect and, when applicable, the Building Department, confirming physical characteristics of materials used.
- H. Material Certificates: For each of the following, signed by manufacturers:
 1. Cementitious materials.
 2. Aggregates and sand.
 3. Admixtures.
 4. Fiber reinforcement.
 5. Curing compounds.
 6. Floor and slab treatments.
 7. Bonding agents.
 8. Adhesives.
 9. Vapor retarders.
 10. Semi-rigid joint filler.
 11. Joint-filler strips.
 12. Repair materials.
- I. Sustainable Design Submittal: Submit environmental assessment report for concrete mix. Compare concrete mix submitted with a conventional or reference concrete mixture that meets the specified performance requirements. Include:
 1. Energy consumption.
 2. Emissions.
 3. Potential toxicity.
 4. Potential risk.
 5. Raw material consumption.
 6. Land use.
 7. Third-party validation of comparison methodology.

1.06 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with IBC Chapter 19.
 - 1. Chemical products field-applied to concrete shall comply with the air quality requirements of authorities having jurisdiction.
- B. Perform work of this section in accordance with ACI 301 and ACI 318.
 - 1. Maintain one copy of each document on site.
- C. Follow recommendations of ACI 305R when concreting during hot weather.
- D. Follow recommendations of ACI 306R when concreting during cold weather.
- E. Installer Qualifications: A qualified installer who employs on the Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- F. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer shall be certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- G. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 - 1. 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.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- H. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- I. Pre-installation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
 - 2. As applicable to the Work, review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures and concrete protection.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- C. Warrant concrete floor sealer to be free from manufacturing defects for a period of 15 years. Applications completed by an approved installer in accordance with published technical data will be warranted for the suppression and control of water vapor emission, alkalinity, and relative humidity from concrete during the warranty period.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of ASTM C595/C595M for packaging and marking for cement delivery.

PART 2 PRODUCTS**2.01 GENERAL**

- A. Regulations: Refer to Section 01 4533 regarding compliance with applicable codes and regulations.
- B. Comply with ACI 301 and ACI 318 for interpreting design requirements of reinforced concrete.
 - 1. Contractor shall keep a copy of ACI Field Reference Manual MNL-15(16) in the field office.
- C. Comply with, regulations of the air quality management district in force at the time of the performance of the work of this Section regarding sealers and curing compounds.
- D. Sloping Floors:
 - 1. The running slope of walking surfaces shall not be steeper than 1:20.
 - 2. The cross slope of walking surfaces shall not be steeper than 1:48.
 - 3. At plazas where there is no dominant direction of travel, and at turns, slope shall not exceed 1:48 in any direction.

2.02 FORMWORK

- A. Comply with requirements of Section 03 1000.

2.03 REINFORCEMENT MATERIALS

- A. Comply with requirements of Section 03 2000.

2.04 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150/C150M, type as indicated on drawings.
 - 1. Acquire cement for entire project from same source.
 - 2. Color: Standard Gray UNO.
- B. Blended Hydraulic Cement ASTM C1157/C1157M, Type GU – General Use
 - 1. Cement used in contact with soil shall be Type MS – Moderate Sulfate Resistant.
 - 2. When aggregates are determined to be deleteriously reactive, use low-alkali cement type with a maximum limit of 0.60 percent alkalis established in conformance with ASTM C114.
- C. Normal Weight Aggregates: ASTM C33/C33M .
 - 1. Aggregate shall be nonreactive as determined by one of the methods in ASTM C33/C33M Appendix XI: Methods for Evaluating Potential for Deleterious Expansion Due to Alkali Reactivity of an Aggregate.
 - 2. Fine Aggregate: Washed natural sand consisting of hard particles, containing not more than the maximum limits of deleterious material allowed by Table 1 of ASTM C33/C33M.
 - a. Fineness modulus shall be in the range of 2.90 to 3.10.
 - 3. Coarse Aggregate, Structural Concrete:
 - a. Clean washed gravel or sound crushed rock, containing not more than 5 percent flat, thin, elongated, or laminated material, and containing not more than the maximum limits of deleterious material allowed by Table 3 of ASTM C33/C33M for moderate weathering regions.
 - 1) Grade 1-inch aggregate from No. 100 sieve to 1 inch.
 - 2) Grade 1-1/2-inch aggregate from No. 100 sieve to 1-1/2 inches.
 - b. Maximum Size: As indicated on drawings and as noted below.
 - 1) Aggregate shall be no larger than:
 - (a) 3/4 of the clear space between reinforcing bars or between reinforcing bars and forms
 - (b) 1/5 of the narrowest dimension between sides of forms
 - (c) 1/3 of the depth of slab.
 - 2) 3/8" aggregate may be utilized at areas of congestion only when submitted for review, indicating specifically where intended use will be, and approved by the architect.
 - 3) Pea Gravel shall not be used.
 - 4. Acquire aggregates for entire project from same source.
- D. Fly Ash: ASTM C618, Class C or F.
- E. Slag Cement: ASTM C989/C989M
- F. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.
- G. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.05 ADMIXTURES

- A. General:
 - 1. Admixtures and additives shall be reviewed by architect prior to use.
 - 2. Admixtures and additives shall be incorporated and tested in accepted combinations and mixes
 - 3. Admixtures containing chlorides will not be permitted.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
 - 1. Manufacturers:
 - a. Euclid Chemical Company; PLASTOL 6420: www.euclidchemical.com/#sle.
 - b. Master Builders Solutions; MasterRheobuild 1000: www.master-builders-solutions.com/en-us
 - c. Substitutions: See Section 01 6000 - Product Requirements.
- D. Water Reducing Admixture: ASTM C494/C494M Type A.
 - 1. Water reduction: Not less than 5%.
 - 2. Increase in compressive strength: Not less than 10% at 28 days.
 - 3. Dry Shrinkage: Less than concrete without admixture at 21 days.
 - 4. Manufacturers:
 - a. Euclid Chemical Company; EUCON NW: www.euclidchemical.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- E. Plasticizer: ASTM C494/C494M , Type F

2.06 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: Min 15 mils thick, reinforced high density polyethylene sheet material complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
 - 1. Water Vapor Permeance: 0.02 Perms maximum, in accordance with ASTM E154/E154M Section 7.
 - 2. Puncture Resistance: 2200 grams minimum, in accordance with ASTM D1709 Method B.
 - 3. Tensile Strength: 45 lbf/in minimum, in accordance with ASTM E154/E154M Section 9, Method ASTM D882.
 - 4. Installation: Comply with ASTM E1643.
 - 5. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 - 6. Manufacturers: Comply with ASTM C755
 - a. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
 - b. Stego Industries, LLC: www.stegoindustries.com/#sle.
 - c. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.07 BONDING AND JOINTING PRODUCTS

- A. Chemical Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II. Agent shall be freeze-thaw resistant and suitable for brush or spray application.
 - 1. Manufacturers:
 - a. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com/#sle.
 - b. Larsen Products Corp.; Weldcrete.
 - c. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/#sle.
 - d. W. R. Meadows, Inc; ACRY-LOK-: www.wrmeadows.com/#sle.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- B. Waterstops: Rubber, complying with COE CRD-C 513.
 - 1. Configuration: As indicated on drawings.
 - 2. Size: As indicated on drawings.
- C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
- D. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.

2.08 CURING AND SEALING MATERIALS

- A. Floor Liquid Curing Compound Type FCC: For use on concrete slabs that will be exposed with separately applied floor sealer finish, or on slabs that will be covered by breathable floor coverings or mortar beds.
 - 1. Compound shall be a water-based non-staining dissipating, translucent resin, conforming to ASTM C309, Type 1, Class B.
 - a. Sodium silicate compounds will not be permitted.
 - 2. Product shall be compatible with subsequently applied toppings (sealers, hardeners, finishes, or coverings).
 - 3. Manufacturers:
 - a. Euclid Chemical Co.; Kurex Vox.
 - b. L&M Construction Chemicals; L&M Cure R.
 - c. Sonneborn Building Products; Sonosil.
 - d. W.R. Meadows; Sealtight 1100 Clear.
 - e. Substitutions: See Section 01 6000 - Product Requirements
- B. Curing Barriers:
 - 1. Waterproof Curing Paper: Conform to ASTM C171, non-staining reinforced type.
 - a. Manufacturer:
 - 1) Fortifiber Corporation; Orange Label Sisalkraft.
 - 2. Reinforced Curing Barriers: Transguard 4000 manufactured by Reef Industries or equal.
- C. Floor Remedial Vapor Emission and Alkalinity Control Sealer Type FCS: For remedial use on concrete slabs on grade that do not meet manufacturer's specific moisture emission and alkalinity limits for non-breathable floor finishes.
 - 1. Manufacturers:
 - a. Sinak Corporation; Sinak VC5: www.sinak.com.
 - b. Bonsal American; ProSpec Moisture Guard Max.
 - c. Synthetics International; Synthetic30 two-component liquid-applied, waterborne polymer-based ultra-low viscosity clear sealer. www.syntheticsintl.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements
- D. Floor Sealer Finish Type FSF: For general use at exposed concrete slab areas for appearance.
 - 1. Design is based on the use of high solids, minimum 25% non-yellowing water-based acrylic cure/sealer conforming to ASTM C309, Type 1, Class B and ASTM C1315, Type 1, Grade B, low VOC compliant meeting all local air quality regulations.
 - 2. Product shall be in compliance with volatile organic compounds (VOC) content limits required by air quality management district at the time of performance of the work.
 - 3. Sodium silicate compounds will not be permitted.
 - 4. Manufacturers:
 - a. Euclid Chemical Co.; Euclid Aqua Cure VOX Super.
 - b. L&M Construction Chemicals; Dress & Seal WB30.
 - c. W.R. Meadows; Vocomp 25.
 - d. Sinak Corporation; HLQ-125.
 - e. Substitutions: See Section 01 6000 - Product Requirements

2.09 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. The proportioning of ingredients shall be such that the concrete can be readily worked into forms and around reinforcement under the conditions of placement to be used, without segregation or excessive bleeding.
- C. Concrete Compressive Strengths: Provide compressive strengths as noted on drawings, when tested in accordance with ASTM C39/C39M at 28 days.
 - 1. Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - a. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- D. Fly Ash or other pozzolans Content: Maximum 25 percent of cementitious materials by weight.
- E. Total of fly ash or natural pozzolans and silica fume: Maximum 35 percent by weight.

- F. Total of fly ash or natural pozzolans slag cement and silica fume: Maximum 50 percent by weight.
- G. Water-Cementitious Material Ratio: As indicated on the Contract Drawings
- H. Maximum Slump: As indicated on the Contract Drawings
- I. Accurately control the proportions, water content, and air content. Use weighing equipment accurate to within 1 percent for cement and 2 percent for aggregates, and adjustable for varying aggregate moisture content. A beam auxiliary shall register any part of the last 100 pounds of each aggregate. The aggregate hopper shall have a volume adjustment.
 - 1. Proportion concrete by weight of loose, dry material.
 - 2. Fine aggregate volume shall be at least 35 percent of the sum of the separate fine and coarse aggregate volumes.
- J. Admixtures: Admixtures may only be used if they are incorporated into the accepted concrete mix designs and testing. Where admixture is proposed for use by concrete supplier, conform to types accepted by Architect in writing.
 - 1. Proposed admixtures shall be as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- K. Tests for Concrete Materials at Batch Plant: Utilizing batch plant test records, perform the following tests in accordance with provisions of the building code:
 - 1. Cement: Sample and test cement, or provide mill test reports, as accepted, certifying that the cement conforms to the requirements of this Specification.
 - 2. Aggregate:
 - a. Sample and test concrete aggregate for grading and soundness before concrete mix designs are established.
 - b. Test aggregate for shrinkage characteristics in accordance with ASTM C157/C157M.
 - c. Conduct petrographic examinations of aggregate proposed for use in accordance with ASTM C295/C295M.
 - 3. Air Content: ASTM C173/C173M, volumetric method or ASTM C231/C231M, pressure method. One test for each set of compressive strength test specimens.
 - 4. Refer to "Field Quality Control" in Part 3 for testing of actual concrete mix and placement.
- L. Inspection: Accompany each load of materials or concrete with a signed copy of batch plant's certificate stating quantity of each material, design strength, amount of water added at plant, admixtures, departure time and date, and maximum amount of water allowed to be added at site.

2.10 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M and ASTM C94/C94M.
 - 1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 60 seconds for each additional 1 cu. yd. (0.76 cu. m).
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.
 - 4. Colored Concrete: Add pigments in strict accordance with manufacturer's instructions to achieve consistent color from batch to batch.
 - 5. Fiber Reinforcement: Batch and mix as recommended by manufacturer for specific project conditions.
- B. Transit Mixers: Comply with ASTM C94/C94M.
 - 1. With each load, provide ticket certifying the materials and quantities as well as compliance with the accepted mix design.
- C. On the transit mix ticket, state the time water was first added to the mix.
 - 1. At the batch plant, withhold 2-1/2 gallons of water per cubic yard of concrete.
 - 2. Upon arrival at the job site, as directed by the Testing Laboratory Inspector, add all or part of the withheld water before the concrete is discharged from the mixer.
 - 3. Mix concrete for not less than 5 minutes after the withheld water has been added, and not less than 1 minute of that time immediately prior to discharge of the batch.

- a. Drum shall rotate approximately 70 to 100 revolutions at a mixing speed of approximately 6 to 18 rpm.
 - b. After mixing, drum shall rotate at an agitating speed of approximately 2 to 6 rpm.
 - c. Unless otherwise directed, provide 15 minutes total mixing per batch after first addition of water.
4. Discharge of the concrete shall be completed within 90 minutes after water is introduced into the mix, or before the drum has completed 300 revolutions.
- D. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.
- E. Weather Requirements:
 1. Hot Weather Usage: Adjust mix as required to counteract effects of anticipated or probable hot weather on strength of concrete. Conform to recommendations of ACI 305R regarding admixtures, temperature of mixing water, and delivery times.
 - a. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection and curing to prevent excessive concrete temperatures or water evaporation that may impair required strength or serviceability of the member or structure.
 - b. When air temperature is between 85 degrees F. and 90 degrees F, limit mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F, limit mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prior to performing work and placing concrete, verify:
 1. Lines, levels, and dimensions before proceeding with work of this section.
 2. Elevations and depressions of floor finishes
 3. Final excavation required for foundations and footings prior to placing concrete.
 4. Locations of proposed and future breathable and nonbreathable floor finishes in advance of placing concrete to determine type of floor sealers to be applied in finishing operations.
 5. Formwork is properly located such that the unshored concrete will maintain specified tolerances after forms are removed.

3.02 PREPARATION

- A. Formwork: Comply with Section 03 1000 - Concrete Forming and Accessories.
- B. Reinforcing: Comply with Section 03 2000 - Concrete Reinforcing.
- C. Verify that forms are clean and free of rust before applying release agent.
- D. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning, roughening to exposed aggregate, and applying bonding agent in according to bonding agent manufacturer's instructions.
 1. Use latex bonding agent only for non-load-bearing applications.
- F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade over properly prepared subbase per Geotechnical recommendations. Lap joints minimum 6 inches. Tape and seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 1. Place Slab on Grade directly on vapor retarder.
 2. Avoid grade staking through vapor retarder.

3.03 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
 1. Pour concrete in accordance with accepted pour schedule and construction joint layout.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Notify Architect not less than 48 hours prior to commencement of placement operations.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

- E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- F. Place concrete continuously between predetermined construction joints per ACI and CBC requirements. Where construction joints are located, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
- G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.
- H. Compacting:
 - 1. General: Spade, rod, vibrate, and consolidate concrete in forms. Vibrators shall not be left in any one spot longer than 30 seconds and shall be kept constantly in motion. One vibrator shall be assigned to each location where concrete is being placed and a standby vibrator shall be kept ready at all times. Avoid creating rock pockets, air bubbles, honeycomb, or separation of ingredients.
 - 2. Work concrete thoroughly around reinforcement and embedded items and into corners and angles of forms by spading, rodding, and tamping.
 - 3. Consolidation: Vibrate to consolidate each layer with previously placed layers, completely embedding reinforcing and fixtures, and bringing fine material to surface of slab to produce proper finish.
- I. Hot Weather Placing: Comply with recommendations of ACI 305R.
- J. Cold Weather Placing: Comply with recommendations of ACI 306R.

3.04 GROUTING

- A. Non-Shrink Grout: Install non-shrink grout per drawing properly beneath bearings of plates, columns, and other structural members using product recommended by manufacturer for specific application and in accordance with printed instructions.
 - 1. Compressive strength of grout shall be tested in accordance with ASTM C109/C109M .

3.05 CONTROL AND CONSTRUCTION JOINTS

- A. Control Joints:
 - 1. Location: As indicated on the Contract Drawings, but not more than 20 feet on centers in both directions at exterior slabs. Limit interior slabs on grade to 400 square foot bays with length to width ratios of 1 to 1.5 maximum.
 - a. Locate on column center lines and at re-entry corners wherever practical.
 - b. Avoid areas receiving tile or paver floor finish.
 - c. Coordinate locations with proposed floor finish joint layout.
 - d. Limit length to width ratios to 1 to 1.25.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; with width and depth as indicated on drawings.
 - 1. Fill saw cuts in interior walkways with control joint filler specified.
- E. Construction Joints:
 - 1. Details and proposed location of construction joints shall be as indicated on the Drawings, located to least impair strength of structure, in accordance with the following:
 - 2. Thoroughly clean contact surface by sand blasting entire surface not earlier than 5 days after initial placement.
 - 3. A mix containing the same proportion of sand and cement provided in concrete plus a maximum of 50 percent of coarse aggregate shall be placed to a depth of at least one inch on horizontal joints. Vertical joints shall be wetted and coated with a neat cement grout immediately before placing of new concrete.
 - 4. Should contact surface become coated with earth, sawdust, or deleterious material of any kind after being cleaned, entire surface shall be re-cleaned before applying mix.

3.06 SEPARATE NON-STRUCTURAL FLOOR TOPPINGS

- A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.
- B. Place required dividers, edge strips, reinforcing, and other items to be cast in.

- C. Non-structural toppings slabs shall be normal-weight concrete, reinforced as noted on the Contract Drawings.
- D. Place concrete floor toppings to required lines and levels.
 - 1. Place topping in checkerboard panels not to exceed 20 feet in either direction.

3.07 TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS

- A. An independent testing agency, as specified in Section 01 4000, will inspect finished slabs for compliance with specified tolerances.
- B. Conform to requirements of ACI 117, except as modified by the requirements of these Specifications.
- C. Formed Surfaces:
 - 1. Maintain bowing, warping, and dimensional tolerances within the maximum tolerances stated in ACI 117 for Class A surfaces.
 - 2. Overall Dimension for Height and Width: Plus zero to minus 3/32-inch for surfaces that are 10 feet and over.
 - 3. Thickness: Plus-or-minus 1/8-inch maximum.
 - 4. Openings: Accurate to within a tolerance of plus 1/8-inch to minus zero.
 - 5. Exposed Slab Edges: Free of jogs exceeding 1/8-inch.
- D. Concrete Slabs: Floor finish tolerances shall be measured in accordance with ASTM E1155 and ACI 302.1R the F-Number System (Inch-Pound Units) for the following conditions:

Element	Specified Overall Value		Minimum Local Value	
	FF	FL	FF	FL
Slab-on-Grade:				
Mech and Electrical Rooms, parking structures	20	15	15	10
Carpeted	25	20	17	15
Thinset Tile, Resilient Flooring	35	25	24	17
Wood Flooring	50	35	35	35
Other not indicated	35	25	24	17
Suspended Slabs:				
Mechanical and Electrical Rooms, parking structures	20	15 (SHORED)	N/A	N/A
Carpeted	25	20 (SHORED)		
Thinset Tile, Resilient Flooring	35	25 (SHORED)		
Wood Flooring	50	35 (SHORED)		
Other not indicated	35	25 (SHORED)		

- E. Verify flatness requirements in accordance with Owner's specification requirements prior to installation.
- F. Concrete Door Sills:
 - 1. Slabs Under Operable Partitions or Sound-Rated Accordion Doors: 1/8-inch from level along line under partition or door.
 - 2. Slabs Under Roll-up Doors: 1/8-inch from level along line under partition or door.
- G. Levelness tolerances shall be measured within 72 hours after slab concrete placement.
 - 1. Tolerances for sloped floors shall not exceed the slopes specified in "REGULATORY REQUIREMENTS" in Part 2.
- H. Owner reserves the right to test floors and concrete members for conformance to ACI 117 by Use of the Dipstick Floor Profiler. Should tolerances not be within the limits specified, the Contractor shall be required to pay the cost of the tests, as well as the repairs required to bring work into compliance.
- I. Corrective Procedures: See "FILLING, LEVELING AND PATCHING."
 - 1. Areas requiring corrective work should be identified and submitted to Architect. Re-measure corrected areas by the same process.

3.08 CONCRETE FINISHING

A. Formed Concrete

1. Surface Repairs: Repair surface defects, including defective areas and tie holes as recommended in ACI 301 Section 2 or 6.
2. Rough-Formed Finish: Cast concrete texture imparted by form-facing material, not arranged in any specific visual manner. Repair and patch tie holes and defective areas. Rub down or chip off fins and other projections exceeding 1/4-inch in height.
 - a. Apply to concrete surfaces not exposed to public view.
3. Smooth-Formed Finish: 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. Completely remove fins and other projections.
 - 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, damp-proofing, veneer plaster, or painting.
 - b. Apply the following rubbed finish, defined in ACI 301 Section 6, to smooth-formed finished concrete.
 - 1) Grout-cleaned finish.
 - 2) Smooth-rubbed finish.
4. Painted Finish: Entire surface area exposed to view shall be free of voids, cracks, spalls, protrusions, or non-uniform textures.
 - a. Prior to sacking, prepare surfaces in accordance with Section 09 9113 - Exterior Painting and Section 09 9123 - Interior Painting as applicable.
 - b. Entire surface area of concrete exposed to view shall be repaired, resurfaced, and made ready to receive paint finish specified under Section 09 9113 - Exterior Painting and Section 09 9123 - Interior Painting as applicable.
 - 1) Resurfacing of concrete panel surfaces shall be accomplished with specified resurfacing materials in accordance with manufacturer's instructions and the preparation and application procedures of ACI 503.4.
 - c. Interior surfaces at window openings shall be ground smooth, resurfaced, and prepared to receive sealants.
 - 1) Resurface concrete sills, jambs, and heads with specified resurfacing, patching, and finishing materials in accordance with manufacturer's instructions.
 - (a) Interior surfaces at openings shall be ground smooth, resurfaced, and prepared to receive sealants.
 - d. Finish repaired surfaces with primer and two coats of paint finish as specified under Section 09 9113 - Exterior Painting and Section 09 9123 - Interior Painting as applicable.
5. Related 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.
6. Electrostatic Coatings: Install in accordance with manufacturer's printed instructions.
7. Patching and Skim Coating: Refer to "FILLING, LEVELING AND PATCHING."

B. Flatwork

1. Screeding: Work out irregularities and bring surfaces to true finish grade or elevation. Remove excess water and debris worked to the surface during compaction and screeding.
2. Initial Troweling:
 - a. Do not commence troweling until surface water sheen has disappeared.
 - b. Use wood bullfloats to open top of slab to allow bleed water out.
 - c. Do not use metal floats.
 - d. Do not apply dry cement, sand, or water to surface.
 - e. Slabs to Receive Mortar-bed with Topping or Bonded Finish: Upon completion of pour, and before concrete has hardened, texture surface of slab with stiff broom, or roughen surface.
 - f. Slabs to Receive Crack Isolation Membrane or Mortar-bed with Cleavage Membrane: Finish slabs with typical smooth troweled surface.
3. Final Troweling:
 - a. Interior Slabs: Steel trowel and burnish.
 - 1) Do not finish slab until bleed water has evaporated.
 - 2) Do not apply water to the concrete during finishing.

- 3) Do not allow rainwater to stand on slab.
 - b. Sills and Other Weather Surfaces: Smooth trowel and burnish. Finish external angles uniform and tooled.
 - c. Sealer: Where specified, apply in accordance with the requirements of Section 033511.
4. Finish for Interior Stairs:
 - a. Sprinkle abrasive aggregate uniformly on unhardened surface immediately prior to finishing, at the rate of 2 pounds per square yard. Work into surface during finishing. Rub lightly to expose abrasive aggregate while concrete is green.
 - b. Concrete walking surfaces shall have a minimum slip resistance coefficient of friction of 0.6 as tested in accordance with ASTM D 2047.
 - c. Stairs: Apply grooves and tooled edges to tread nosing in accordance with the Contract Drawings.
 - 1) Provide medium broom finish.
 - d. Warning Stripes: Apply 2-inch wide warning stripe of 70 percent contrasting color at top and bottom nosing of each run at interior stairs, 1 inch maximum from edge of nosing.
 - e. Pedestrian, General:
 - 1) Provide medium broom finish.
 - 2) Medium acid etch finish.
5. Float Finish:
 - a. After screeding, consolidating, and straightening concrete slabs, do not work surface until ready for floating.
 - b. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats. The application of Portland cement to slab during floating or troweling is prohibited.
 - c. Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and frill low spots. Repeat float passes and straightening until surface is left with a uniform, smooth, granular texture.
 - d. Finish to straightedge tolerance.
 - e. Cut down high areas and fill in low areas.
 - f. After straightening, refloat surface to uniform, smooth, granular texture.
 - g. Locations:
 - 1) Surfaces scheduled for trowel and broom finishes.
 - 2) Surfaces scheduled to receive adhered roofing or waterproofing membrane.
 - 3) Surfaces scheduled to receive thick-set mortar beds on cleavage membrane.
6. Trowel Finish:
 - a. After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - b. Finish to straightedge tolerance.
 - c. Locations:
 - 1) Surfaces scheduled to receive thin-set mortar beds, resilient flooring, carpet, and wood flooring.
 - 2) Exposed surfaces.
 - 3) Surfaces scheduled to receive paint or other thin film finish coating.
7. Medium Broom Finish:
 - a. Provide float finish and let set.
 - b. While surface is still plastic draw medium stiff fiber bristle broom uniformly over surface to provide texture perpendicular to main traffic direction.
 - c. Locations:
 - 1) Stair treads.
- C. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 2. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners,

- surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.
3. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

3.09 SEALING

- A. Formed Concrete Surface:
 1. Interior Vertical Surfaces: Where indicated on Contract Drawings, treat vertical surfaces of interior exposed formed concrete with specified sealer finish Type WSR.
 - a. Apply protective treatment in saturating applications without atomizing the product. Use enough to thoroughly wet the surface and create a slight rundown below the spray pattern. Apply uniformly. Don't over apply.
 - 1) Provide two applications of protective treatment at exposed concrete toilet room wall locations. Apply the second coat within a few minutes after the first coat has penetrated and appears dry; do not atomize the product during application.
 - b. Brush heavy runs and drips thoroughly into the surface.
 - c. Protect treated surfaces from contact or by water or for 4 hours.
 2. Exterior Vertical Surfaces: Where indicated on Contract Drawings, treat vertical surfaces of exterior exposed formed concrete with sealer in accordance with specified sealer finish Type FSF.
- B. Flatwork
 1. Grind and clean floors prior to sealing.
 2. Sealer/Dustproofer:
 - a. Prepare substrates and spray apply curing sealer in accordance with manufacturer's directions.
 - b. Locations:
 - c. Mechanical rooms, main trash room, electrical rooms, and telephone rooms.
 - d. Other locations where indicated or scheduled in Contract Drawings.
 3. Penetrating Sealer:
 - a. Sealed Concrete Type SC2: Polish with clear finish in accordance with Section 03 3513 - High-Tolerance Concrete Floor Finishing.

3.10 CURING

- A. Comply with requirements of ACI 308R and ACI 318. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 1. Normal concrete: Not less than seven days.
- C. Forms containing concrete, top of concrete between forms, and exposed concrete surfaces after removal of forms shall be maintained in a thoroughly wet condition for at least 7 consecutive days after placing.
- D. Surfaces Not in Contact with Forms:
 1. Curing Compound: Cure by completely and uniformly applying liquid curing compound in accordance with manufacturer's printed instructions. Apply at least two coats at right angles to each other.
 - a. Reapply curing membrane at saw cut joints and at exposed edges of slab after removal of forms.
 - b. Omit curing compound and use moisture curing where required to provide floor sealer.
 - c. Omit curing compound where curing/sealing compound specified provides a concurrent curing function and is applied at the time of concrete placement appropriate to such function.
 - d. Slabs and floors to receive adhesive-applied flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
 2. Continuous Moisture: Cure by keeping concrete continuously wet for a period of at least 7 days after pouring in accordance with ACI 308R and ACI 318 for curing interior slabs to receive flooring finishes. During periods of high temperature, low humidity, or wind, wet concrete as often as required to keep concrete continuously moist for a period of at least 10 days. Cover with waterproof curing paper or reinforced vapor retarder, maintaining a film of water.
 3. Final Curing: Begin after initial curing but before surface is dry.
- E. Ambient Conditions:

1. Hot Weather Curing:
2. Conform to recommendations of ACI 305R regarding curing of concrete flatwork in hot weather.

3.11 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed testing agency.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Testing:
 1. Sample fresh concrete in accordance with ASTM C172/C172M, except modified for slump to comply with ASTM C94/C94M.
 2. Slump: Test will be performed in accordance with ASTM C143/C143M. One test will be made for each concrete load at point of discharge and one test for each set of compressive strength test specimens.
 3. Concrete Temperature: Test will be taken hourly when air temperature is 40 degrees F or below, and when 80 degrees F or above, and each time a set of compression test specimens is made.
 4. Curing: Cure specimens in accordance with ASTM C31/C31M.
 5. Frequency of Compressive Strength Testing: Test will be made in accordance with ASTM C39/C39M, ACI 318.
 - a. Test one set of four cylinders for each concrete class placed in any one day for each 50 cubic yards or fraction thereof, or for each 2000 square feet of surface area placed. One specimen will be tested at 7 days, two at 28 days, and:
 - 1) When frequency of testing will provide less than five strength tests for a given class of concrete, testing from at least five randomly selected batches, or from each batch if fewer will be conducted.
 - b. If the average of strength tests of all strength tests of a given class of concrete equals or exceeds the specified strength at 28 days, with no individual strength test less than 500 psi below that specified, the strength level of concrete will be considered satisfactory.
 - c. Retain one cylinder for testing at 56 days if 28-day test fails.
- E. Moisture Vapor Emission Testing: After concrete slabs have cured and prior to installation of finish flooring materials, verify that moisture content and alkali content of concrete slabs do not exceed limits acceptable to manufacturer of flooring materials.
 1. Testing Equipment: Test methods based on ASTM F2170 using RH meters and testing kits equal to AMT Moisture/Relative Humidity Meter manufactured by American Moisture Test, Inc., or equivalent by Vaprecision Testing Systems may be used at testing agency's option except at concrete floors with exposed or polished finish.
 2. Alkalinity: Concrete pH test using calibrated digital 1-14 wide range pH meter equal to PH100 to determine alkalinity level in accordance with ASTM F710. Paper and pencil type tests are not acceptable.
 3. Calcium Chloride Testing: After building air conditioning has been in operation for at least 15 days, calcium chloride and pH testing kits may be used: Prepackaged test kit of commercial consistency, equipped with a sealed dish of anhydrous calcium chloride, a metering dome with butyl rubber gasket and instructions for implementation. Weigh dishes on site prior to installation. Conform with requirements of ASTM F1869.
- F. Vapor Emission and Alkalinity Testing:
 1. Perform vapor emission and alkalinity testing and take appropriate action based on results in relation to finish floor manufacturer's moisture and alkalinity requirements.
- G. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

3.12 FILLING, LEVELING AND PATCHING

- A. Concrete slabs exhibiting high or low spots and indicated to receive resilient floor covering or soft floor covering, shall have surfaces repaired, or as directed by Architect.
 1. High spots shall be honed, or ground with power-driven machines to required tolerances with approval from Architect.
 2. Low spots shall be filled with floor leveling compound, installed in accordance with manufacturer's written recommendations.

- B. Holes resulting from form ties or sleeve nuts shall be solidly packed, through exterior walls, by pressure grouting with cement grout, as specified. Grouted holes on exposed surfaces shall be screeded flush and finished to match adjoining surfaces.
- C. Patching Exposed Concrete: After flushing with water, pack tie wire, nail, bolt, and core sample holes which will be exposed as soon as possible after form removal. Grout and repair rough pockets, cracks, or honeycomb. If patches are required, chip defective areas to a uniform depth of at least 1 inch with sides at right angles to surface.
 - 1. Match surrounding concrete surfaces in color and texture. Make trial patch to determine color match. Before applying, moisten surrounding concrete and apply specified bonding compound.
 - 2. Smooth Formed Concrete: Grind off ridges, offsets, and other prominent marks of smooth formed concrete while concrete is green and grind smooth. Sack exposed concrete surfaces.
 - a. Painted concrete shall be considered as being exposed.
 - 3. Patch defects deeper than 1/2-inch in panels with specified patching material and methods deemed by the Architect as the appropriate method to correct such defects.
- D. Skim Coating: Where sack and patch is noted on Contract Drawings, apply to architectural formed cast-in-place concrete walls in accordance with manufacturer's instructions.
 - 1. New concrete must be cured 28 days.
 - 2. pH must be verified prior to skim coating application to determine if primer needs to be applied, as required by manufacturer.
 - 3. Clean concrete in accordance with ASTM D4258.
 - 4. Mixing Skim Coat:
 - a. Add to water, adding only enough to make a stiff trowelable consistency like soft putty.
 - b. Add color additive.
 - c. Working Time: Approximately 15 minutes.
 - 5. Apply to walls with trowel in smooth uniform coat in continuous operations to maintain a uniform shade.
 - 6. Patching: Broad deep areas in concrete surface shall be filled with skim coat material in accordance with manufacturer's directions prior to application of skim coat. Where surfaces are shiny smooth, apply manufacturer's Type II bonding agent.
- E. Patching Unexposed Concrete: Ridges, offsets, and other prominent marks need not be ground off, cleaned, or sacked. This requirement applies to concrete areas that will be concealed by other construction.
 - 1. Finish below-grade concrete indicated to receive waterproofing in the same manner as exposed, smooth-formed concrete, except that surfaces need not be sacked.
 - 2. Patch and repair concrete slabs ready to receive future finish materials installed by Owner.

3.13 DEFECTIVE CONCRETE

- A. Strength
 - 1. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
 - 2. If the strength of any grade of concrete for any portion of Work, as indicated by molded test cylinders, falls below minimum 28 days compressive strength specified or indicated, adjust mix design for remaining portion of construction so that resulting concrete meets minimum strength requirements.
 - 3. Should strength of any grade of concrete, for any portion of Work indicated by tests of molded cylinders and core tests, fall below minimum 28 days strength specified or indicated, concrete will be deemed defective and shall be evaluated by Architect and replaced or adequately strengthened in a manner acceptable to the Architect and DSA.
 - 4. Test Cores: Should required test cylinders fail to show minimum design compressive strength, take test cores at locations coordinated with the Architect.
 - a. If results show compressive strength to be less than design stress, concrete shall be deemed defective and shall be replaced in a manner acceptable to the Architect and DSA.
 - b. If results show compressive strength to conform to design stress, grout solid coring holes with grout exceeding design compressive strength and finish to match adjacent surface.
- B. Concrete Work that is not formed as indicated, is not true within tolerances of span, not true to intended alignment, not plumb or level where so intended, not true to intended grades and levels, cracked, contains sawdust shavings, wood or embedded debris, or does not fully conform to Contract provisions, shall be deemed to be defective Work and shall be removed and replaced.

- C. Concrete substrates for non-breathable floor finishes that indicate by testing excess quantities of moisture and alkalinity shall require remedial measures, as specified in this Section.
- D. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing, including patching for cores, shall be borne by Contractor when defective concrete is identified.
- E. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.14 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.
- B. Wash and clean flatwork surfaces. Leave free from oil, paint, plaster, form coating, and other foreign substances, ready to receive scheduled finishes.

3.15 PROTECTION

- A. Protect the Work of this section until Substantial Completion.
- B. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

**SECTION 03 3511
CONCRETE FLOOR FINISHES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Surface treatments for concrete floors and slabs.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

- A. See Section 01 3000 - 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. Submit special concrete finishes manufacturer's recommended installation procedures, which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
- D. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.05 MOCK-UP

- A. Provide mock-ups of each type finish, to demonstrate typical joints, surface finish, color variation (if any) and standard of workmanship.
- B. Mock-Up Size: 10 feet square.
- C. Locate where directed.
- D. Obtain approval of mock-up from Architect and Owner before starting construction.
- E. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.
- F. Mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's sealed packaging, including application instructions.
- B. Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.07 FIELD CONDITIONS

- A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.
- B. Maintain ambient temperature of 50 degrees F minimum.
- C. Concrete shall have a Floor Flatness rating of at least 50.
- D. Aggregate exposure shall be Salt and Pepper (fine aggregate exposure).
- E. Close areas to traffic during floor application and after applications, for time period recommended in writing by manufacturer.
- F. Dispose of slurry and finish byproducts in compliance with all applicable codes.

PART 2 PRODUCTS**2.01 SEALED CONCRETE**

- A. Liquid Densifier/Hardener: Penetrating chemical compound that reacts with concrete, filling the pores and dustproofing; for application to concrete prior to set.
 - 1. Composition: Lithium silicate.
 - 2. Products:
 - a. PROSOCO, Inc; Consolideck LS/CS: www.prosoco.com/consolideck.
 - b. W. R. Meadows, Inc; Liqui-Hard Ultra: www.wrmeadows.com.

- c. Substitutions: See Section 01 6000 - Product Requirements.

2.02 POLISHED CONCRETE SYSTEM

- A. Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.
 - 1. Acceptable Systems:
 - a. W. R. Meadows, Inc; Induroshine and Bellatrix Concrete Enhancer: www.wrmeadows.com/#sle.
 - b. RetroPlate 99, manufactured by Advanced Floor Products; www.retroplatesystem.com.
 - c. Certi-Shine, manufactured by Vexcon Chemicals; www.vexcon.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Materials:
 - 1. Concrete Mix: Refer to 03 3000 CAST-IN-PLACE CONCRETE.
 - 2. Hardening/Sealing Agent: Water-based lithium silicate hardener and stain-resistant hardener.
 - a. Liqui-Hard Ultra, manufactured by W. R. Meadows, Inc.
 - b. RetroPlate 99, manufactured by Advanced Floor Products.
 - c. Certi-Shine Clear, manufactured by Vexcon Chemicals.
 - 3. Floor Repair Material: Liquid silicate material to fill and repair concrete surface imperfections.
 - a. Certi-Shine Fusion, manufactured by Vexcon Chemicals.
 - b. Equal product manufactured by proposed manufacturer.
 - 4. Unreacted Silicate Rinse: Liquid rinse solution.
 - a. Certi-Shine Fixative, manufactured by Vexcon Chemicals.
 - b. Equal product manufactured by proposed manufacturer.
 - 5. Scrubber Machines.
 - a. Equal to Clark Encore Max38 or L38 with a head pressure of 150 pounds.
 - 6. Polishing Pads.
 - a. Stripper Pad: Equal to 3M 7300 Black Stripper Pad, 3M 6800 Red Cleaner Pad or 3M 5300 Blue Cleaner Pad.
 - b. Buffer Pad: Equal to 3M Beige Buffer Pad.
- C. Related Materials:
 - 1. Water: Potable
 - 2. Neutralizing Agent: Tri-sodium phosphate or baking soda.
 - 3. Curing agent shall be Ashford Formula, or compatible equal.

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 PREPARATION

- A. Apply materials in accordance with manufacturer's instructions.
- B. Remove contamination of the slab by soil, foot prints, drag marks, welding marks, hydraulic fluids or any other outside contaminant. Provide additional treatment or grinding as required.
- C. Protect adjacent surfaces from damage. Tape and protect areas adjacent to work areas.

3.03 PROTECTION

- A. Take precautions to prevent petroleum stains from the concrete surfaces to be exposed. Since no satisfactory chemicals or cleaning procedure is available to remove petroleum stains from concrete, stained concrete shall be removed and replaced.
 - 1. Hydraulic powered equipment must be diapered to avoid staining of the concrete.
 - 2. No trade shall park vehicles on the interior floor slabs. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
 - 3. No pipe cutting machine shall be used on the interior floor slabs.
 - 4. Steel shall not be placed on interior floor slabs to avoid rust staining.
 - 5. All equipment must be equipped with non-marking tires.
- B. Protect finished surface as required and as recommended by manufacturer of polishing system.

3.04 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.

3.05 CONCRETE POLISHING

- A. Execute using materials, equipment, and procedures specified by manufacturer, using manufacturer approved installer.
- B. Floor to be prepared for polishing application with specified diamond grinding steps, followed by the application of hardener/sealer agent and final polishing steps. Note that the exact number of grinding and polishing steps required will be determined by the flatness achieved by the concrete finisher, along with the desired look that is specified.
 - 1. Exposed Aggregate (Salt and Pepper) with Level Three Gloss: 40 grit metal bonded diamonds, 60 grit metal bonded diamonds, 150 grit metal bonded diamonds, 50 grit resin diamonds, 120 grit resin diamonds, 220 grit resin diamonds, hardener/sealer, 400 grit resin diamonds, 800 grit resin diamonds, and 1200 grit resin diamond final polish.

3.06 SCHEDULE

- A. Exposed Aggregate with Level Three Gloss:
 - 1. All areas not scheduled to be sealed and that are not scheduled to receive carpet, resilient flooring, or tile flooring.
- B. Sealed Concrete:
 - 1. MDF 104A
 - 2. Storage 104B
 - 3. HVAC 110
 - 4. Storage 111
 - 5. Pool Office/Concessions 116

END OF SECTION

**SECTION 04 2000
UNIT MASONRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Flashings.

1.02 RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories
- B. Section 03 2000 - Concrete Reinforcing: Reinforcing steel for grouted masonry.
- C. Section 07 6200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.
- D. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. The applicable version of the standards listed below shall be most current version of the standard or as referenced by other standards.
 - 1. ACI 216 - Code Requirements for Determining Fire Resistance of Concrete and Masonry Construction Assemblies.
 - 2. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 3. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
 - 4. ASTM C5 - Specification for Quicklime for Structural Purposes.
 - 5. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
 - 6. ASTM C91/C91M - Standard Specification for Masonry Cement.
 - 7. ASTM C110 - Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone.
 - 8. ASTM C114 - Method for Chemical Analysis of Hydraulic Cement.
 - 9. ASTM C140 - Sampling and Testing Concrete Masonry Units.
 - 10. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
 - 11. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
 - 12. ASTM C150/C150M - Standard Specification for Portland Cement.
 - 13. ASTM C207 - Specification for Hydrated Lime for Masonry Purposes.
 - 14. ASTM C260 - Specification for Air-Entraining Admixtures for Concrete.
 - 15. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
 - 16. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
 - 17. ASTM C426 - Test Method for Linear Drying Shrinkage of Concrete Masonry Units.
 - 18. ASTM C476 - Standard Specification for Grout for Masonry.
 - 19. ASTM C494 - Specification for Chemical Admixtures for Concrete.
 - 20. ASTM C744 - Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
 - 21. ASTM C979 - Specification for Pigments for Integrally Colored Concrete.
 - 22. ASTM C1019 - Test Method of Sampling and Testing Grout.
 - 23. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.
 - 24. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.
- B. ICC Evaluation Service, Inc. (ICC ES), a subsidiary corporation of the International Code Council:
 - 1. ICC ES Evaluation Reports (ESR) for Materials, Products, Methods, and Types of Construction with current report conforming to the applicable building code.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.

- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
- D. Samples: Submit samples of units to illustrate color, texture, and extremes of color range.
- E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- F. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.
- G. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and by thickness of wall as indicated on contract drawings
 - a. Cap units shall be 2 inches high by 16 inches long by thickness of wall.
 - 2. Shapes: Provide open end units typically.
 - a. Bond Beam Block: Deep cut type.
 - b. Provide lintel units over wall openings.
 - c. Special Units: Provide cap, end, corner, pilaster, and other special units as required.
 - 3. Load-Bearing Units: ASTM C90, medium weight.
 - a. Hollow block, as indicated.
 - 4. Nonloadbearing Units: ASTM C129.
 - a. Hollow block, as indicated.
 - 5. Average oven-dry density of solid grouted medium weight CMU block shall not exceed 115 pounds per cubic foot.
 - 6. Admixture: Add water repellent admixture to block mix used for exterior construction in accordance with recommendations of manufacturer.
 - 7. Surface Texture:
 - a. Buildings: Provide smooth precision block surface, or as indicated on drawings.
 - b. Site Walls: Ground-Face (Burnished) Units, or as indicated in drawings.
 - 8. Block Color:
 - a. Smooth: Provide natural color unless noted otherwise on the Contract Drawings.

2.02 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type II; color as required to produce approved color sample.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Aggregate: ASTM C144.
- D. Grout Aggregate: ASTM C404, coarse type.
- E. Water: Clean and potable.
- F. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.
 - 1. Use only in combination with masonry units manufactured with integral water repellent admixture.
 - 2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
 - 3. Meet or exceed performance specified for water repellent admixture used in masonry units.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: Type specified in Section 03 2000; size as indicated on drawings.
- B. Supports and spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete.
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

2.04 FLASHINGS

- A. Metal Flashing Materials: As specified in Section 07 6200.

2.05 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Type as indicated on drawings.
 - 2. Minimum compressive strength of the mortar shall be as required to achieve the compressive strength ($f'm$) of masonry specified when combined with masonry units used in the structure.
 - 3. Exterior, loadbearing masonry: Type S.
 - 4. Proportion per TMS 402/602.
 - 5. Water Repellent Admixture: Add water repellent admixture to mortar mix in accordance with recommendations of manufacturer.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
 - 1. Minimum compressive strength of the grout shall be as required to achieve the compressive strength ($f'm$) of masonry specified when combined with masonry units used in the structure, with a minimum compressive strength of 2000 psi at 28 days.
 - 2. Proportions: In accordance with ASTM C376.
- C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.

2.06 PERFORMANCE CRITERIA

- A. Minimum specified average net area compressive strength ($f'm$) of masonry assembly shall be in accordance with the contract drawings.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- C. Verify dowels are properly located.
- D. Do not commence installation until foundations are clean, rough, and level, or until floor slabs are structurally sound. Clean projecting dowels free from loose scale, dirt, concrete, and other material that will inhibit bond.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 and CBC Chapter 22.

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:

1. Bond: Running.

3.05 PLACING AND BONDING

- A. Lay hollow masonry units with face shell bedding on head and bed joints.
- B. Lay only dry masonry units
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- F. Interlock intersections and external corners.
- G. Provide full mortar coverage on horizontal and vertical face shells and webs in courses of the following:
 1. Piers, columns, and pilasters.
 2. Starting course on footings and solid foundation walls. Provide full bedding under both the face shell and web.
 3. Where adjacent to cells or cavities to be filled with grout.
- H. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- I. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- J. If necessary to stop a horizontal run of masonry, rack back one-half block length in each course. Do not use toothing to join new masonry to set or partially set masonry when continuing a horizontal run.
- K. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- L. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
- M. Horizontal and Vertical Face Joints:
 1. Thickness: 3/8-inch nominal, and uniform in appearance.
 2. When thumb-print hard, tool joints in exposed surfaces with round jointer for concave joint. Mortar joints shall be tooled only where walls will be left exposed.
 - a. Compress and strike off for flush joints when serving as a base for plaster, textured coatings, membrane waterproofing or dampproofing.
 3. Remove mortar protruding into cells of cavities to be reinforced or filled.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. Provide reinforcing as shown on contract drawings.
- B. Install reinforcing in conformance with TMS 402/602.

3.07 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

3.08 GROUTED COMPONENTS

- A. Lap splices as indicated on drawings.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.

3.09 CONTROL JOINTS

- A. Continue horizontal joint reinforcement through control joints.
- B. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

3.10 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.11 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.

3.12 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.13 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

3.14 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.

3.15 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
- B. 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 down both sides and hold cover securely in place.
 2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- C. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- D. 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 mud and from mortar splatter by coverings spread on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and 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.

END OF SECTION

**SECTION 06 1000
ROUGH CARPENTRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Non-structural dimension lumber framing.
- B. Sheathing.
- C. Roofing nailers.
- D. Preservative treated wood materials.
- E. Fire retardant treated wood materials.
- F. Miscellaneous framing and sheathing.
- G. Communications and electrical room mounting boards.
- H. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

- A. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
- B. Section 09 9000 - Painting and Coating.
- C. Structural Sheet Specifications - Sheets S0.01 and S0.02

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- C. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2011.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- F. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.
- G. NFPA 285.
- H. ICC-ES AC310 - Water-resistive Membranes Factory-bonded to Wood-based Structural Sheathing, Used as Water-Resistive Barriers; 2015.
- I. PS 1 - Structural Plywood; 2009.
- J. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- K. PS 20 - American Softwood Lumber Standard; 2015.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Samples: For rough carpentry members that will be exposed to view, submit two samples, in size illustrating wood grain, color, and general appearance.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 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. 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.
2. 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.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS (REFER TO STRUCTURAL SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS).

- A. Sizes: Nominal sizes as indicated on drawings.
- B. Moisture Content: S-dry or MC19.
- C. Stud Framing:
 1. Grade: No. 2.
- D. Joist, Rafter, and Small Beam Framing:
 1. Species: Southern Pine.
 2. Grade: No. 2.
- E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 1. Lumber: S4S, No. 2 or Standard Grade.
 2. Boards: Standard or No. 3.

2.03 EXPOSED DIMENSION LUMBER (REFER TO STRUCTURAL SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS).

- A. Sizes: Nominal sizes as indicated on drawings.
- B. Surfacing: S4S.
- C. Moisture Content: S-dry or MC19.
- D. Joist, Rafter, and Small Beam Framing:
 1. Species and Grades: As indicated on drawings for various locations.

2.04 STRUCTURAL COMPOSITE LUMBER (REFER TO STRUCTURAL SHEET SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS).

- A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.
- B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.

2.05 EXPOSED BOARDS

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Moisture Content: Kiln-dry (15 percent maximum).
- C. Surfacing: S4S.
- D. Species: Southern Pine.
- E. Grade: No. 2, 2 Common, or Construction.

2.06 CONSTRUCTION PANELS

- A. Roof Sheathing: Oriented strand board structural wood panel, PS 2, with factory laminated roofing underlayment layer.
 1. Sheathing Panel:
 - a. Grade: Structural 1 Sheathing.
 - b. Performance Category: 5/8 PERF CAT.
 - c. Span Rating: 40/20.
 - d. Edge Profile: Square edge.
 2. Integral Roofing Underlayment Layer: Medium density, phenolic impregnated kraft paper overlay.
 3. Exposure Time: Sheathing undamaged and integral roofing underlayment layer intact after exposure to weather for up to 180 days.
 4. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center.

5. Seam Tape: Manufacturer's standard pressure-sensitive, self-adhering, cold-applied seam tape consisting of polyolefin film with acrylic adhesive.
6. Manufacturers:
 - a. Huber Engineered Woods, LLC; ZIP System Roof/Wall Sheathing and ZIP System Seam Tape: www.huberwood.com.
- B. Wall Sheathing: Oriented strand board structural wood panel with factory laminated water-resistive and air barrier layer.
 1. Sheathing Panel: PS 2, Exposure 1.
 - a. Grade: Sheathing.
 - b. Performance Category: 1/2 PERF CAT.
 - c. Span Rating: 32/16.
 - d. Edge Profile: Square edge.
 2. Integral Water-Resistive and Air Barrier: Sheet material qualifying as a Grade D water resistive barrier; complying with ICC-ES AC310.
 3. Water Vapor Permeance of Water Resistive and Air Barrier: 12 to 16 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure B.
 4. Maximum Allowable Air Leakage of Assembly, complying with ASTM E2357:
 - a. Infiltration: 0.0072 cfm per square foot, maximum, at a pressure differential of 1.57 pounds per square foot.
 - b. Exfiltration: 0.0023 cfm per square foot, maximum, at a pressure differential of 1.57 pounds per square foot.
 5. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
 6. Seam Tape: Manufacturer's standard pressure-sensitive, self-adhering, cold-applied, seam tape.
 7. Warranty: Manufacturer's standard, limited system warranty for:
 - a. Residential Projects: Lifetime of the structure, limited to original owner.
 - b. Commercial Projects: Two year; transferable.
 8. Manufacturers:
 - a. Georgia-Pacific LLC; ForceField® Air and Water Barrier System: www.buildgp.com.
 - b. Huber Engineered Woods, LLC; ZIP System Roof/Wall Sheathing and ZIP System Seam Tape: www.huberwood.com.
- C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.07 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. Anchors: Toggle bolt type for anchorage to hollow masonry.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
- E. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed.
 1. Manufacturers:
 - a. Franklin International, Inc; Titebond PROvantage Weatherproof Subfloor Adhesive: www.titebond.com.
 - b. Huber Engineered Woods, LLC; AdvanTech Subfloor Adhesive: www.huberwood.com.
 - c. Liquid Nails, a brand of PPG Architectural Coatings; LN-902 Subfloor and Deck Construction Adhesive, 10 oz: www.liquidnails.com/.
- F. Construction Adhesives:

1. Manufacturers:
 - a. Franklin International, Inc; Titebond Fast Set Polyurethane Construction Adhesive:
www.titebond.com/#sle.

2.08 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. 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. Preservative Treatment:
 1. Manufacturers:
 - a. Arch Wood Protection, Inc: www.wolmanizedwood.com.
 - b. Koppers Performance Chemicals, Inc: www.koppersperformancechemicals.com.
 - c. Viance, LLC: www.treatedwood.com.
 - d. Substitutions: See Section 01 6000 - 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.

PART 3 EXECUTION

3.01 PREPARATION

- A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

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 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.
- E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 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.

3.05 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.

3.06 INSTALLATION OF CONSTRUCTION PANELS

- A. Subflooring: Glue and nail to framing; staples are not permitted.
- B. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. Nail panels to framing; staples are not permitted.
- C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
- D. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches 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.
- E. Wall Sheathing and Roof Sheathing with Laminated Water-Resistive Barrier and Air Barrier: Secure to studs as recommended by manufacturer.
 - 1. Install with laminated water-resistive and air barrier on exterior side of sheathing.
 - 2. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
 - 3. Use only mechanically attached and drainable EIFS and exterior insulation with wall sheathing with laminated water-resistive and air barrier.
 - 4. Apply manufacturer's standard seam tape to joints between sheathing panels. Use tape gun or hard rubber roller as recommended by manufacturer.

3.07 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.08 CLEANING

- A. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

**SECTION 06 2000
FINISH CARPENTRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Finish carpentry items.
- B. Wood door frames.
- C. Wood casings and moldings.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 09 9000 - Painting and Coating: Staining and finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.
- C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2020.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
- C. Samples: Submit two samples of wood trim 6 inches long illustrating wood grain and specified finish.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect work from moisture damage.

PART 2 PRODUCTS**2.01 FINISH CARPENTRY ITEMS**

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
- C. Exterior Woodwork Items:
 - 1. Soffits and Fascias: Prepare for paint finish.
- D. Interior Woodwork Items:
 - 1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.
 - 2. Door, Glazed Light, and Pocket Door Frames: White birch; prepare for paint finish.
 - 3. Window Sills: Clear fir; prepare for paint finish.
 - 4. Wood Slats at Multipurpose Room Ceiling: Clear white pine; prepare for custom stain finish.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.03 SHEET MATERIALS

- A. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1 Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.04 ACCESSORIES

- A. Primer: Alkyd primer sealer.
- B. Wood Filler: Solvent base, tinted to match surface finish color.

2.05 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- D. Install prefinished paneling with full bed contact adhesive applied to substrate.

3.03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

**SECTION 06 2530
SLATWALL PANEL SYSTEMS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Pre-finished slatwall panel system for displays.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets on each product to be used.
- B. Product Drawings: Manufacturer's drawings showing details and dimensions.
- C. Product Installation: Manufacturer's installation instruction and procedures.
- D. Product Samples: For each finish specified, select from manufacturer's full range of available colors and patterns.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Open packaging promptly after deliver and inspect panels carefully. Contact manufacturer for replacement order.
- B. Store panels in cool, dry environment. Do not subject to moisture.
- C. Do not stack panels directly on floor.

1.04 PROJECT CONDITIONS

- A. Condition panels to normal room temperature and low humidity prior to installation.

1.05 WARRANTY

- A. All products shall be warranted to be free of defects for a period of 90 days after installation.

PART 2 PRODUCTS**2.01 MANUFACTURER**

- A. Slatwall Display panels shall be manufactured by Spacewall International: www.spacewall.com or approved equal

2.02 MATERIALS

- A. All Slatwall panels shall be constructed using 48# density medium density fiberboard (MDF) substrate, having an internal bond strength of 110# per square inch minimum. All Slatwall panels shall have formaldehyde emissions of .3 PPM or less and shall comply with HUD 24 CFR Part 3280 Standards set forth for particleboard panels.
- B. All Slatwall panels shall have engineered "T" grooves factory machined as follows:
 - 1. For all Slatwall installations on wall surfaces provide: engineered groove machined into $\frac{3}{4}$ " thick substrate, reinforced with aluminum inserts. Insert finish color to be selected from manufacturer's standard color options. Inserts are to be factory installed.
- C. All Slatwall panels shall be low pressure laminate (LPL) in color selected from manufacturer's entire line.
- D. All Slatwall panels shall have grooves machined on 3" on center
- E. Slatwall Accessories: Provide the following slatwall accessories:
 - 1. 2 boxes of slatwall picture hooks (10 hooks per box).
 - 2. 1 box of slatwall 2" long hooks (100 per box).
 - 3. 2 boxes of slatwall pin hooks (10 hooks per box).
 - 4. 4 Duron plastic slatwall shelves (13" x 24").
 - 5. 8 shelf brackets, chrome, 12".

2.03 FABRICATION / FACTORY FINISHING

- A. Tolerances for panels:
 - 1. Dimensional : $\pm .0625$ "
 - 2. Squareness: .125" across diagonals
 - 3. Thickness: $\pm .008$ "
 - 4. Grooving: $\pm .031$ " (groove width and spacing between grooves)

PART 3 EXECUTION**3.01 PREPARATION**

- A. All walls or partitions which are to receive Slatwall panels shall be dry, solid and flat. Recommended stud spacing is 16" on-center. Slatwall panels may be applied directly to open studs or over drywall. Care must be taken to prevent moisture penetration through the walls. Refer to manufacturer's installation instructions.

3.02 INSTALLATION

- A. All Slatwall panels are to be installed in strict accordance with the manufacturer's written installation instructions.
- B. Where shown, provide trim boards and materials for field installation of all components surrounding each area of slatwall.

END OF SECTION

**SECTION 06 4100
ARCHITECTURAL WOOD CASEWORK**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Cabinet hardware.
- D. Factory finishing.
- E. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 10 1101 - Visual Display Boards: Sliding markerboards.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.
- C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.
- D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

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. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- B. Product Data: Provide data for hardware accessories.
- C. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
- B. No particle board allowed.

1.07 MOCK-UP

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.09 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: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

- B. Plastic Laminate Faced Cabinets: Custom grade.
- C. Cabinets:
 - 1. Cabinet Design Series: As indicated on drawings.
 - 2. Adjustable Shelf Loading: 50 lbs. per sq. ft.
 - 3. Cabinet Style: Flush overlay.
 - 4. Cabinet Doors and Drawer Fronts: Flush style.
 - 5. Drawer Construction Technique: Dovetail joints.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- B. Provide specific types as indicated.
 - 1. Vertical Surfaces: VGS, 0.028 inch nominal thickness, colors as indicated, finish as indicated.
 - 2. Cabinet Liner: CLS, 0.020 inch nominal thickness, colors as indicated, finish as indicated.

2.04 COUNTERTOPS

- A. Countertops are specified in Section 12 3600.

2.05 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
 - 1. Color: As selected by Architect from manufacturer's standard range.
- C. Fasteners: Size and type to suit application.
- D. 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.
- E. Grommets: Standard plastic 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 spacing adjustments.
- C. Drawer and Door Pulls: FCMetal, FCM-P-81 Series Wire Pull, 6" in Matte Black.
- D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.
- E. Catches: Magnetic.
- F. Drawer Slides:
 - 1. Type: Extension types as indicated.
 - 2. Static Load Capacity: Heavy Duty grade.
 - 3. Mounting: Side mounted.
 - 4. Features: Provide self closing/stay closed type.
 - 5. Manufacturers:
 - a. Accuride International, Inc: www accuride.com.
 - b. Grass America Inc: www.grassusa.com.
 - c. Hettich America, LP: www.hettich.com.
 - d. Knappe & Vogt Manufacturing Company: www.knappeandvogt.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- G. Hinges: 5 knuckle flush overlay institutional type, steel with satin finish.
 - 1. Manufacturers:
 - a. Grass America Inc: www.grassusa.com.
 - b. Hardware Resources: www.hardwareresources.com.

- c. Hettich America, LP: www.hettich.com.
- d. Blum, Inc: www.blum.com.
- e. Substitutions: See Section 01 6000 - Product Requirements.

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. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
 - 1. Provide center matched panels at each elevation.
 - 2. Provide sequence matching across each elevation.
- E. 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.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.
- G. 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 06 8316
FIBERGLASS REINFORCED PANELING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Fiberglass reinforced plastic panels.
- B. Trim.

1.02 REFERENCE STANDARDS

- A. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.

1.03 SUBMITTALS

- A. See Section 01 3000 - 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. Samples: Submit two samples in size illustrating material and surface design of panels.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fiberglass Reinforced Plastic Panels:
 - 1. Crane Composites, Inc; Glasbord, smooth texture: www.cranecomposites.com.
 - 2. Marlite, Inc; Smooth FRP: www.marlite.com.
 - 3. Nudo Products, Inc; Fiberlite FRP, smooth finish: www.nudo.com.
 - 4. Panolam Industries International, Inc: www.panolam.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

- A. Wall Panels:
 - 1. Panel Size: 4 by 8 feet.
 - 2. Panel Thickness: 0.09 inch.
 - 3. Surface Design: Smooth.
 - 4. Color: White.
 - 5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.03 MATERIALS

- A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
 - 1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
- B. Trim: Manufacturer's standard PVC trim pieces designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners as needed, and caps as need to conceal edges; color coordinating with panel.
- C. Moldings: Manufacturer's standard base molding; color to be selected from manufacturer's standard range.
- D. Adhesive: Type recommended by panel manufacturer.
- E. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
- C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
- D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
- E. Install panels with manufacturer's recommended gap for panel field and corner joints.
- F. Place trim on panel before fastening edges, as required.
- G. Fill channels in trim with sealant before attaching to panel.
- H. Install trim with adhesive and screws or nails, as required.
- I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
- J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 1300 SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sheet Waterproofing:
 - 1. Self-adhered modified bituminous sheet membrane.
 - 2. Butyl rubber sheet membrane.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete substrate.
- B. Section 07 2100 - Thermal Insulation: Insulation used for protective cover.
- C. Section 07 6200 - Sheet Metal Flashing and Trim: Metal coping and counterflashing.
- D. Section 07 9200 - Joint Sealants: Sealing moving joints in waterproofed surfaces that are not required to be treated in this section.

1.03 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2015a).
- B. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2012).
- C. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2012.
- D. ASTM D6134 - Standard Specification for Vulcanized Rubber Sheets Used in Waterproofing Systems; 2007 (Reapproved 2013).
- E. ASTM D6506 - Standard Specification for Asphalt Based Protection for Below-Grade Waterproofing; 2001 (Reapproved 2009).
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- G. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2013).
- H. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for membrane, surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants with temperature range for application of waterproofing membrane.
- C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- D. Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Membrane Manufacturer Qualifications: Company specializing in manufacturing products 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 and with at least three years of documented experience.

1.06 MOCK-UP

- A. Locate where directed.
- B. Mock-up may remain as part of this Work.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.08 WARRANTY

- A. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

PART 2 PRODUCTS**2.01 MEMBRANE MATERIALS**

- A. Self-Adhered Modified Bituminous Sheet Membrane:
 - 1. Thickness:
 - a. Carrier Film: 4 mils.
 - b. Polymeric Membrane: 56 mils.
 - 2. Tensile Strength, ASTM D42, Die C:
 - a. Carrier Film: 5,000 psi minimum.
 - b. Polymeric Membrane: 325 psi minimum.
 - 3. Elongation, ASTM D412, Die C:
 - a. Polymeric Membrane: 350% minimum.
 - 4. Peel Adhesion, ASTM D903: 10.0 lbf/in.
 - 5. Lap Adhesion, ASTM D1876: 8.62 lbf/in.
 - 6. Water Vapor Permeability, ASTM E96, Method B: 0.036 perms.
 - 7. Water Absorption, ASTM D570: 0.1%, 72 hours maximum.
 - 8. Resistance to Hydrostatic Head: Equivalent to 230.9 feet of water.
 - 9. Puncture Resistance, ASTM E154: 48.2 lbf.
 - 10. Exposure to Fungi, Soil Test, Pass, 16 weeks.
 - 11. Sheet Width: 36 inch, minimum.
 - 12. Manufacturers:
 - a. Carlisle Coatings & Waterproofing Inc; MiraDRI 860/861: www.carlisleccw.com.
 - b. Henry Company; Blueskin WP 200: www.henry.com.
 - c. Mar-flex Waterproofing & Building Products; ArmorSheet 600 Summer Grade: www.mar-flex.com.
 - d. Polyguard Barrier Systems, Inc, a division of Polyguard Products, Inc; Balconyguard Membrane: www.polyguardbarriers.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

- A. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.
- B. Surface Conditioner:
 - 1. Temperatures above 40 degrees F: Mel-Prime Water Base Primer.
 - 2. Temperatures above 0 degrees F: Mel-Prime VOC Compliant Solvent Base Primer or Standard Solvent Base Primer.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- C. Flexible Flashings and Fillets: Type recommended by membrane manufacturer.
- D. Termination Bar: Type recommended by membrane manufacturer.
- E. Pointing Mastic: Type recommended by membrane manufacturer.
- F. Corner Tape: Type recommended by membrane manufacturer.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

- A. Protect adjacent surfaces from damage not designated to receive waterproofing.

- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.
- C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
- D. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.
- E. Seal moving cracks with sealant and non-rigid filler, using procedures recommended by sealant and waterproofing manufacturers.
- F. Apply surface conditioner to surfaces that will be covered within one working day according to manufacturer's recommended coverage rates.
- G. Install corner tape on all inside and outside corners, including the footing.
- H. Apply a 9" strip of self-adhering membrane over construction, control and expansion joints and over cracks greater than 1/16" wide.
- I. Seal all terminations with pointing mastic.

3.03 INSTALLATION

- A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- B. Roll out membrane, and minimize wrinkles and bubbles.
- C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.
- D. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.
- E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
- F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.
- G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.
- H. Seal membrane and flashings to adjoining surfaces.
 - 1. Install counterflashing over exposed edges.

3.04 INSTALLATION - PRE-APPLIED INTEGRALLY BONDED SHEET WATERPROOFING MEMBRANE

- A. Horizontal Applications:
 - 1. Strictly comply with installation instructions in manufacturer's published literature, including but not limited to, the following:
 - a. Place the membrane HDPE film side to the substrate with the yellow zip strip facing towards the concrete pour. End laps should be staggered to avoid a build-up of layers.
 - b. Leave the yellow and blue zip strips in position until overlap procedure is completed.
 - c. Accurately position succeeding sheets to overlap the previous sheet 3 in. along the marked selvedge. The blue zip strip on the underside of the membrane shall be positioned on top of the yellow zip strip on the top of the succeeding sheet. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap.
 - d. Peel back and remove both the yellow and blue zip strips in the overlap area to achieve an adhesive to adhesive bond at the overlap.
 - e. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller.
- B. Vertical Applications:
 - 1. Strictly comply with installation instructions in manufacturer's published literature, including but not limited to, the following:
 - a. Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the yellow zip strip facing towards the concrete pour. The membrane may be installed in any convenient length.
 - b. Fasten through the selvedge using a small and low profile head fastener so that the membrane lays flat and allows firmly rolled overlaps.
 - c. Leave the yellow and blue zip strips in position until overlap procedure is completed.
 - d. Accurately position succeeding sheets to overlap the previous sheet 3 in. along the marked selvedge. The blue zip strip on the underside of the membrane shall be positioned on top of the

yellow zip strip on the top of the succeeding sheet. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap.

- e. Peel back and remove both the yellow and blue zip strips in the overlap area to achieve and adhesive to adhesive bond at the overlap.
 - f. Roll firmly to ensure a watertight seal.
- C. Roll Ends and Cut Edges:
- 1. Overlap all roll ends and cut edges by a minimum 3 in. and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary.
 - 2. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap edges and roll firmly.
 - 3. Immediately remove printed plastic release liner from the Preprufe Tape.

3.05 FIELD QUALITY CONTROL

- A. Owner will provide testing services in accordance with Section 01 4000 - Quality Requirements. Contractor shall provide temporary construction and materials for testing.
- B. Upon completion of horizontal membrane installation, dam installation area in preparation for flood testing.
 - 1. Flood to minimum depth of 1 inch with clean water, and after 48 hours inspect for leaks.
 - 2. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect; repeat flood test, and repair damage to building.
 - 3. When area is proven watertight, drain water and remove dam.

3.06 PROTECTION

- A. Do not permit traffic over unprotected or uncovered membrane.
- B. Backfill immediately using care to avoid damaging waterproofing membrane system.

3.07 SCHEDULE

- A. Base Flashings: One ply of 12-inch-wide self-adhered modified bitumen flashing.
- B. Opening and Penetration Flashings: One ply of 6-inch-wide self-adhered modified bitumen flashing.

END OF SECTION

SECTION 07 2100 THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Batt insulation for filling crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

- A. Section 04 2000 - Unit Masonry: Cavity wall insulation.

1.03 REFERENCE STANDARDS

- A. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2016a.
- B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.
- C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2019.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- G. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation in Wood Framed Walls: Batt insulation with no vapor retarder.

2.02 BATT INSULATION MATERIALS

- A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.
- B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
 - 4. Thermal Resistance: R-value of 21 at 2x6 walls and R-value of 28 at 2x8 walls.
 - 5. Manufacturers:
 - a. CertainTeed Corporation: www.certainteed.com.
 - b. Johns Manville: www.jm.com.
 - c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

- A. Adhesive: Type recommended by insulation manufacturer for application.

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, irregularities, or materials or substances that may impede adhesive bond.

3.02 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.03 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

**SECTION 07 2119
FOAMED-IN-PLACE INSULATION**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Foamed-in-place insulation.
 - 1. In underside of roofs and ceilings.
- B. Protective intumescent coating.
- C. Protective cementitious coating.

1.02 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- C. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.
- C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.
- D. Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

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.

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 of dew point.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Foamed-In-Place Insulation: Open Cell
 - 1. BASF Corporation; ENERTITE Open Cell: www.spf.basf.com.
 - 2. Icynene-Lapolla; Foam Lok 500: www.icynene.com.
 - 3. Johns Manville; Corbond Open Cell: www.jm.com.
 - 4. Demilec: Agribalance Open Cell

2.02 MATERIALS

- A. Foamed-In-Place Insulation: Low-density, flexible, open cell, water vapor permeable 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 of 7, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
 - 3. Air Permeance: 0.04 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
 - 4. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2.03 ACCESSORIES

- A. Primer: As required by insulation manufacturer.

- B. Protective Coating: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes in exposed areas.
- C. Soffit Edge Seal: Prefabricated, flexible seal designed for unventilated attic spaces.
 - 1. Applications: Sealing space between wood framing top plate and underside of roof sheathing.
 - 2. Material: Polyvinyl chloride (PVC).
 - 3. Roof Joist/Truss Spacing: 16 inch on center, nominal.
 - 4. Manufacturers:
 - a. Brentwood Industries, Inc; AccuBlock 22-1/2 Inch: www.brentwoodindustries.com.

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. Apply to achieve a thermal resistance R-value of 38.
- D. Apply overcoat monolithically, without voids to fully cover foam insulation where insulation is exposed to comply with building codes.
- E. Patch damaged areas.
- F. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.
- G. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 FIELD QUALITY CONTROL

- A. Field inspections and tests will be performed by an independent testing agency under provisions of Section 01 4000 - Quality Requirements.
- B. Inspection will include verification of insulation and overcoat thickness and density.

END OF SECTION

**SECTION 07 4113
METAL ROOF PANELS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Metal roof panel system of preformed standing seam steel panels.
- B. Fastening system.
- C. Factory finishing.
- D. Accessories and miscellaneous components.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Roof sheathing.
- B. Section 07 2100 - Thermal Insulation
- C. Section 07 9200 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

1.03 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; 2015.
- B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).
- C. 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; 2015.
- D. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.
- E. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005 (Reapproved 2012).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Storage and handling requirements and recommendations.
 - 2. Installation methods.
 - 3. Specimen warranty.
- C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
 - 1. Show work to be field-fabricated or field-assembled.
- D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Test Reports: Indicate compliance of metal roofing system to specified requirements.
- H. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise noted.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section and with at least three years of documented experience.
- C. 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. Provide strippable plastic protection on prefinished roofing panels for removal after installation.
- B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.
- C. Special Warranty: Provide 2-year warranty for weathertightness of roofing system, including agreement to repair or replace metal roof panels that fail to keep out water commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Metal Roof Panels:
 - 1. ATAS International, Inc: www.atas.com.
 - 2. Basis of Design - Berridge Manufacturing Company; Cee-Lock Panel: www.berridge.com.
 - 3. Pac-Clad: www.pac-clad.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
 - 1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed $L/180$ of span length(L) when tested in accordance with ASTM E1592.
 - 2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
 - 3. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

2.03 METAL ROOF PANELS

- A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Panels: Factory-formed panels with factory-applied finish.
 - 1. Steel Panels:
 - a. Aluminum-zinc alloy-coated steel complying with ASTM A792/A792M; minimum AZ55 coating.
 - b. Steel Thickness: Minimum 24 gauge, 0.024 inch.
 - 2. Texture: Smooth.
 - 3. Width: Maximum panel coverage of 16 inches.

2.04 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.05 SECONDARY FRAMING

- A. Miscellaneous Secondary Framing: Light gauge steel framing incidental to structural supports; fabricated from steel sheet.
- B. Framing Material: ASTM A 1011/A 1011M, Designation SS steel sheet.
 - 1. Profile: Manufacturer's standard cee, zee, asymmetrical zee, hat channel, plain channel, single slope eave strut, double slope eave strut, and angle.
 - 2. Thickness: 12 gauge, 0.1046 inch.
 - 3. Finish: Galvanized per ASTM A653/A653M, G90.
- C. Framing Connectors: Factory-made formed steel sheet, ASTM A653/A653M SS Grade 50, with G60/Z180 hot dipped galvanized coating and factory punched holes.

2.06 FABRICATION

- A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

2.07 FINISHES

- A. Acrylic Enamel Coating: Epoxy primer and acrylic enamel topcoat with minimum dry film thickness (DFT) of 0.8 mil; color shall be Natural Metal Finish, Acrylic-Coated Galvalume.

2.08 ACCESSORIES

- A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, and caps of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
 - 1. Downspouts: 4-inch round.
 - 2. Gutters: 6-inch half round.
- B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.
- C. Sealants:
 - 1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
 - 2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
- D. Underlayment for Wood Substrate: ASTM D226/D226M roofing felt, perforated type; covered by water-resistant rosin-sized building paper.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Do not begin installation of preformed metal roof panels 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. Broom clean wood sheathing prior to installation of roofing system.
- B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure that completed roof will be free of leaks.
- C. Remove protective film from surface of roof panels immediately prior to installation; strip film carefully to avoid damage to prefinished surfaces.
- D. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.
- E. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

- A. Overall: Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.
 - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
 - 2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.
- B. Accessories: Install necessary components that are required for complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, caps, rib closures, ridge closures, and similar roof accessory items.
- C. Install roofing felt and building paper slip sheet on roof sheathing before installing preformed metal roof panels; secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners; apply from eaves to ridge in shingle fashion, overlapping horizontal joints at least 2 inches and side and end laps at least 3 inches; offset seams in building paper and seams in roofing felt.

- D. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.

3.04 CLEANING

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

**SECTION 07 4213
METAL WALL PANELS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Manufactured metal panels for ceilings, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.
- B. Section 09 2116 - Gypsum Board Assemblies: Soffit panel substrate.

1.03 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; 2019a.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.

1.05 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.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Basis of Design:
 - 1. Metal Wall Panels - Exposed Fasteners: 7/8" PBC Panel manufactured by MBCI.
- B. Metal Wall Panels - Exposed Fasteners:
 - 1. ATAS International, Inc; Corrugated Panel: www.atas.com.
 - 2. Englert, Inc; Corrugated Profile 2.67 Inch by 0.875 Inch: www.englertinc.com.
 - 3. Fabral; 7/8 Inch Corrugated: www.fabral.com.
 - 4. Petersen Aluminum Corporation; 7/8 inch Corrugated Panel: www.pac-clad.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED METAL PANELS

- A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
 - 1. Provide ceiling panels.
 - 2. Maximum Allowable Deflection of Panel: L/90 for length(L) of span.
 - 3. 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.
 - 4. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
 - 5. Corners: Factory-fabricated in one continuous piece with minimum 2 inch returns.
- B. Ceiling Panels:

1. Basis of Design: 7/8 PBC Panel, manufactured by MBCI.
 2. Material: Precoated steel sheet, 22 gage, 0.0299 inch minimum thickness.
 3. Rib Spacing: 2-2/3 inches on center.
 4. Rib Heights: 7/8 inch.
 5. Color: Galvalume Plus.
 6. Finish: Smooth.
 7. Panel Attachment: Exposed fastening system.
 8. Seams: Lapped, sealed with continuous bed of sealant.
 9. Coverage Width: 32 inches.
- C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
- D. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
- E. Anchors: Galvanized steel.

2.03 ACCESSORIES

- A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.
- B. Concealed Sealants: Non-curing butyl sealant or tape sealant.
- C. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
- D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Concealed by panels
- E. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that water-resistive barrier has been installed over substrate completely and correctly.

3.02 PREPARATION

- A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at intervals indicated.

3.03 INSTALLATION

- A. Install panels on ceilings 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.
- F. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 TOLERANCES

- A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.05 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Remove protective material from wall panel surfaces.
- C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

**SECTION 07 4646
FIBER-CEMENT TRIM**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Fiber-cement trim.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Trim substrate.
- B. Section 07 9200 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.
- C. Section 09 9113 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

- A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2012).

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Manufacturer's requirements for related materials to be installed by others.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods, including nail patterns.
- B. Warranty: Submit copy of manufacturer's warranty, made out in Owner's name, showing that it has been registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products under waterproof cover and elevated above grade, on a flat surface.

PART 2 PRODUCTS**2.01 FIBER-CEMENT SIDING**

- A. Trim Boards: Individual boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1. Style: 4/4.
 - 2. Texture: Smooth.
 - 3. Length: 12 ft, nominal.
 - 4. Width (Height): 4 inches.
 - 5. Thickness: 3/4 inch, nominal.
 - 6. Finish: Factory applied primer.
 - 7. Color: As selected by Architect.
 - 8. Manufacturers:
 - a. James Hardie Building Products, Inc; Hardie Trim: www.jameshardie.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

- A. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.
- B. Finish Paint: Latex house paint acceptable to siding manufacturer; primer recommended by paint manufacturer.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Do not begin until unacceptable conditions have been corrected.

- C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations.
 - 1. Read warranty and comply with terms necessary to maintain warranty coverage.
 - 2. Use trim details indicated on drawings.
 - 3. Touch up field cut edges before installing.
 - 4. Pre-drill nail holes if necessary to prevent breakage.
- B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.
- C. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.
- D. Do not install trim less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
- E. After installation, seal joints, seal around penetrations, and paint exposed cut edges.
- F. Finish Painting: Within one week after installation, paint trim with one coat primer and two coats finish paint.

3.03 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

**SECTION 07 6200
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.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood nailers for sheet metal work.
- B. Section 07 6100 - Sheet Metal Roofing.
- C. Section 07 9200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 REFERENCE STANDARDS

- A. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.
- C. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).
- D. CDA A4050 - Copper in Architecture - Handbook; current edition.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five (5) years of documented experience.

PART 2 PRODUCTS**2.01 SHEET MATERIALS**

- A. Aluminum-Zinc Alloy Coated Steel Sheet (Galvalume): ASTM A792/A792M; AZ55 coating designation; 24 gauge, 0.0239 inch thick.
- B. Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; anodized finish of color as selected.
- C. Copper: ASTM B370, cold rolled 16 oz/sq ft (24 gage) (0.0216 inch) thick; natural finish.

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; 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 long legs; seam for rigidity, seal with sealant.
- F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 GUTTER AND DOWNSPOUT FABRICATION

- A. Gutters: SMACNA (ASMM) Semi-circular profile.
- B. Downspouts: Round profile.
- C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).

- D. 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. Reglets: Surface mounted type, galvanized steel; face and ends covered with plastic tape.
- G. 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.

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.

END OF SECTION

**SECTION 07 9200
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 RELATED REQUIREMENTS

- A. Section 07 1300 - Sheet Waterproofing: Sealing cracks and joints in waterproofing substrate surfaces using materials specified in this section.
- B. Section 08 7100 - Finish Hardware: Setting exterior door thresholds in sealant.
- C. Section 08 8000 - Glazing: Glazing sealants and accessories.
- D. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014a.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- D. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).

1.04 SUBMITTALS

- A. See Section 01 3000 - 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. Installation instructions, including precautions, limitations, and recommended backing materials and tools.

1.05 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.

1.06 WARRANTY

- A. See Section 01 7800 - 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. BASF Construction Chemicals-Building Systems; MasterSeal NP 1:
www.buildingsystems.basf.com.

2. Substitutions: See Section 01 6000 - 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. BASF Construction Chemicals-Building Systems; MasterSeal SL 1: www.buildingsystems.basf.com.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- C. Weather Barrier Sealant: Neutral one part silicone sealant designed for adhering to low energy surfaces common in sheet or peel and stick weather resistant barriers.
 1. Dow Corning Corporation; DOWSIL 758: www.dowcorning.com/construction.
 2. Substitutions: See Section 01 6000 - 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. 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.
- B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
- C. Exterior Door and Window Frames: Use neutral one part silicone sealant, unless otherwise indicated.
- D. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.

2.03 NONSAG JOINT SEALANTS

- A. 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 25 percent, minimum.
 2. Color: To be selected by Architect from manufacturer's standard range.
 3. Cure Type: Single-component, neutral moisture curing
 4. Service Temperature Range: Minus 65 to 180 degrees F.
 5. Manufacturers:
 - a. Dow Corning Corporation; 758 Silicone Weather Barrier Sealant: www.dowcorning.com/construction.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
 1. Movement Capability: Plus and minus 35 percent, minimum.
 2. Hardness Range: 25 to 30, Shore A, when tested in accordance with ASTM C661.
 3. Color: Match adjacent finished surfaces.
 4. Service Temperature Range: Minus 40 to 180 degrees F.

2.04 SELF-LEVELING SEALANTS

- A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
 1. Movement Capability: Plus and minus 25 percent, minimum.

2. Hardness Range: 25, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.

2.05 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.
 - a. Manufacturers:
 - 1) Nomaco, Inc; HBR: www.nomaco.com.
 - 2) Substitutions: See Section 01 6000 - Product Requirements..
- 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.

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. 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.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. 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.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

- A. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

**SECTION 08 1113
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.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Finish Hardware.
- B. Section 09 9000 - Painting and Coating: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

- A. ANSI - American National Standards Institute.
- B. ASCE - American Society of Civil Engineers.
- C. HMMA - Hollow Metal Manufacturers Association.
- D. NAAMM - National Association of Architectural Metal Manufacturers.
- E. NFPA - National Fire Protection Association.
- F. SDI - Steel Door Institute.
- G. UL - Underwriters Laboratories.

1.04 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; 2011.
- C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2003 (R2009).
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.
- H. 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; 2015.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- K. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
- L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.
- M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- O. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.
- P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2006.
- Q. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

1.05 SUBMITTALS

- A. See Section 01 3000 - 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.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 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.
 - 2. Republic Doors: www.republicdoor.com.
 - 3. Steelcraft, an Allegion brand: www.allegion.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DESIGN CRITERIA

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
 - 4. Door Edge Profile: Manufacturers standard for application indicated.
 - 5. Typical Door Face Sheets: Flush and embossed . Refer to Door Schedule for additional information.
 - 6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - 7. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
- 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 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 2. Door Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
 - a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
 - 3. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane.
 - 4. Door Thickness: 1-3/4 inch, nominal.
 - 5. Top Closures for Outswinging Doors: Flush with top of faces and edges.
 - 6. Door Face Sheets: Flush.
 - 7. Weatherstripping: Refer to Section 08 7100.
 - 8. Door Finish: Factory primed and field finished.

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. Frame Finish: Same as hollow metal door.
- C. Exterior: Full profile/continuously welded type.
 - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 3. Frame Finish: Factory primed and field finished.
 - 4. Weatherstripping: Separate, see Section 08 7100.
- D. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- E. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- F. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high to fill opening without cutting masonry units.
- G. Refer to Door Details for flange required at hollow metal frames.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

- A. Louvers: Roll formed steel with overlapping frame; finish same as door components ; factory-installed.
 - 1. Style: Sightproof inverted Y blade.
 - 2. Louver Free Area: 50 percent.
 - 3. Size: 12" by 60".
 - 4. Fasteners: Exposed, tamper proof fasteners.
 - 5. Manufacturers:
 - a. Air Louvers.
 - b. NGP (National Guard).
 - c. Cal-Royal.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Astragals for Double Doors: Specified in Section 08 7100.
- C. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.
- 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.

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. Coordinate frame anchor placement with wall construction.
- C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- D. Install door hardware as specified in Section 08 7100.
 - 1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.
- E. Comply with glazing installation requirements of Section 08 8000.
- F. Coordinate installation of electrical connections to electrical hardware items.
- G. Touch up damaged factory finishes.

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 measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

**SECTION 08 1433
STILE AND RAIL WOOD DOORS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Wood doors, stile and rail design; non-fire rated.
- B. Panels of wood and glass.

1.02 RELATED REQUIREMENTS

- A. Section 08 1113 - Hollow Metal Doors and Frames.
- B. Section 08 7100 - Finish Hardware.
- C. Section 08 8000 - Glazing.
- D. Section 09 9000 - Painting and Coating: Field finishing doors.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- C. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.
- D. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016).
- E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- F. WDMA I.S. 6A - Interior Architectural Wood Stile and Rail Doors; 2013.

1.04 SUBMITTALS

- A. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.
- B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required , special beveling , special blocking for hardware , factory machining criteria , identify cutouts for glazing.
- C. Samples: Submit two samples of door veneer, in size illustrating wood grain, stain color, and sheen.
- D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.
- F. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of 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 quality standard specified.
- B. Protect doors with resilient packaging. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week. Break seal on site to permit ventilation.

1.07 WARRANTY

- A. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Stile and Rail Wood Doors:
 - 1. VT Industries; Eggers Stile and Rail Collection, E109 and E309: www.vtindustries.com.
 - 2. Karona, Inc: www.karonadoor.com.

3. Marshfield DoorSystems, Inc; Aspiro Series: www.marshfielddoors.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS

- A. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 6A.
- B. Exterior Doors: 1-3/4 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints; water repellent treated. Transparent or opaque finish as indicated on drawings.
- C. Interior Doors: 1-3/4 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints. Transparent or opaque finish as indicated on drawings.

2.03 DOOR AND PANEL FACINGS

- A. Veneer Facing for Transparent Finish: Natural Birch, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 1. Transom Panels: Continuous match to door.
 2. Pairs: Pair match each pair; set match pairs within 10 feet of each other when doors are closed.
- B. Materials for Opaque Finishes: Hardboard faces.
- C. Adhesive: Type I - Waterproof.

2.04 DOOR CONSTRUCTION

- A. Astragals for Double Doors: Wood, T shaped, overlapping and recessed at face edge, specifically for double doors.
- B. Vertical Exposed Edge of Stiles: Of same species as veneer facing.
- C. Bond edge banding to cores.
- D. At exterior doors, provide aluminum flashing at the top and bottom rail for full thickness and width of door.
- E. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- F. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- G. Cut and configure exterior door edge to receive recessed weatherstripping devices. Provide edge clearances in accordance with referenced quality standards.

2.05 ACCESSORIES

- A. Wood Door Frames: As specified in Section 06 2000.
- B. Hollow Metal Door Frames: As specified in Section 08 1113.
- C. Glazed Openings:
 1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
 2. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 3. Glazing: Sealed insulated glazing units with 1 inch overall thickness, and consisting of two 1/4 inch thick panes of glass.
 4. Tint: Clear.
 5. Coating: Low-E type, on No. 2 surface.
- D. Door Hardware: As specified in Section 08 7100.

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 standards.
 1. Install exterior doors in accordance with ASTM E2112.
- B. Field-Finished Doors: Trimming to fit is acceptable.
 1. Adjust width of non-rated doors by cutting equally on both jamb edges.

- 2. Trim door height by cutting bottom edges to a maximum of 3/4 inch.
- C. Machine cut for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Conform to specified quality standard for fit, clearance, and joinery tolerances.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

**SECTION 08 3100
ACCESS DOORS AND PANELS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Wall and ceiling access door and frame units.

1.02 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2012.

1.03 SUBMITTALS

- A. See Section 01 3000 - 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. Project Record Documents: Record actual locations of each access unit.

PART 2 PRODUCTS**2.01 ACCESS DOORS AND PANELS ASSEMBLIES**

- A. Wall-Mounted Units:
 - 1. Material: Steel.
 - 2. Size: 12 inch by 12 inch.
 - 3. Door/Panel: Hinged, standard duty, with keyed cam lock and no handle.
 - 4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
- B. Wall-Mounted Units in Wet Areas:
 - 1. Material: Stainless steel, Type 304.
 - 2. Size: 12 inch by 12 inch.
 - 3. Door/Panel: Hinged, standard duty, with keyed cam lock and no handle.
 - 4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
- C. Ceiling-Mounted Units:
 - 1. Material: Steel.
 - 2. Size - Other Ceilings: 12 inch by 12 inch, or as required to access equipment.
 - 3. Door/Panel: Hinged, standard duty, with keyed cam lock and no handle.

2.02 WALL AND CEILING MOUNTED UNITS

- A. Manufacturers:
 - 1. ACUDOR Products Inc: www.acudor.com.
 - 2. Karp Associates, Inc: www.karpinc.com.
 - 3. Milcor, Inc: www.milcorinc.com.
 - 4. Nystrom, Inc: www.nystrom.com/#sle.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Style: Exposed frame with door surface flush with frame surface.
 - 2. Door Style: Single thickness with rolled or turned in edges.
 - 3. Heavy Duty Frames: 14 gage, 0.0747 inch, minimum thickness.
 - 4. Steel Finish: Primed.
 - 5. Stainless Steel Finish: No. 4 brushed finish.
 - 6. Hardware:
 - a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
 - b. Latch/Lock: Cylinder lock-operated cam latch, two keys for each unit.

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 3313
COILING COUNTER DOORS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Non-fire-rated coiling counter doors and operating hardware.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 08 7100 - Finish Hardware: Cylinder cores and keys.

1.03 REFERENCE STANDARDS

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2020.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.
- C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.
- D. Manufacturer's Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.
- E. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Coiling Counter Doors:
 - 1. Clopay: www.clopaydoor.com.
 - 2. CornellCookson, Inc.: www.cooksondoor.com.
 - 3. Overhead Door Co.: www.overheaddoor.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COILING COUNTER DOORS

- A. Coiling Counter Doors, Non-Fire-Rated: Stainless steel slat curtain.
 - 1. Basis of Design: Cookson Rolling Counter Door Model ESC20 with Integral Frame.
 - 2. Mounting: Interior face mounted.
 - 3. Nominal Slat Size: 1-1/4 inches wide.
 - 4. Slat Profile: Flat.
 - 5. Finish, Stainless Steel: No. 4 - Brushed.
 - 6. Finish for Hood, Brackets, Frame and Trim: No. 4 - Brushed.
 - 7. Guides: Formed track; same material and finish unless otherwise indicated.
 - 8. Manual push up operation.
 - 9. Locking Devices: Slide bolt on inside.

2.03 MATERIALS

- A. Curtain Construction: Interlocking, single thickness slats.
 - 1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
 - 2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
 - 3. Stainless Steel Slats: ASTM A666, Type 304; minimum thickness 22 gage, 0.03 inch.
- B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
 - 1. Stainless Steel Guides: ASTM A666, Type 304, rollable temper.
- C. Lock Hardware:

1. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.
- D. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

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.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft 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 5213
ALUMINUM-CLAD WOOD WINDOWS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Factory fabricated alluminum-clad wood windows.
- B. Glazing.
- C. Operating hardware.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Rough opening framing.
- B. Section 07 2500 - Weather Barriers: Sealing frames to weather barrier installed on adjacent construction.
- C. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- D. Section 08 7100 - Finish Hardware.
- E. Section 09 9000 - Painting and Coating: Site finishing wood surfaces.

1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2011.
- B. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.
- C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2010).
- E. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.
- F. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2014a.
- G. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016).
- H. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Show component dimensions, anchorage and fasteners, glass, and internal drainage details.
- C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, and installation requirements.
- D. Submit one sample 12 by 12 inch in size illustrating window frame section.
- E. Manufacturer's Certificate: Certify that products furnished meet or exceed specified requirements.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Warranty Documentation: 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 not less than 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 DELIVERY, STORAGE, AND HANDLING

- A. Protect factory finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Aluminum Clad Wood Windows:
 - 1. Pella Corporation; Architect Series Reserve: www.pellacommercial.com.

2.02 WOOD WINDOWS

- A. Wood Windows: Wood frame and sash, factory fabricated and assembled.
 - 1. Exterior Finish: Metal clad, painted.
 - 2. Interior Finish: Unfinished, for transparent finish.
 - 3. Color: As selected by Architect from manufacturer's standard range.
 - 4. Configuration: Single Hung.
 - 5. Window Product Types: HS - Horizontal sliding window and single-hung window, in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 6. Factory glazed; dry glazing method.
 - 7. Wood Species: Clear pine, preservative treated using treatment type suitable for required finish.
 - 8. Metal Cladding: Formed aluminum, factory finished, factory fit to profile of wood members.
 - 9. Transparent Finish: Scarf joints permitted if wood matches in color and grain texture.
 - 10. Weather Stop Flange: Continuous at perimeter of unit.
 - 11. Clearances and Shim Spacing: Minimum required for installation and dynamic movement of perimeter seal.
 - 12. Fasteners: Concealed from view.
 - 13. Internal Drainage of Glazing Spaces to Exterior: Weep holes.

2.03 COMPONENTS

- A. Glazing: Double glazed, clear, Low-E coated, manufacturer's standard fill, with glass thicknesses as recommended by manufacturer for specified wind conditions.
- B. Frames: 3/4 inch wide by 5 inch deep profile; flush solid wood glass stops of screw fastened type, sloped for positive drainage.
- C. Sills: Extruded aluminum; sloped for positive drainage; single piece full width of opening.
- D. Muntins/Grilles: Grilles permanently installed on outside and inside faces of insulating glass.
 - 1. Pattern: 6 lites in each sash.
 - 2. Bar Width: 1 inch.
 - 3. Color: Match interior and exterior of frame.
- E. Fasteners: Stainless steel.
- F. Sealant and Backing Materials: As specified in Section 07 9200 of types as indicated.
 - 1. Perimeter Sealant: Appropriate for application.
 - 2. Sealant Used Within System (Not Used for Glazing): Appropriate for application.
- G. Flashing: Provide related flashings, with necessary anchors and attachment devices.
- H. Sealant for Setting Sills, Stools, Aprons, and Sill Flashing: Non-curing butyl type.

2.04 PERFORMANCE REQUIREMENTS

- A. Comply with AAMA/WDMA/CSA 101/I.S.2/A440 requirements for the specific window type in accordance with the following:
 - 1. Performance Class (PC): LC.
- B. Design Pressure (DP): In accordance with applicable codes.
- C. Fenestration Assembly Thermal transmittance (U-value): Comply with ASHRAE Std 90.1 I-P for building envelope requirements for applicable climate zone.

2.05 HARDWARE

- A. Horizontal Sliding Sash: Nylon rollers in steel bracket, screw adjustable, limit stops in head and sill track.
- B. Sash lock: Lever handle with cam lock.
- C. Pulls: Manufacturer's standard type.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Install windows in accordance with ASTM E2112.
- C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- E. Set sill members and sill flashing in continuous bead of sealant.
- F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- G. Install operating hardware.
- H. Finish exterior surfaces with opaque materials as indicated in drawings.
- I. Finish interior surfaces with transparent materials as indicated in drawings.

3.03 TOLERANCES

- A. Maximum Variation from Level or Plumb: 1/16 inch per 3 ft non-cumulative or 1/8 inch per 10 ft, whichever is less.

3.04 ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING

- A. Remove protective material from factory finished surfaces.
- B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
- C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

**SECTION 08 5413
FIBERGLASS WINDOWS**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Factory fabricated fiberglass windows with fixed and operating sash.
- B. Glazed by factory.
- C. Operating hardware.
- D. Insect screens.

1.02 RELATED REQUIREMENTS

- A. Section 07 2500 - Weather Barriers: Sealing frames to water-resistive barrier installed on adjacent construction.
- B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2011.
- B. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- C. 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).
- D. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2010).
- E. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.
- F. ASTM E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation; 2016.
- G. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016).
- H. FS L-S-125 - Screening, Insect, Nonmetallic; 1972b, with Notice (1987).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage details.
- C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.
- D. Manufacturer's Certificate: Certify that products of this section 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 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 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.
- B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.07 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F.
- B. Maintain this minimum temperature during and after installation of sealants.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fiberglass Windows:
 - 1. Pella Corporation; Pella Impervia Windows: www.pellacommercial.com/.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WINDOW UNITS

- A. Fiberglass Windows: Hollow, tubular, multi-layer fiber reinforced material; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.
 - 1. Product Type: HS - Horizontal sliding window in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 2. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
 - 3. 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.

2.03 PERFORMANCE REQUIREMENTS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
 - 1. Performance Class (PC): LC.

2.04 COMPONENTS

- A. Frames: flush glass stops of screw fastened type.
 - 1. Type: Nailing flange (for new windows). Flush and offset where indicated.
 - 2. Frame Corners: Mitered and joined with nylon corner locks.
- B. Sills: composite fiberglass; sloped for positive wash; fit under sash to 1/2 inch beyond wall face; one piece full width of opening.
- C. Insect Screen Frame: Rolled fiberglass frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
- D. Insect Screens: FS L-S-125 woven plastic mesh; 14/18 mesh size.
 - 1. Color: Color as selected.
- E. Operable Sash Weather Stripping: Wool pile; permanently resilient, profiled to effect weather seal.
- F. Fasteners: Galvanized steel.
- G. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.
- H. Sash Blocks: Fiberglass blocks anchored thru frame above both sides of operable sash with 4" star screws to prevent unauthorized opening of windows.

2.05 GLASS AND GLAZING MATERIALS

- A. Glass and Glazing Materials:
 - 1. Glass in Exterior Lights: Polyurethane reactive (PUR) hot-melt glazed, 1-inch thick dual-pane, insulating glass, clear, tempered, Low-E coated.

2.06 HARDWARE

- A. Horizontal Sliding Sash: Nylon rollers in steel bracket, screw adjustable, limit stops in head and sill track.
 - 1. Sash Lock: Cam lock and keeper.

2.07 FABRICATION

- A. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.
- B. Form sills in one piece. Slope sills for wash.
- C. Form weather stop flange to perimeter of unit.
- D. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- E. Arrange fasteners to be concealed from view.
- F. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.

- G. Double weatherstrip operable units.
- H. Factory glaze window units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify wall openings and adjoining water-resistive barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Set frame flanges in continuous bead of sealant. Install self-adhered flashings over flanges.
- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Install operating hardware.

3.03 TOLERANCES

- A. Maximum Variation from Level or Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

3.04 CLEANING

- A. Remove protective material from pre-finished surfaces.
- B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
- C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

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. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 - 3. ANSI/UL 294 - Access Control System Units.

4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

- a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
 - D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
 - E. Informational Submittals:
 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
 - F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- 1.4 QUALITY ASSURANCE
- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
 - B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
 - C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware 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.
 - D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor,

Architect, and Owner concerning both standard and electromechanical door hardware and keying.

- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Please note that ASSA ABLOY is transitioning the Yale Commercial brand to ASSA ABLOY ACCENTRA. This affects only the brand name; the products and product numbers will remain unchanged. The brand transition is expected to be complete in or about May of 2024, and products shipping after that time will be branded ASSA ABLOY ACCENTRA.
- D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Manufacturers:
 - a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets with a 1-year warranty. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
 1. Manufacturers:
 - a. McKinney (MK) - QC (# wires) Option.
- B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
 1. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney (MK) - Connector Hand Tool: QC-R003.
 2. Manufacturers:
 - a. McKinney (MK) - QC-C Series.

2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 5. Manufacturers:
 - a. Rockwood (RO).
- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Pulls, where applicable, shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
 6. Manufacturers:
 - a. Rockwood (RO).

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years' experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.

4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide temporary keyed construction cores.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

2.7 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - CL 3300 Series.
 - b. Sargent Manufacturing (SA) - 10 Line.

2.8 DEADLOCKS AND LATCHES

A. Cylindrical Deadlocks: ANSI/BHMA A156.36 Grade 1 Certified Products Directory (CPD) listed deadlocks to fit standard ANSI 161 preparation. Provide tapered collars to resist vandalism and 1" throw solid steel bolt with hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other locksets.

1. Manufacturers:

- a. Corbin Russwin Hardware (RU) - DL3000 Series.
- b. Sargent Manufacturing (SA) - 480 Series.

2.9 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.10 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. Exit devices shall have a five-year warranty.
 - 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 - 5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 - 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.

- b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 - 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 - 8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 - 9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 - 10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 - 11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.
- 1. Electromechanical exit devices shall have the following functions and features:
 - a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
 - b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
 - c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
 - d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
 - e. Five-year limited warranty for electromechanical features.
 - 2. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.

2.11 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
- 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 - 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 - 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible

to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. Norton Rixson (NO) - 9500 Series.
 - c. Sargent Manufacturing (SA) - 281 Series.

2.12 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, .050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

- a. Rockwood (RO).

2.13 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:
 - a. Rockwood (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 1. Manufacturers:
 - a. Norton Rixson (RF).
 - b. Rockwood (RO).
 - c. Sargent Manufacturing (SA).

2.14 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. 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.
 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. 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.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 1. Pemko (PE).

2.15 ELECTRONIC ACCESSORIES

- A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
 1. Manufacturers:
 - a. Securitron (SU) - DPS Series.

2.16 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.17 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted

items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. RO - Rockwood
3. SA - SARGENT
4. RF - Rixson
5. PE - Pemko
6. SU - Securitron

H

S **1.0**

Doors: 112A, 112D, 112E

Description: E T - HM - EAC

3 Hinge (heavy weight)	T4A3386 NRP	US32D	MK
1 Hinge, Full Mortise, Hvy Wt Elec	T4A3386 QCxx	US26D	MK
1 Rim Exit Device, Storeroom	55 56 8804 ETP	US32D	SA
1 Door Closer	281 CPS	EN	SA
1 Kick Plate	K1050 10" 2" LDW	US32D	RO
1 Gasketing	303AS		PE
1 Rain Guard	346C x LAR		PE
1 Sweep	3452AV		PE
1 Threshold	2005AT MSES25SS		PE
1 ElectroLynx Harness	QC-C1500 PS to hinge		MK
1 ElectroLynx Harness	QC-C P Lock / exit to hinge		MK
1 Card Reader	By Others		
1 Wiring Diagram	WD-SYSPK		SA
1 Position Switch	DPS-M/W-WH (as required)		SU
1 Power Supply	AQD1 SIZE AS REQUIRED		SU

Notes: Door normally closed and secured.

Authorized credentials retract the latchbolt to allow free entry, door relocks upon closing. RE (request to exit) switch in device rail allows for free exit at all times

Entry by key override at all times

Door is fail secure

During daytime hours exit device may be manually or electronically "dogged" to allow door to be push/pull (free access/egress)

S□□ 2.0

Doors: 110

Description: E T - MEP

3 Hinge, Full Mortise	TA2314 NRP	US32D	MK
1 Storeroom/Closet Lock	10 G04 LL	US26D	SA
1 Door Closer	281 CPS	EN	SA
1 Armor Plate	K1050 36" 2" LDW	US32D	RO
1 Gasketing	S88D		PE
1 Rain Guard	346C x LAR		PE
1 Sweep	3452AV		PE
1 Threshold (Heavy Duty)	2715AK MSES25SS		PE

S□□ 3.0

Doors: 100, 104D, 113A, 116

Description: E T - EAC LOCK - INSWING

2 Hinge, Full Mortise	TA2314 NRP	US32D	MK
1 Hinge, Full Mortise	TA2314 QC NRP	US32D	MK
1 Fail Secure Lock	10 G71 LL	US26D	SA
1 Door Closer	281 Reg / PA	EN	SA
1 Kick Plate	K1050 10" 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
1 Gasketing	303AS		PE
1 Rain Guard	346C x LAR		PE
1 Sweep	3452AV		PE
1 Threshold	271A MSES25SS		PE
1 ElectroLynx Harness	QC-C1500 PS to hinge		MK
1 ElectroLynx Harness	QC-C P Lock / exit to hinge		MK
1 Card Reader	By Others		
1 Position Switch	DPS-M/W-WH (as required)		SU
1 Power Supply	AQD1 SIZE AS REQUIRED		SU

S□□ 4.0

Doors: 104B, 104C, 105

Description: E T - EAC LOCK

2 Hinge, Full Mortise	TA2314 NRP	US32D	MK
1 Hinge, Full Mortise	TA2314 QC NRP	US32D	MK
1 Fail Secure Lock	10 G71 LL	US26D	SA
1 Door Closer	281 Reg / PA	EN	SA
1 Kick Plate	K1050 10" 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
1 Gasketing	S88D		PE
1 ElectroLynx Harness	QC-C1500 PS to hinge		MK
1 ElectroLynx Harness	QC-C P Lock / exit to hinge		MK

1 Card Reader	By Others	
1 Position Switch	DPS-M/W-WH (as required)	SU
1 Power Supply	AQD1 SIZE AS REQUIRED	SU

S□□ 5.0

Doors: 021, 022, 023, 024, 114, 115, 117

Description: E T - Privacy - Deadbolt

3 Hinge, Full Mortise	TA2314 NRP	US32D	MK
1 Deadbolt	487	US26D	SA
1 Privacy Lock	10 U65 LL	US26D	SA
1 Door Closer	281 CPS	EN	SA
1 Armor Plate	K1050 36" 2" LDW	US32D	RO
1 Gasketing	S88D		PE
1 Rain Guard	346C x LAR		PE
1 Sweep	3452AV		PE
1 Threshold (Heavy Duty)	2715AK MSES25SS		PE

Notes: In the event that someone is mistakenly locked inside the restroom, the deadbolt can be unlocked from inside. However, the inside thumb turn cannot lock the deadbolt. While restroom is in use the privacy lock will allow users to maintain privacy.

S□□ 6.0

Doors: 113B

Description: SGL - LOCK - CLASS

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Lock	10 G37 LL	US26D	SA
1 Door Closer	281 Reg / PA	EN	SA
1 Kick Plate	K1050 10" 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

S□□ 7.0

Doors: 103, 107, 108, 109

Description: SGL - PRIVACY - TOILET

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Privacy Lock	10 U65 LL	US26D	SA
1 Door Closer	281 Reg / PA	EN	SA
1 Mop Plate	K1050 4" 1" LDW	US32D	RO
1 Kick Plate	K1050 10" 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
1 Gasketing	S88D		PE

S□□ 8.0

Doors: 112B

Description: SGL - LOCK - PASSAGE

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Passage Latch	10 U15 LL	US26D	SA
1 Door Closer	281 Reg / PA	EN	SA
1 Kick Plate	K1050 10" 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

S□□ .0

Doors: 112C

Description: PR - LOCK - STOR

6 Hinge, Full Mortise	TA2714	US26D	MK
2 Flush Bolt	555 12" / 72" AFF	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Storeroom/Closet Lock	10 G04 LL	US26D	SA
2 Door Stop	409 / 446 as required	US26D	RO
2 Silencer	608		RO

S□□ 10.0

Doors: 113D

Description: SGL - JAN OHS

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom/Closet Lock	10 G04 LL	US26D	SA
1 Surf Overhead Stop	10- 36	689	RF
1 Mop Plate	K1050 4" 1" LDW	US32D	RO
1 Gasketing	S88D		PE

S□□ 11.0

Doors: 104A

Description: SGL - LOCK - CLASS

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Lock	10 G37 LL	US26D	SA
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

S□□ 12.0

Doors: 113C

Description: OH DOOR

1 HBO-Balance	Balance of hardware by door mfg
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END OF SECTION 087100

**SECTION 09 2116
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Cementitious backing board.
- B. Gypsum wallboard.
- C. Joint treatment and accessories.
- D. Textured finish system.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Building framing.
- B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 07 2100 - Thermal Insulation: Acoustic insulation.
- D. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2016.
- D. 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.
- E. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- F. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
- H. GA-216 - Application and Finishing of Gypsum Board; 2016.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.
- C. 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 gypsum board installation and finishing, with minimum 3 years of experience.

PART 2 PRODUCTS**2.01 BOARD MATERIALS**

- A. Manufacturers - Gypsum-Based Board:
 - 1. American Gypsum Company: www.americangypsum.com.
 - 2. CertainTeed Corporation: www.certainteed.com.
 - 3. Georgia-Pacific Gypsum: www.gpgypsum.com.
 - 4. National Gypsum Company: www.nationalgypsum.com/#sle.
 - 5. USG Corporation: www.usg.com.
 - 6. Substitutions: See Section 01 6000 - 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. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
 - b. Mold resistant board is required where drawings indicate GYP2 - Moisture Resistant Gypsum Board.
3. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
- C. Backing Board For Wet Areas: One of the following products:
 1. Application: Surfaces behind tile in wet areas including toilet rooms.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. 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: 5/8 inch.
 - b. Products:
 - 1) Custom Building Products: www.custombuildingproducts.com/#sle.
 - 2) National Gypsum Company; PermaBase Cement Board: www.nationalgypsum.com/#sle.
 - 3) USG Corporation; Durock: www.usg.com.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

- A. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 1. Rigid Corner Beads: Low profile, for 90 degree outside corners.
- B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
- C. Textured Finish Materials: Latex-based compound; plain.
- D. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- E. Exterior Soffit Vents: One piece, perforated, ASTM B221 6063 T5 alloy aluminum, with edge suitable for direct application to gypsum board and manufactured especially for soffit application. Provide continuous vent.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 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. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- D. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- E. Installation on Wood Framing: For non-rated assemblies, install as follows:
 1. Single-Layer Applications: Screw attachment.

3.03 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 apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

- D. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings. Provide vent area indicated on drawings.

3.04 JOINT TREATMENT

- A. 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.
- B. 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.
- C. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.05 TEXTURE FINISH

- A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.
- B. Texture Required: light orange peel.

END OF SECTION

**SECTION 09 2236
LATH****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Metal lath for cement plaster.
- B. Furring for metal lath.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Sheathing on exterior walls.
- B. Section 06 1000 - Rough Carpentry: Water-resistive barrier under exterior plaster and stucco.
- C. Section 09 2116 - Gypsum Board Assemblies: Water-resistive barrier under exterior plaster and stucco.
- D. Section 09 2400 - Cement Plastering.

1.03 REFERENCE STANDARDS

- A. ASTM C847 - Standard Specification for Metal Lath; 2014a.
- B. ASTM C933 - Standard Specification for Welded Wire Lath; 2014.
- C. 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; 2015.
- D. 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.
- E. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2016c.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Metal Lath:
 - 1. Alabama Metal Industries Corporation: www.amico-lath.com/#sle.
 - 2. Cemco: www.cemcosteel.com/#sle.
 - 3. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com/#sle.
 - 4. Semco Southeastern Metals: www.semetals.com/#sle.
 - 5. Structa Wire Corporation; Structa Mega Lath: www.structawire.com/#sle.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING AND LATH ASSEMBLIES

- A. Provide completed assemblies with the following characteristics:
 - 1. Maximum Deflection of Vertical Assemblies: 1:360 under lateral point load of 100 lbs.
 - 2. Maximum Deflection of Horizontal Assemblies: 1:240 deflection under dead loads and wind uplift.

2.03 FRAMING MATERIALS

- A. Furring Channels: Formed steel, minimum 0.020 inch thick, 3/8 inch deep by 7/8 inch high, splicing permitted; galvanized.

2.04 LATH

- A. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring.
 - 1. Weight: To suit application and as specified in ASTM C841 or ASTM C1063 for framing spacing.
 - 2. Weight: 2.5 lb/sq yd.
 - 3. Backed with treated paper.
- B. Strip Mesh: Expanded metal lath, same weight as lath, 2 inch wide by 24 inch long; same finish as lath.

- C. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, and maximum possible lengths.
 - 1. Corner Beads: Bullnosed corners.
 - 2. Expansion Joints: Accordion profile with factory-installed protective tape, 2 inch wide flanges, fill with elastomeric sealant and paint to match adjacent plaster.
 - a. Products:
 - 1) Phillips Manufacturing Co; #15 Double V Expansion Joint: www.phillipsmfg.com/#sle.
 - 3. Base Screeds: Bevelled edges.
 - 4. Control Joints: Accordion profile with factory-installed protective tape, 2 inch flanges, Phillips #15 Double V, fill with elastomeric sealant and paint to match stucco.

2.05 ACCESSORIES

- A. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized.
- B. Fasteners: Self-piercing tapping screws; ASTM C1002 or ASTM C954.
- C. Tie Wire: Annealed galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready to receive work and conditions are suitable for application.
- B. For exterior plaster and stucco on stud walls, verify that water-resistive barrier has been installed over sheathing substrate completely and correctly.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION - GENERAL

- A. Install metal lath and furring for Portland cement plaster in accordance with ASTM C1063.

3.03 WALL FURRING INSTALLATION

- A. Install wall furring by directly attaching to walls.
- B. Install furring channels horizontally; secure with fasteners on alternate channel flanges at maximum 16 inches on center.
- C. Space furring channels maximum 16 inches on center, and not more than 4 inches away from floor and ceiling lines.

3.04 CONTROL AND EXPANSION JOINT INSTALLATION

- A. Locate joints as indicated on drawings and comply with ASTM C1063.
 - 1. Area of plaster panel not to exceed 144 sq ft for vertical surfaces.
 - 2. Area of plaster panel not to exceed 100 sq ft for horizontal, curved or angled surfaces.
 - 3. Spacing between control joints not to exceed 18 ft in each direction.
 - 4. Area bounded by control joints not to exceed a length-to-width ratio of 2-1/2 to 1.
- B. Install expansion joints where an expansion joint occurs in base exterior wall.
- C. Construct expansion joints of back-to-back casing beads with a backer rod and sealant, set 1/4 inch apart.

3.05 LATH INSTALLATION

- A. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.
- B. Place corner bead at external wall corners; fasten at outer edges of lath only.
- C. Place base screeds at termination of plaster areas; secure rigidly in place.
- D. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.
- E. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.
- F. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

END OF SECTION

SECTION 09 2400 CEMENT PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cement plastering.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood stud framing for plaster.
- B. Section 07 2500 - Weather Barriers.
- C. Section 09 2236 - Lath: Lath, furring, beads, screeds, and joint accessories for plaster base.
- D. Section 09 9000 - Painting and Coatings.

1.03 REFERENCE STANDARDS

- A. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.
- B. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.
- C. ASTM C206 - Standard Specification for Finishing Hydrated Lime; 2014 (Reapproved 2022).
- D. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- E. ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters; 2015.
- F. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2016b.
- G. ASTM C1328/C1328M - Standard Specification for Plastic (Stucco) Cement; 2012.
- H. ICC (IBC) - International Building Code; 2015.
- I. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- J. UL (FRD) - Fire Resistance Directory; current edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide data on plaster materials and trim accessories.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 MOCK-UP

- A. Mock-Up Panel: Construct a 4 foot wide by 8 foot high sample panel of plaster work at the jobsite demonstrating installation procedures, finish texture (including vertical texture, and color. Show each phase of installation including framing and reinforcement.
- B. Construct mock-up of exterior wall, 8 feet long by 8 feet wide, illustrating surface finish.
 - 1. Mock-up may remain as part of this work.

1.07 FIELD CONDITIONS

- A. Exterior Plaster Work: Do not apply plaster when substrate or ambient air temperature is 40 degrees F or lower, or when temperature is expected to drop below 40 degrees F within 48 hours of application.

PART 2 PRODUCTS

2.01 CEMENT PLASTER APPLICATIONS

- A. Lath Plaster Base: Metal lath.
 - 1. Plaster Type: Factory prepared plaster mix.
 - 2. Number of Coats: Three.
 - 3. First Coat: Apply to a nominal thickness of 3/8 inch.
 - 4. Second Coat: Apply to a nominal thickness of 3/8 inch.
 - 5. Finish Coat: Apply to a nominal thickness of 1/8 inch.

2.02 ACCESSORIES

- A. Lath: As specified in Section 09 2236.

- B. Beads, Screeds, and Joint Accessories: As specified in Section 09 2236.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify masonry joints are flush and surfaces are ready to receive work of this section, and that there are no existing bituminous or water repellent coatings on masonry surfaces.
- C. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.

3.02 PREPARATION

- A. Dampen masonry surfaces to reduce excessive suction.
- B. Apply dash bond coat of plaster to solid bases and moist cure for at least 24 hours before applying first coat of jobsite mixed plaster.

3.03 MIXING

- A. Mix only as much plaster as can be used prior to initial set.
- B. Mix materials dry, to uniform color and consistency, before adding water.
- C. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

3.04 APPLICATION

- A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.
- B. Base Coats:
 - 1. Apply base coat(s) to fully embed lath and to specified thickness.
 - 2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.
- C. Finish Coats:
 - 1. Cement Plaster:
 - a. Apply with sufficient material and pressure to ensure complete coverage of base to specified thickness.
 - b. Apply desired surface texture while mix is still workable.
 - c. Float to a consistent finish.

3.05 TOLERANCES

- A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

3.06 REPAIR

- A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

END OF SECTION

**SECTION 09 3000
TILING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

- A. Section 07 1400 - Fluid-Applied Waterproofing.
- B. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- C. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

- A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2017.
- B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.
- 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 A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2019.
- F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 2021.
- G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 1999 (Reaffirmed 2019).
- H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).
- I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2019).
- J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).
- K. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
- L. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2019).
- M. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2010 (Revised).
- N. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 2014.
- O. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014.
- P. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2012.
- Q. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- R. ASTM D4068 - Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane; 2015.
- S. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2016.

1.04 SUBMITTALS

- A. See Section 01 3000 - 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. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 10 square feet of each size, color, and surface finish combination.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of and ANSI A108/A118/A136.1 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: Company specializing in performing tile installation, with minimum of five years of documented experience.
- D. Preinstallation meeting: Conduct a meeting prior to installation to review all waterproofing and tile patterns and trims.

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 of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS**2.01 TILE**

- A. Manufacturers: Products noted on the drawings .
- B. Glazed Wall Tile: ANSI A137.1 standard grade.
 - 1. Pattern: See Interior Elevations.
 - 2. Products: See Finish Schedule
 - a. Substitutions: See Section 01 6000 - Product Requirements.
- C. Porcelain Tile: ANSI A137.1 standard grade.
 - 1. Products: See finish schedule
 - a. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions as indicated on drawings, for setting using tile mortar or adhesive.
 - 1. Applications:
 - a. Open edges of wall tile.
 - b. Open edges of floor tile.
 - c. Wall corners, outside and inside.
 - d. Transition between floor finishes of different heights.
 - e. Thresholds at door openings.
 - f. Floor to wall joints.
 - g. Borders and other trim as indicated on drawings.
 - 2. Manufacturers:
 - a. Schluter-Systems: www.schluter.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SETTING MATERIALS

- A. Manufacturers:
 - 1. ARDEX Engineered Cements: www.ardexamericas.com.
 - 2. Custom Building Products: www.custombuildingproducts.com.

3. LATICRETE International, Inc: www.laticrete.com.
 4. Merkrete, by Parex USA, Inc: www.merkrete.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
 2. Products:
 - a. ARDEX Engineered Cements; S 28: www.ardexamericas.com.
 - b. Custom Building Products; Complete Contact-LFT Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com.
 - c. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- C. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, latex additive, and water.
1. Products:
 - a. LATICRETE International, Inc; LATICRETE 3701 Fortified Mortar Bed: www.laticrete.com.
 - b. Merkrete, by Parex USA, Inc; Merkrete Underlay C: www.merkrete.com.
 - c. Proflex Products, Inc; MSI - Mud Set Installation: www.proflex.us/.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 GROUTS

- A. Standard Grout: ANSI A118.6 standard cement grout.
1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 2. Color(s): As indicated on drawings.
 3. Products:
 - a. Custom Building Products; Polyblend Non-Sanded Grout: www.custombuildingproducts.com.
 - b. LATICRETE International, Inc; LATICRETE 1500 Sanded Grout: www.laticrete.com.
 - c. Merkrete, by Parex USA, Inc; Merkrete Duracolor Non-Sanded Grout: www.merkrete.com.

2.05 ACCESSORY MATERIALS

- A. Waterproofing Membrane: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
 2. Fluid or Trowel Applied Type:
 - a. Products:
 - 1) ARDEX Engineered Cements; ARDEX 8+9: www.ardexamericas.com.
 - 2) Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: www.custombuildingproducts.com.
 - 3) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.
- B. Waterproofing Membrane Under Thick Mortar Bed at Showers and Tiled Tubs:
1. Material: Chlorinated polyethylene sheet, 40 mils thick, minimum; complying with ASTM D4068.
 2. Products:
 - a. Noble Company; Chloraloy Shower Pan Liner: www.noblecompany.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. 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.
- B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
- C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
- 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 and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, 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 wall 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.

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.
- B. Over wood substrates, install in accordance with TCNA (HB) Method F142, with standard grout, unless otherwise indicated.
- C. Over wood substrate with backer board underlayment, install in accordance with TCNA (HB) Method F144, for cementitious backer boards, with standard grout.
- D. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 INSTALLATION - FLOORS - MORTAR BED METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F111, with cleavage membrane, unless otherwise indicated.
 - 1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCNA (HB) Method F121.
- B. Cleavage Membrane: Lap edges and ends.
- C. Waterproofing Membrane: Install as recommended by manufacturer and as specified in the section in which the product is specified.
- D. Mortar Bed Thickness: minimum 1-1/4 inch, unless otherwise indicated.

3.06 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.

3.07 CLEANING

- A. Clean tile and grout surfaces.

3.08 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

**SECTION 09 6500
RESILIENT FLOORING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Resilient base.
- B. Installation accessories.

1.02 RELATED REQUIREMENTS**1.03 REFERENCE STANDARDS**

- A. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).

1.04 SUBMITTALS

- A. See Section 01 3000 - 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. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Wall Base: 20 linear feet of each type and color.

1.05 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 and 90 degrees F.

1.06 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 to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS**2.01 RESILIENT BASE**

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set no toe.
 - 1. Manufacturers:
 - a. Roppe Corp; Pinnacle Rubber Base: www.roppe.com.
 - b. Tarkett; Traditional Wall Base: www.tarkettexchange.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Height: 4 inch.
 - 3. Thickness: 0.125 inch.
 - 4. Finish: Satin.
 - 5. Length: Roll.
 - 6. Color: As indicated on drawings.
 - 7. Accessories: Premolded external corners and end stops.

2.02 ACCESSORIES

- A. Primers and Adhesives: 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 Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and 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. Clean substrate.
- B. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's written instructions.
- B. Spread only enough adhesive to permit installation of materials before initial set.
- C. Fit joints and butt seams tightly.

3.04 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.05 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

END OF SECTION

**SECTION 09 9000
PAINTING AND COATING**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Interior painting and coating systems.
- C. Exterior painting and coating systems.

1.02 REFERENCE STANDARDS

- A. SSPC-SP 1 - Solvent Cleaning; 2015.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Product characteristics.
 - 2. Surface preparation instructions and recommendations.
 - 3. Primer requirements and finish specification.
 - 4. Storage and handling requirements and recommendations.
 - 5. Application methods.
 - 6. Clean-up information.
- C. Samples: Submit two paper draw down samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to manufacturer's label.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 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, product name, product code, color designation, VOC content, batch date, environmental handling, surface preparation, application, and use instructions.
- C. Paint Materials: Store at a minimum of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

- A. Do not apply materials when environmental conditions are outside the ranges required by manufacturer.
- B. Follow manufacturer's recommended procedures for producing the best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Basis of Design Products: Subject to compliance with requirements, provide Sherwin-Williams Company (The) products indicated; www.sherwin-williams.com.
- B. Comparable Products: Products of approved manufacturers will be considered in accordance with 01 6000 - Product Requirements, and the following:
 - 1. Products that meet or exceed performance and physical characteristics of basis of design products.
 - 2. Other Acceptable Manufacturers:

2.02 PAINTINGS AND COATINGS

- A. General:

1. Provide factory-mixed coatings unless otherwise indicated.
 2. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's instructions.
- B. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Concrete: Cementitious siding, Flexboard, Transite, non-roof shingles, common brick, stucco, tilt-up, precast, and poured-in-place cement.
1. Latex Systems:
 - a. Satin Finish:
 - 1) 1st Coat: Sherwin-Williams Loxon Concrete and Masonry Primer Sealer LX02W50: www.sherwin-williams.com.
 - 2) 2nd and 3rd Coat: Sherwin-Williams A-100 Exterior Latex Satin, A82 Series: www.sherwin-williams.com.
- B. Metal: Aluminum, galvanized.
1. Latex Systems:
 - a. Satin Finish:
 - 1) 1st and 2nd Coats: Sherwin-Williams Pro Industrial Acrylic Eg-Shel, B66-660 Series: www.sherwin-williams.com.
- C. Wood: Siding, trim, shutters, sashes, and hardboard-bare/primed.
1. Latex Systems:
 - a. Satin Finish:
 - 1) 1st Coat: Sherwin-Williams Latex Wood Primer, B42W8041: www.sherwin-williams.com.
 - 2) 2nd and 3rd Coat: Sherwin-Williams A-100 Exterior Latex Satin, A82 Series: www.sherwin-williams.com.

2.04 PAINT SYSTEMS - INTERIOR

- A. Masonry CMU: Concrete, split face, scored, smooth, high density, low density, and fluted.
1. Latex Systems:
 - a. Gloss Finish High Performance:
 - 1) 1st Coat: Sherwin-Williams Pro Industrial Heavy Duty Block Filler, B42W00150-20: www.sherwin-williams.com.
 - 2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Acrylic Gloss, B66-600 Series: www.sherwin-williams.com.
- B. Metal, Galvanized: Ceilings and ductwork.
1. Multi-Surface Acrylic Coating System:
 - a. Gloss Finish High Performance:
 - 1) 1st and 2nd Coat: Sherwin-Williams Pro Industrial Multi-Surface Acrylic, B66-1500 Series: www.sherwin-williams.com.
 2. Dryfall Waterborne Topcoats:
 - a. Eg-Shel Finish:
 - 1) 1st and 2nd Coat: Sherwin-Williams Pro Industrial Waterborne Acrylic Dryfall, B42-82 Series: www.sherwin-williams.com.
- C. Wood: Walls, ceilings, doors, and trim.
1. Latex Systems:
 - a. Eg-Shel/Satin Finish:
 - 1) 1st Coat: Sherwin-Williams Premium Wall and Wood Primer, B28W8111: www.sherwin-williams.com.
 - 2) 2nd and 3rd Coat: Sherwin-Williams Scuff Tuff Interior Waterbased Enamel, Eg-Shel, S24-50 Series: www.sherwin-williams.com.
 2. Stain and Varnish System:
 - a. Satin Finish:
 - 1) Stain per drawings.
- D. Drywall: Walls, ceilings, gypsum board, and similar items.
1. Latex Systems:
 - a. Eg-Shel Finish:

- 1) 1st Coat: Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600: www.sherwin-williams.com.
- 2) 2nd and 3rd Coat: Sherwin-Williams ProMar 200 Zero VOC Eg-Shel, B20-2600 Series: www.sherwin-williams.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

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. Cementitious Siding: Remove dirt, dust and other foreign matter. Pressure clean, if needed, to remove grease, oil, and loose particles.
- D. Gypsum Board: Fill minor defects with filler compound; sand smooth and remove dust prior to painting.
- E. Plaster: Fill hairline cracks, small holes, and imperfections with patching plaster. Make smooth and flush with adjacent surfaces. Treat textured, soft, porous, or powdery surfaces in accordance with manufacturer's instructions.
- F. Aluminum: Remove surface contamination and oil; wash with solvent according to SSPC-SP 1.
- G. Wood: Remove dust, grit, and foreign matter. Scrape, sand, and spot prime knots and pitch streaks. Fill nail holes and imperfections with wood filler and sand smooth.

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.
- C. Apply coatings at spread rate required to achieve manufacturer's recommended dry film thickness.
- D. Regardless of number of coats specified, apply additional coats until complete hide is achieved.

3.04 PRIMING

- A. Apply primer to all surfaces unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.
- B. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to top coat manufacturers.

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 coatings from damage until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

**SECTION 10 1423
PANEL SIGNAGE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Panel signage.

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.
- C. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
 - 2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - b. 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.
 - c. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit one sample of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.
- E. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- F. Manufacturer's qualification statement.

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. Store under cover and elevated above grade.
- 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 minimum ambient temperature during and after installation.

PART 2 PRODUCTS**2.01 PANEL SIGNAGE**

- A. Panel Signage:
 - 1. Application: Room and door signs.
 - 2. Description: Flat signs with engraved panel media, tactile characters.
 - 3. Sign Size: As indicated on drawings.
 - 4. Total Thickness: 1/8 inch.
 - 5. Sign Edges: Squared.
 - 6. Letter Edges: Squared.
 - 7. Corners: Squared.
 - 8. Color and Font, unless otherwise indicated:
 - a. Character Font: Helvetica, Arial, or other sans serif font.
 - b. Character Case: Upper case only.

- c. Background Color: As scheduled.
- d. Character Color: Contrasting color.
- 9. Material: Laminated colored plastic engraved through face to expose core as background color.
- 10. Profile: Flat panel without frame.
- 11. Tactile Letters: Raised 1/32 inch minimum.
- 12. One-Sided Wall Mounting: Tape adhesive.
- 13. Blank Matching Panel where sign is mounted on glass.

2.02 ACCESSORIES

- A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.
- B. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards.

END OF SECTION

**SECTION 10 2600
WALL AND DOOR PROTECTION**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Corner guards.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Blocking for wall and corner guard anchors.
- B. Section 09 2116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
- C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
- D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- E. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Corner Guards:
 - 1. Inpro; Tape On Corner Guard Rigid Vinyl: www.inprocorp.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PRODUCT TYPES

- A. Corner Guards - Surface Mounted:
 - 1. Material: High impact vinyl.
 - 2. Width of Wings: 1 1/2 inches.
 - 3. Corner: Square.
 - 4. Color: As selected from manufacturer's standard colors.
 - 5. Length: 8'-0"; one piece.

2.03 FABRICATION

- A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that substrate surfaces for adhered items are clean and smooth.
- C. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position corner guard 4 inches above finished floor to 100 inches high.

3.03 CLEANING

- A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

**SECTION 10 2800
TOILET & BATH ACCESSORIES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Commercial toilet accessories.
- B. Diaper changing stations.
- C. Utility room accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.
- B. Section 04 20 00 - Unit Masonry: CMU substrate.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2011.
- F. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- G. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).
- H. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration; 1996.

1.04 SUBMITTALS

- A. See Section 01 3000 - 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.

1.05 COORDINATION

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.
- B. Install blocking for owner furnished and owner installed toilet accessories.
 - 1. TA3: Paper Towel Dispenser
 - 2. TA7: Soap Dispenser
 - 3. TA11: Toilet Seat Cover Dispenser
 - 4. TA12: Toilet Tissue Dispenser

PART 2 PRODUCTS**2.01 MANUFACTURERS - TOILET ACCESSORIES**

- A. Products listed are made by Bobrick Corporation.
- B. Other Acceptable Manufacturers:
 - 1. AJW Architectural Products: www.ajw.com.
 - 2. ASI - American Specialties, Inc: www.americanspecialties.com.
 - 3. Bradley Corporation: www.bradleycorp.com.
 - 4. Substitutions: Section 01 6000 - Product Requirements.
- C. Diaper Changing Stations:
 - 1. Koala Kare Products: www.koalabear.com.

2. Substitutions: 01 6000 - Product Requirements.

D. All items of each type to be made by the same manufacturer.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Keys: Provide keys for each accessory to Owner; master key all lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- F. Adhesive: Two component epoxy type, waterproof.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.
- C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. TA1, TA2, and TA9 - Grab Bars: Stainless steel, nonslip grasping surface finish.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - 2. Length and configuration: As indicated on drawings.
 - 3. Product: B-6806 and B-5837 manufactured by Bobrick.
- B. TA4 - Sanitary Napkin Disposal
 - 1. Surface-Mounted.
 - 2. Dimensions: 7-1/2" x 10" x 3-13/16".
 - 3. Product: B-270 manufactured by Bobrick.
- C. TA5 - Baby Changing Station
 - 1. Recessed.
 - 2. 18 gauge, type 304 stainless steel exterior finish
 - 3. Product: KB310-SSRE manufactured by Koala Kare Child Care Products.
- D. TA6 - Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036
 - 1. Size: 24 x 42.
 - 2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
 - 3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
 - 4. Product: B-290 2442 manufactured by Bobrick.
- E. TA8 - Commercial Robe Hook
 - 1. Surface mounted with concealed fasteners.
 - 2. Product: B-76717 manufactured by Bobrick.
- F. TA10 - Hook Strip
 - 1. Size: 4 x 24, three hooks
 - 2. Product: B-232 x 24 manufactured by Bobrick.
- G. TA13 - Shelf with Mop and Broom Holders and Hooks

1. Size: 34" long
2. Product: B-239 x 34 manufactured by Bobrick.

2.05 SHOWER ACCESSORIES

- A. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, hinges and mechanical fasteners of Type 304 stainless steel, rectangular seat.
 1. Seat: Teak seat slats.
 2. Size: 32" x 16".
 3. Weight Rating: Up to 400 pounds.
 4. Product: Model #62-TK32 manufactured by Grab Bar Specialists or equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.
- D. See Section 06 1000 - Rough Carpentry 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 and Locations: As required by accessibility regulations and as indicated on drawings.

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

**SECTION 10 4400
FIRE PROTECTION SPECIALTIES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a.
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features.
- C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, locations of individual fire extinguishers, installation procedures, and accessories required for complete installation.
- 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.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fire Extinguishers:
 - 1. Ansul, a Tyco Business: www.ansul.com.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com.
 - 3. Nystrom, Inc: www.nystrom.com/sle.
 - 4. Pyro-Chem, a Tyco Business: www.pyrochem.com.
 - 5. JL Industries, Inc: www.jlindustries.com.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Fire Extinguisher Accessories:
 - 1. Ansul, a Tyco Business: www.ansul.com.
 - 2. JL Industries, Inc: www.jlindustries.com.
 - 3. Kidde, a unit of United Technologies Corp: www.kidde.com.
 - 4. Larsen's Manufacturing Co: www.larsensmfg.com.
 - 5. Nystrom, Inc: www.nystrom.com/sle.
 - 6. Pyro-Chem, a Tyco Business: www.pyrochem.com.
 - 7. Substitutions: See Section 01 6000 - 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 gage.
 - 1. Class: A:B:C type.
 - 2. Size: 10 pound.
 - 3. Finish: Baked polyester powder coat, red color.

2.03 FIRE EXTINGUISHER CABINETS

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

- B. Cabinet Construction: Non-fire rated.
 - 1. Formed aluminum.
- C. Cabinet Configuration: Recessed type.
 - 1. Trim: Flat square edge, with 1.25 inch wide face.
- D. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- F. Finish of Cabinet Exterior Trim and Door: Clear satin anodized.
- G. Finish of Cabinet Interior: Clear satin anodized.

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. Secure rigidly in place.
- C. Place extinguishers in cabinets.

END OF SECTION

**SECTION 11 0050
MISCELLANEOUS EQUIPMENT**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Pull-Down Attic Access Ladder

1.02 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking requirements.
- B. Section 06 20 00 - Finish Carpentry: Trim.
- C. Section 09 90 00 - Painting and Coating.

1.03 SUBMITTALS

- A. Product Data: For each type of miscellaneous specialty indicated.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver miscellaneous specialties including components and accessories to Project site in original, unopened packages and store them in a space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, vandalism, theft and other causes.
- B. Handle miscellaneous specialties to avoid damage in any way.

PART 2 PRODUCTS**2.01 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 those indicated below.

2.02 MATERIALS

- A. Materials as indicated in Miscellaneous Specialty Schedule. Item listed is a basis of design and any item submitted must either meet or exceed requirements based on specified item, including but not limited to dimension, color selection and materials comprising the item.

2.03 MISCELLANEOUS EQUIPMENT SCHEDULE

- A. Pull-Down Attic Access Ladder: Louisville Ladder, Insulated Aluminum Attic Ladder (available at Home Dept) or approved equal.
 - 1. Dimensions: 22.5 in x 54 in
 - 2. Install trim at ceiling as required. Paint to match ceiling.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Examine openings, structural support, anchorage, substrates and conditions with Installer present, for compliance with requirements for installation, operation and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions.
- B. Unless otherwise directed by manufacturer in writing install Miscellaneous Specialties level, plumb, square and true to line.

3.03 ADJUSTING AND CLEANING

- A. Adjust and clean miscellaneous specialties according to manufacturer's written instructions.
- B. Inspect miscellaneous specialties for damaged or defective items. Promptly replace damaged or defective items.
- C. Provide final protection and maintain conditions that ensure Miscellaneous Specialties are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

**SECTION 11 3013
RESIDENTIAL APPLIANCES**

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Kitchen appliances.

1.02 RELATED REQUIREMENTS

- A. Division 22: Plumbing connections for appliances.
- B. Division 26: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

- A. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: 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 not less than three years of documented experience.
- B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

PART 2 PRODUCTS**2.01 KITCHEN APPLIANCES**

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Refrigerator, Catering Space: Free-standing, Two door, and Automatic Defrost.
 - 1. Capacity: Total minimum storage of 36 cubic ft.
 - 2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
 - 3. Exterior Finish: Stainless steel.
 - 4. Manufacturers:
 - a. Westlake; Model #WK-48R: www.westlakechef.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- C. Freezer, Catering Space: Reach In, Upright
 - 1. Capacity: Total minimum storage of 23 cubic ft.
 - 2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
 - 3. Exterior Finish: Stainless steel.
 - 4. Manufacturers:
 - a. Westlake; Model WKF-23B: www.westlakechef.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- D. Warming Cabinet, Catering Space.
 - 1. Capacity: Six full-size pans 4" deep.
 - 2. Door: Solid.
 - 3. Door Swing: Left hinged.
 - 4. Cabinet: Reach in.
 - 5. Casters: 5 inch.
 - 6. Shelves: Chrome wire, reach in. 10 shelves total.

7. Manufacturers:
 - a. Alto-Shaam; Model 750-S: www.altoshaam.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- E. Refrigerator, Work Room.
 1. Capacity: 20 cubic ft.
 2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
 3. Exterior Finish: Stainless steel.
 4. Manufacturers:
 - a. LG; Model #LTCS20020S (available at Lowe's).
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- F. Merchandiser Refrigerator, Concessions.
 1. Capacity: 8.6 cubic ft.
 2. Door Style: Swing.
 3. Door Type: Glass.
 4. Door swing: Right hinged.
 5. Color: Black.
 6. Manufacturers:
 - a. Avantco; Model GDC-10-HC: www.avantcorefrigeration.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.03 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION

**SECTION 12 2400
WINDOW SHADES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

- A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- B. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.
- C. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. 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.

1.05 SUBMITTALS

- A. See Section 01 3000 - 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. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.
- E. Selection Samples: Include fabric samples in full range of available colors and patterns.
- F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.
- H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.07 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.

1.08 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

- A. See Section 01 7800 - 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. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
 - 2. Hunter Douglas Architectural; RB500 Manual Roller Shades: www.hunterdouglasarchitectural.com/#sle.
 - 3. MechoShade Systems LLC; Mecho/7 System: www.mechoshade.com/#sle.
 - 4. SWFcontract, a division of Springs Window Fashions, LLC.; Pro Series Manual Solar Shade System: www.swfcontract.com/#sle.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

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.

2.03 SHADE FABRIC

- A. Fabric for Light-Filtering Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
 - 1. Manufacturers:
 - a. Lutron Electronics Co., Inc; E Screen THEIA - 1%: www.lutron.com/#sle.
 - b. MechoShade Systems LLC; Soho - 1100 Series (1% open): www.mechoshade.com/#sle.
 - c. Mermet Corporation; E-Screen - 1%: www.mermetusa.com/#sle.
 - d. Phifer, Inc; Style 2500 1%: www.phifer.com/#sle.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Color: As selected by Architect from manufacturer's full range of colors.

2.04 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 space between bottom bar and window stool.
 - 2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.
- C. Dimensional Tolerances: As recommended in writing by manufacturer.

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 7800 - Closeout Submittals, for closeout submittals.
- B. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.06 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

**SECTION 12 3600
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 4100 - Architectural Wood Casework.
- B. Section 22 4000 - Plumbing Fixtures: Sinks.

1.03 REFERENCE STANDARDS

- A. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.
- B. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.
- C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- D. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

- A. 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.
- B. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- C. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- D. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- 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. Quality Certification:
 - 1. Provide designated labels on shop drawings as required by certification program.
 - 2. Provide designated labels on installed products as required by certification program.
 - 3. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

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. Quartz Countertops: Sheet or slab of quartz over continuous substrate.
 - 1. Flat Sheet Thickness: 3/4 inch, or as indicated on drawings.
 - 2. Quartz Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic 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. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA Dimension Stone Design Manual.
 - b. Finish on Exposed Surfaces: Polished.
 - c. Manufacturers:
 - 1) Basis of Design: Wilsonart.
 - 2) Other Acceptable Manufacturers:
 - (a) Corian Quartz: www.corianquartz.com.
 - (b) Cambria: www.cambriausa.com.
 - (c) Silestone: www.cosentino.com/usa/silestone.
 3. Other Components Thickness: 3/4 inch, minimum.
 4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; edge profile as indicated on drawings.
 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
 6. Schedule:
 - a. SS1 - Wilsonart, Quartz, Q6011 Crystal Frost.

2.02 MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- B. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
- C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- D. 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 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, unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
- D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces (minimum 48" spacing) as indicated on drawings, finished to match.

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. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch 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 22 00 00**PLUMBING GENERAL PROVISIONS****1.0 GENERAL****1.1 SUMMARY**

- a. Except as modified in this section, General Conditions, Supplementary Conditions, applicable provisions of Division 01, General Requirements, and other provisions and requirements of the contract documents apply to work of Division 22, Plumbing.
- b. Applicable provisions of this section apply to all sections of Division 22, Plumbing.
- c. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details of special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems or required to complete the installation, whether mentioned or not.
- d. Refer to Division 22 for piping, insulation, valves, etc.

1.2 CODE REQUIREMENTS AND PERMITS

- a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.
- b. Resolve any code violation discovered in contract documents with the Engineer prior to award of the contract. After award of the contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.
- c. Obtain and pay for all permits and inspections.

1.3 REFERENCE SPECIFICATIONS AND STANDARDS

- a. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimum for all equipment, material, and work. In instances where capacities, size or other feature of equipment, devices or materials exceed these minimums, meet listed or shown capacities.

1.4 CONTRACTOR QUALIFICATIONS

- a. An acceptable contractor for the work under this division shall be a specialist in this field and have the personal experience, training, skill and the organization to provide a practical working system. If required, he shall be able to furnish acceptable evidence of having contracted for and installed not less than three systems of comparable size and type to this one, that have served their owners satisfactorily for not less than three years.
- b. The foreman for this work shall have had experience in installing not less than three such systems and shall be approved before the work is begun. Adequate and competent supervision shall be provided to ensure first class workmanship and installation.

- c. Work shall be executed and all materials installed in accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen, presenting a neat appearance when completed. Work shall be performed by mechanics skilled in the trade.
- d. The Contractor shall be responsible for all construction techniques required for all mechanical systems specified and shown on the drawings.

1.5 REQUEST FOR INFORMATION

- a. The Contractor may, after exercising due diligence to locate required information, request from the Consultant clarification or interpretation of the requirements of the Contract Documents. The consultant shall respond to such Contractor's requests for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract documents or is reasonably inferable from them, the Contractor shall be responsible to the Owner for all reasonable costs charged by the consultant to the Owner for the Additional Services required to provide such information.

1.6 CONTRACT DRAWINGS

- a. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work or show all offsets or required fittings. Determine exact locations from field measurements. Making adjustments to field conditions is considered a part of the work required.
- b. When the mechanical and electrical Contract Documents do not give exact details to the elevation of pipe, conduit and ducts, the Contractor shall physically arrange the systems to fit in the space available at the elevations intended with proper grade for the functioning of the system involved. Piping, exposed conduit and the duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The Contract Documents do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas.
- c. Prior to locating mechanical equipment, plumbing fixtures, water heaters, water coolers and other plumbing or mechanical items, obtain approval as to exact method and exact placement and location of equipment in the various areas shown on the drawings. In no case shall the locations be determined by scaling the drawings. Plumbing fixtures shall be mounted at the heights directed by the Architect and local code authorities. Relocate equipment and devices and pay all costs of modifying work of all trades necessitated by failure to comply with this requirement.
- d. These specifications are accompanied by drawings of the building and details of the installation indicating the locations of equipment, piping, ductwork, outlets, switch controls, circuits, lines, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.
- e. It is the Contractor's responsibility to properly use all information found on the Architectural, Structural, Mechanical and Electrical Drawings where such information affects his work.
- f. The drawings show diagrammatically the location of the various outlets and apparatus. Exact locations of these outlets and apparatus shall be determined by reference to the general drawings and to all detail drawings, equipment drawings, rough-in drawings, etc., by measurements at the building, and in cooperation with the other trades. The Owner reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.

- g. Should the drawings or specifications disagree within themselves, or with each other, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished.

1.7 OFFSETS

- a. The Contract Documents are diagrammatic as stated above. Not all offsets are shown. This applies to all ductwork, piping, flues, or any other component that is routed underground or throughout the structure. The Contractor shall be responsible to layout all piping in a manner that allows for complete maintenance access. Contractor shall provide and install, without additional costs, all offsets necessary to complete this project and to provide a complete, working, accessible, and maintainable system.

2.0 EXECUTION

- 2.1 Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material which is not suitable in this respect.

2.2 OBSTRUCTIONS

- a. The drawings indicate certain information pertaining to surface and subsurface obstructions which have been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
- b. Before any cutting or trenching operations are begun, verify with Owner's representative, utility company, municipalities, and other interested parties that all available information has been provided. Verify locations given.
- c. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.
- d. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

2.3 CUTTING AND PATCHING

- a. The Contractor shall be responsible for timely placing of all equipment and piping to avoid cutting new construction.

2.4 OPENINGS

- a. Framed, cast or masonry openings for piping or equipment is specified under other divisions. However, drawings and layout work for exact size and location of all such openings are included under this division.

2.5 COORDINATION

- a. Contract Documents are diagrammatic in showing certain physical relationships to other trades. Interface and coordination with other work including utilities and electrical work is the exclusive responsibility of the contractor.

- b. Contractor shall coordinate with Division 26 and other divisions as required. This is to include but not be limited to verification of power, voltage, phase and other characteristics as being compatible with that called for on the electrical drawings and Division 26 specifications, as well as that called for in Division 23 drawings and specifications or other divisions requiring electrical connections or interface with this division. This shall be done prior to placing orders for equipment.
- c. Arrange mechanical work in a neat, well organized manner with services running parallel with primary lines of the building construction, and with the maximum overhead clearance possible.
- d. Locate operating and control equipment properly to provide easy access. Arrange entire mechanical work with adequate access for operation and maintenance.
- e. Advise other trades of openings required in their work for the subsequent move-in of large units of mechanical work.
- f. Verify exact locations of existing equipment and determine exact requirements for connections prior to routing services to equipment.

2.6 CONCEALED WORK

- a. Where the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the word is understood to mean hidden from sight as in chases, furred spaces or suspended ceilings. "Exposed" is understood to mean open to view.

2.7 PROTECTION

- a. The Contractor shall be responsible for the protection of all materials and equipment to be installed under this Division from physical and weather damage.
- b. Provide all hoisting and scaffolding equipment required for proper installation of equipment. The contractor shall take full responsibility for the safety of the materials and equipment using such hoisting equipment and scaffolding.
- c. Adequately protect work, equipment, fixtures, and materials. At work completion, all work shall be clean and in good condition.

2.8 GUARANTEE

- a. Guarantee work for 1 year from the date of final acceptance of the project and during that period make good any faults or imperfections that may arise due to defects or omissions in materials or workmanship.

2.9 MATERIALS AND EQUIPMENT

- a. Furnish new and unused materials and equipment of Domestic Manufacturers meeting requirements of the paragraph specifying acceptable manufacturers. Where two or more units of same type or class of equipment are required, provide units of a single manufacture.

2.10 ACCEPTABLE MANUFACTURERS

- a. The following is a list of acceptable manufacturers for items of equipment specified under Division 23, Mechanical. Manufacturers names and catalog numbers specified under sections of Division 23 are used to establish standards of design, performance, quality and serviceability and not to

limit competition. Equipment of similar design, equal to that specified, manufactured by a manufacturer named below will be acceptable on approval.

- b. A request for prior approval of equipment not listed must be submitted 14 days before bid due date. Only manufacturers specified in sections of Divisions 21, 22 or 23, on drawings or listed below (including subsequent addenda) will be acceptable. There will be no exceptions to this requirement. Submit complete design and performance data to the Architect.

Item	Manufacturer
Plumbing Fixtures	American-Standard, Kohler,
Plumbing Fixtures, Trim	American-Standard, Chicago-Faucet, Moen Commercial, Elkay, Kohler, McGuire, Symmons, T & S Brass
Water Closet Seats	Bemis, Beneke, Church
Mop Sinks	Stern-Williams
Drinking Fountains	Elkay, Halsey-Taylor, Haws, Oasis,
Stainless Steel Sinks	Elkay, Just
Mixing Valves	Leonard, Powers, Symmons, Bradley
Drains, Cleanouts Carriers and Hydrants	J.R. Smith, Josam, Wade, Zurn
Water Hammer Arresters	J.R. Smith, Wade, Zurn
Trap Primers	Precision Plumbing Products
Access Doors	Inryco/Milicor, Karp
Water Heaters	A.O. Smith, Rheem, State, Lochinvar, Bradford White
Valves	Hammond, Nibco, Powell, Stockham, Walworth
Backflow Preventer Valves	Beeco/Hersey, Febco, Watts
Pumps	Aurora, Bell and Gossett, Paco, Taco
Insulation	CertainTeed, Johns-Manville, Knauf, Owens-Corning, Kingspan
Expansion Tanks	Taco, Wood Industrial, Amtrol
Circuit Setters	Bell & Gossett, Taco
Vibration Isolation	Amber-Booth, Mason Industries
Thermometers and Gauges	Ashcroft, Dwyer, Marsh, Terice

- c. Manufacturers listed in schedules, on the drawings or in a specific section of the specifications for a specific product is the basis of design. Any other submitted product will be construed to be a

proposed substitute, even if listed in the acceptable manufacturers list, and must comply with the following paragraphs.

- d. Acceptance of materials and equipment will be based on manufacturer's published data and will be tentative subject to the submission of complete shop drawings indicating compliance with the contract documents and that adequate and acceptable clearances for entry, servicing, and maintenance will exist. Acceptance of materials and equipment under this provision shall not be construed as authorizing any deviations from the contract documents, unless the attention of the Architect has been directed in writing to the deviations.
- e. Each proposed substitute shall be referenced to the trade name of the specified product, and the paragraph and page number of the specifications where the specified items occur. Each proposed substitute shall be accompanied by adequate supporting information including catalog cuts, diagrams, representative samples, published ratings, drawings, and other such descriptive information as may be required to properly illustrate the complete characteristics of materials and equipment. In addition, a detailed statement indicating item-by-item and paragraph-by-paragraph wherein the product to be offered deviates from the specification shall be submitted for each proposed alternate. Any such alternate proposal must include all necessary changes and additions to other work occasioned by such substitution. In addition, each alternate proposal must stipulate that the substituted product will fit the space allotted the specified product and provide the same or greater clearances for maintenance, removal and/or access.
- f. When requested by the Architect, the Contractor shall provide a sample of the proposed substitute item. In some cases, samples of both the specified item and the proposed item shall be provided for comparison purposes.
- g. Should a substitution be accepted, and should the substitute material prove defective, or otherwise unsatisfactorily for the service intended within the guarantee period, this material or equipment shall be replaced with the material or equipment specified at no additional cost to the Owner.

2.11 SUBMITTAL DATA AND SHOP DRAWINGS

The submittals shall include a specification compliance analysis for review and approval before work shall begin. The compliance document shall address each paragraph of the specification by indicating COMPLY, EXCEED, or EXCEPTION. Do not indicate COMPLY unless the proposed system exactly meets the paragraph requirement. If EXCEED or EXCEPTION is indicated, then provide a clear and concise explanation of the variance from the specifications and the net effect this would have on the specified system performance. This is to be included with each submittal.

- a. Submittal data. Submit descriptive literature, physical data, and performance data by the appropriate specification section or the specific sheet where products are shown on the contract drawings that are not referenced by the specification for review. All specification sections require a submittal. Submit each spec section separately but at one time. Submittals can be contained in one binder or binders, however, each specification section must be submitted as a single submittal and each section must be clearly marked or tagged with the specification section number. Each submittal shall bear the specification section number it is related to. Any submittal received without referring to the appropriate specification section number will be returned without review. Include identifying symbols and equipment numbers used in plans and specifications, with reference to specification paragraphs, and drawing numbers of all equipment and material submitted. Submittal data shall specifically list all proposed deviations from the contract documents. Submittals that are not clearly marked will be rejected for that reason.

- b. Contractor's Check. Shop drawings and submittal data will be submitted only by the Contractor. Indicate by signed stamp that the drawings and submittal data have been checked, that the work shown on the drawings and submittal data is in accordance with contract requirements and that dimensions and relationship with work of other trades have been checked. If drawings and submittal data are submitted for approval that have not been checked and signed by the Contractor, they will be returned for checking before being considered by the Architect.
- c. Engineer's approval of submitted material constitutes an acknowledgment only and in no way relieves the contractor of full responsibility for providing all systems complete in accordance with the intent of the drawings and specifications. Contractor is responsible for confirming and correlating dimensions at job site, for information which pertains to fabrication processes or construction techniques and for coordination of work with all other trades. Any materials or equipment provided by this contractor without approved shop drawings constitutes the contractor's agreement to comply with the engineer's intent whether specified, shown or implied.
- d. In addition, the Contractor cannot produce submittals and shop drawings by copying sealed engineering plans in whole or in part. The Contractor must produce their own shop drawings, no exceptions.

2.12 OPERATING AND MAINTENANCE INSTRUCTIONS

- a. Secure three copies of operating and maintenance instructions, service manuals, and parts listed applicable to each item of equipment furnished. Deliver three bound sets for the Owner's use. Include nameplate data and design parameters in operation and maintenance manuals. Clearly distinguish between information which applies to the equipment and information which does not apply. Also include all approved submitted data, all warranties on equipment, contractor's warranty and all test and balance reports. Delivery of required documents is a condition of final acceptance.
- b. Upon completion of work, and at time designated by Architect, provide services of a competent representative of the contractor for a period of at least 24 hours to instruct the owner's representative in the operation and maintenance of the entire system.

2.13 PROJECT RECORD DOCUMENTS

- a. Preparation. Maintain at the job site a separate set of white prints of the contract drawings for the sole purpose of recording the "as built" changes and diagrams of those portions of work in which actual construction is significantly at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, drawings clearly indicating locations of various lines, valves, traps, equipment, and other pertinent items, as installed. Include flow-line elevation of sewer lines. Record underground and under slab piping installed, dimensioning exact location and elevation of such piping.
- b. Deliver. At conclusion of project, obtain without cost to Owner, sepia's of original mechanical drawings and transfer as-built changes to these. Delivery of as-built prints and reproducible is a condition of final acceptance.
- c. Throughout progress of the work of this Contract, maintain an accurate record of all changes in the Contract Documents. Upon completion of the Work of this Contract, transfer the recorded changes to the AutoCAD drawing files and specification word processing files. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff. Thoroughly coordinate all changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to properly show the change. Include all addenda items, request for

information Architect's Supplemental Instructions and any other document that causes a change in the Construction Documents. Accuracy of records shall be such that future search for items shown in the Contract Documents may reasonably rely on information obtained from the approved Record Documents.

- d. The Contractor shall mark any deviations on a daily basis. The Architect will visit the site and will require to see the "As-Built" documentation periodically. If the Contractor does not keep an accurate set of as-built drawings, the pay request may be altered or delayed at the request of the Architect. Mark the drawings with a colored pencil.
- e. Record Documents shall consist of the following:
 - (1) Job Set: Promptly following award of Contract, secure from the Architect, at no charge to the Architect, one complete set of all mechanical documents comprising the Contract.
 - (2) Final Record Documents: Obtain the REVIT drawings files requesting a release form).
 - (a) The Contractor shall transfer all change data shown on the job set of to the corresponding electronic files, coordinating the changes as required, and clearly indicating at each affected detail and other drawing the full description of all changes made during construction and the actual location of items. Call attention to each entry by drawing a "cloud" around the area or areas affected.
 - (3) Submit the completed total set of Record Documents to the Engineer as described above. Participate in review meeting or meetings as required by the Engineer, make all required changes in the Record Documents, and promptly deliver the final Record Documents to the Architect. Upon completion of Work, the Contractor shall certify the "Record Drawings" for correctness by signing the following certification:

CERTIFIED CORRECT (3/8" high letters)

(Name of the Contractor)

By

Date

(Name of the Sub-Contractor)

By

Date

- f. Deliver record drawings to the Architect in the number and manner specified in Division 01 - General Requirements.

2.14 NOISE AND VIBRATION

- a. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions without cost to the Owner.

2.15 OPERATING TESTS

- a. After all mechanical systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequence and operation throughout the range of operation. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections.

2.16 SUBSTITUTIONS REQUIRING CHANGES

- a. Manufacturers and power requirements indicated on the mechanical and electrical drawings are the basis of design. If changes are required for the equipment submitted, such as changes in conduit size, conductors, breakers, disconnects, panels, etc., it shall be made at no additional cost to the Owner.

2.17 PIPE SLEEVES

- a. Fit with sleeves all pipes passing through masonry and concrete construction. Fabricate sleeves of schedule 40 galvanized steel pipe. Size sleeve for minimum clearance between pipe or insulation and sleeve.
- b. Extend each sleeve through the floor or wall. Cut the sleeve flush with each surface, except that in exposed locations, extend floor sleeves 3 inches from finished wall or above finished floor line.
- c. Caulk all sleeves water and airtight. Seal annular space between pipes and sleeves with fire stop material, see specification on fire stopping found elsewhere in this specification. Install per manufacturer's recommendations to meet or exceed fire rating of penetrated wall (minimum 1-1/2 hour). Reference architectural drawings for wall fire ratings.
- d. Sleeve pipe through concrete foundations, below grade with Thunderline Link-Seal wall penetration seals. Equip seals with stainless steel nuts, bolts and pressure plate.

2.18 PRECEDENCE OF MATERIALS

- a. The specifications determine the nature and setting of materials and equipment. The drawings establish quantities, dimensions and details.
- b. The installation precedence of materials shall be as follows. Note that if an interference is encountered, this shall guide the Contractor in the determination of which trade shall be given the "Right-of-Way".

Building lines
Structural Members
Soil and Drain Piping
Condensate Drains
Vent Piping
Supply, Return, and Outside Air Ductwork
Exhaust Ductwork
Domestic Water (Cold and Hot)
Refrigerant Piping
Electrical Conduit

End of Section 22 00 00

SECTION 22 07 19.01**LOW TEMPERATURE PIPING INSULATION****1.0 GENERAL****1.1 SCOPE**

- a. This section provides for installing and furnishing low temperature piping insulation of Fiberglass, or as noted below. The insulation will be used for low temperature application including domestic cold water, condensate drains, and horizontal portions of waste lines above grade that receive condensate from air handling units or evaporators.

1.2 RELATED WORK

- a. Division 22, Plumbing. Insulation - General.

2.0 PRODUCTS**2.1 PIPE INSULATION**

Use one of the following as noted in the schedule below:

- a. Fiberglass premolded pipe insulation, 4 PCF density, k-value 0.23 btu· in/hr· ft²· F at 75 F, R-value = 4.3/inch, with factory-applied reinforced All Service Jacket having integral laminated aluminum vapor barrier.

All above materials shall have Flame spread/Smoke developed rating less than 25/50 in accordance with ASTM E 84.

All materials to be installed and vapor sealed in accordance with the manufacturer's recommendations.

Insulated Unit	Thickness (Inches)		
	Fiberglass	Koolphen-K	Armaflex AP
Condensate Drain Lines	—	—	1/2
Above Ground Sanitary Waste Piping receiving Condensate from HVAC Equipment	1/2	3/4	—
Domestic Cold-Water Piping (All)	1	3/4	—
(1) Pipe 1-1/2" and less - 1" insulation; larger than 1-1/2" - 1-1/2" insulation			

2.2 FLANGE, VALVE AND FITTING INSULATION

- a. Provide molded or mitered covers for flanges, valves and fittings. Refer to paragraph 3.2 for method of fabrication.

2.3 INSULATION SHIELD

- a. Field Fabricated. Use sections of high density Koolphen-K, fiberglass, or foamglass insulation that will support the bearing area at hangers and supports. Further support insulation at hangers and supports with a shield of galvanized metal extending not less than 4 inches on either side of the support bearing area, covering at least half of the pipe circumference, and conforming to the schedule below.

Adhere metal shield to insulation so that metal will not slide with respect to insulation.

<u>Pipe Diameter</u>	<u>Insulated Section Length in Inches</u>	<u>Minimum U.S. Standard Gauge of Metal Shield</u>
3" and smaller	12	18

2.4 SEALANT, ADHESIVE AND FINISH

- a. Sealant. Use Foster 95-44 or Childers CP-76 to be used at valve covers and vapor stops.
- b. Adhesive. Furnish Foster 85-60 or Childers CP-127 to seal longitudinal laps of the vapor barrier jacket and to adhere butt joint covers. Self-sealing laps and butt strips are not allowed.
- c. Finish. Use Foster 30-65 or Childers CP-34 with glass fabric reinforcement.
- d. Finish Armaflex AP insulation installed outdoors with minimum two coats of Armstrong Finish per manufacturer's recommendations.

2.5 ALUMINUM JACKETING

- a. Apply aluminum jacketing to all fiberglass and Phenolic insulated pipe located outdoors or as noted. For piping in crawl spaces, apply white PVC sealed jacketing.
 - (1) Piping. Furnish for finishing insulated pipe, a self-fastening jacket of type 3003-H14 aluminum alloy, 0.016-inch thick.
 - (2) Valves, Fittings and Flanges. For finishing all valves, fittings and flanges, and smaller installations, provide formed aluminum covers, 0.024-inches thick, Type 3003-H14 aluminum alloy.
 - (3) Straps and seals. Provide aluminum strapping seals for jackets and covers according to manufacturer's recommendations.
 - (4) Acceptable manufacturers. Jacketing as manufactured by Preformed Metal Products Company, Childers or Johns-Manville will be acceptable.

3.0 EXECUTION

3.1 PIPE

- a. Apply insulation to clean, dry pipes. Butt insulation joints firmly together. Seal longitudinal laps and butt strips with adhesive.
- b. Where piping is interrupted by fittings, flanges, valves, or hangers and at intervals not to exceed 25 feet on straight runs, an isolating seal (vapor stop) shall be formed between the vapor barrier jacket and the bare pipe by liberal application of the sealant to the exposed joint faces carried continuously down to and along 4 inches of pipe and up to and along 2 inches of the jacket. This shall be provided only for chilled water service. In areas with high ambient temperature and humidity conditions, seal all butt joints with vapor stop sealant in accordance with recommendations of the insulation manufacturer.

3.2 VALVES, FLANGES AND FITTINGS

- a. Insulate all valves, flanges and fittings with factory molded or mitered fitting covers secured with wire. Thickness of insulation shall be equal to that of adjoining piping. Mitered covers for pipe 2" and smaller shall be minimum 3-piece to the side, and pipe 2-1/2" and larger shall be minimum 6 pieces to the side. The fitting shall then be rasped or otherwise formed to have a smooth appearance.
- b. Finish with 1/4-inch layer of Foster 30-65 or Childers CP-34 reinforced with glass fabric.

3.3 SHIELDS AND HANGERS

- a. When the insulation is jacketed in aluminum, install a length of 40-pound roofing felt 1/2 inch longer than the insulation shield between shield and jacket.

End of Section 22 07 19.01

SECTION 22 07 19.02**HIGH TEMPERATURE PIPING INSULATION (FIBERGLASS)****1.0 GENERAL****1.1 SCOPE**

- a. This section provides for furnishing and installing high temperature piping insulation, including domestic hot water piping. Emergency generator exhaust is not included.

1.2 RELATED WORK

- a. Division 22, PLUMBING. Insulation - General.

2.0 PRODUCTS**2.1 INSULATION**

- a. Use premolded fiberglass pipe insulation, 4 PCF density, R-value = 4.3/inch with a factory-applied, all service reinforced jacket having integral laminated aluminum vapor barrier. Provide insulation thickness as listed.

<u>Insulating Unit</u>	<u>Fiberglass Thickness (Inches)</u>	<u>Phenolic Foam Thickness (Inches)</u>
Domestic Hot Water Piping, 1-1/2" and smaller	1	1
Domestic Hot Water Piping, 2" and greater	1-1/2	1-1/2

2.2 INSULATION SHIELD

- a. Field Fabricated. Use sections of high-density fiberglass, calcium silicate, or foamglass insulation that will support the bearing area at hangers and supports. Further support insulation at hangers and supports with a shield of galvanized metal extending not less than 4 inches on either side of the support bearing area, covering at least half of the pipe circumference, and conforming to the schedule below. When pipe is guided at top and bottom, metal shields shall cover the whole pipe circumference. Adhere metal shield to insulation so that metal will not slide in respect to insulation.

<u>Pipe Diameter</u>	<u>Insulated Section Length in Inches</u>	<u>Minimum U.S. Standard Gauge of Metal Shield</u>
3" and smaller	12	18

2.3 ADHESIVE, FINISH AND CEMENT

- a. Adhesive. Furnish Foster 85-60 or Childers CP-127 to seal longitudinal laps of vapor barrier jacket and to adhere joint butt covers.
- b. Finish. Use Foster 46-50 or Childers CP-10/11 with glass fabric reinforcement.

- c. Cement. Furnish Johns-Manville No. 460 on insulated fittings, flanges and valves.

2.4 ALUMINUM JACKETING

- a. Apply aluminum jacketing to all insulated pipes located outdoors or as noted.
 - (1) Piping. Furnish for finishing insulated pipe, a self-fastening jacket of type 3003-H14 aluminum alloy, 0.016-inch thick.
 - (2) Valves, Fittings and Flanges. For finishing all valves, fittings and flanges, and smaller installations, provide formed aluminum covers, 0.024-inches thick, type 3003-H14 aluminum alloy.
 - (3) Straps and seals. Provide aluminum strapping seals for jackets and covers according to manufacturer's recommendations.
 - (4) Acceptable manufacturers. Jacketing as manufactured by Preformed Metal Products Company, Childers or Johns-Mansfille will be acceptable.

3.0 EXECUTION

3.1 PIPE

- a. Apply insulation to clean, dry pipes. Butt insulation joints firmly together. Seal longitudinal laps and butt strips with adhesive. Insulation using self-sealing laps and butt strips is acceptable.

3.2 VALVES, FITTINGS AND FLANGES

- a. On concealed piping, insulate fittings and valves 2-1/2 inches IPS and larger, with factory molded or mitered fitting covers. Mitered covers for pipe 2" and smaller shall be minimum 3-pieces to the side, and pipe 2-1/2" and larger shall be minimum 6-pieces to the side. The fitting shall then be rasped or otherwise formed to have a smooth appearance. Thickness of insulation shall be equal to that of adjoining pipe. Finish with coating reinforced with white 10" by 10" glass fabric.
- b. In exposed areas, insulate all fittings, flanges and valves with factory molded or mitered fitting covers. Thickness of insulation shall be equal to that of adjoining pipe. Mitered covers for pipe 2" and smaller shall be minimum 3-pieces to the side, and pipe 2-1/2" and larger shall be minimum 6-pieces to the side. The fitting shall then be rasped or otherwise formed to have a smooth appearance. Finish with coating reinforced with white glass fabric.
- c. Finish with 1/4-inch layer of Foster 46-50 or Childers CP-10/11 reinforced with glass fabric.

3.3 SHIELDS AND HANGERS

- a. When the insulation is jacketed in aluminum, install a length of 40-pound roofing felt 1/2 inch longer than the insulation shield between shield and jacket.

3.4 COVERING FOR INSULATED PIPING LOCATED OUTDOORS

- a. Provide aluminum jacketing on all insulated piping installed outdoors or as noted.

End of Section 22 07 19.02

SECTION 22 11 16**DOMESTIC WATER PIPING AND APPURTENANCES****1.0 GENERAL****1.1 SCOPE**

- a. This section provides requirements for furnishing and installing domestic hot and cold-water piping.

1.2 RELATED WORK

- a. Division 22, PLUMBING

- (1) Access Doors.
- (2) Valves, Strainers and Vents.
- (3) Low Temperature Piping Insulation.
- (4) High Temperature Piping Insulation.
- (5) Pipe and Pipe Fittings - General.

1.3 STANDARDS

- a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.
- b. Resolve any code violation discovered in contract documents with the Engineer prior to award of the contract. After award of the contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.
- c. Obtain and pay for all permits and inspections.

2.0 PRODUCTS**2.1 PIPING AND FITTINGS**

Provide pipe and pipe fittings of domestic manufacturers only.

- a. Underground Piping.
 - (1) 2-1/2-inch and smaller, provide ASTM B-88, hard-drawn, Type K copper water tube with wrought copper fittings.
- b. Underfloor Piping. Furnish ASTM B 88 cold drawn, Type K copper water tube. Run continuous with no joints under the floor slab to 12-inches above finished floor. Insulate all underfloor piping with 1-inch thick Armaflex AP pipe insulation to 6-inches above finished floor.

- c. Above Ground Piping. Provide seamless ASTM B 88 Type L or CDA alloy 194 heavy copper water tube with wrought copper fittings, ANSI B 16.22. Tape all bare copper piping located in CMU block walls with polyvinyl tape.
- d. Solder. Use Harris "Stay-Safe-Bridgit", lead free, UPC and NSF approved, silver bearing solder with Harris "Stay-Clean" liquid solder flux. Apply per manufacturer's recommendations.
- e. Unions. Provide Class-150, standard, 300-pound water-oil-gas service galvanized, malleable iron unions with ground joint and bronze seat. Flange joints larger than 2-inch. Provide dielectric isolating unions at all junctions or connections between metallic piping of dissimilar metal.

2.2 VALVES

Provide valves of one manufacturer only. Do not provide valves of more than one manufacturer throughout project.

- a. Above Ground Gate Valves.
 - (1) 2-1/2-inches and smaller. Provide Class 150, ASTM B-62, cast bronze composition body and bonnet, ASTM B-371 alloy 694 Copper-silicon alloy stem, brass packing gland, Teflon-impregnated packing, rising stem, solid wedge, union bonnet, screwed end all bronze gate valves with malleable iron handwheel. Stockham B-120, Wallworth 11, Powell 2714, Nibco T-134. Milwaukee Valve Up148.
- b. Below Ground Gate Valves. Provide Class 200, WWP, AWWA, non-rising stem, IBBM, double disk with parallel seat, ASTM A-126 Class B cast body and bonnet, flanged end gate valves with 1-1/4-inch shaft and 2-inch operating nut. Stockham G-745-O, Kennedy 561X, Mueller A-23600-6, or Nibco F609-RW.
 - (1) Provide an adjustable, extension type cast iron valve box with screw or locking slide adjustment, flared base and locking lid with 3/16-inch minimum wall thickness. Provide valve box for each valve. Use covers with appropriate identification marking cast on cover of type service. Western Iron Works Fig. 6-1.
- c. Check Valves.
 - (1) 2-1/2-inches and smaller. Provide Class 125, ASTM B-62, MSS-SP80 cast bronze composition body and cap, screwed end all bronze check valves with brass or bronze swing type disc. Hammond IB904, Stockham B-319, Jenkins 4092, Walworth 3406, Nibco T-413-B or Powell 578. Milwaukee Valve Up148.
- d. Ball Valves. 600 PSI, ASTM B62, B61/B584 cast bronze of ASTM B62, B61 or B584 body, replaceable reinforced Teflon seats, full port, blowout proof stems, stainless steel ball and stem with screwed ends. Watts B-6800-SS, Apollo 77-140 or Nibco T-585-70-66. Milwaukee Valve Up148.
- e. Balancing Valves. Provide Nibco series Fig. 1710 balancing valves with NPT connections. Size, install and balance set in accordance with manufacturer's recommendations.
- f. Pressure Reducing Valve. Provide a spring-loaded valve, with bronze body, threaded end with adjustable spring of corrosion-resistant steel and neoprene coated nylon diaphragm. 200 PSI maximum inlet pressure and adjustable from 25 to 75 PSI outlet pressure. Fisher type 75A or Watts U5B series.

2.3 EXPANSION TANKS

- a. Expansion tanks shall be provide for all domestic hot water heaters and boilers to absorb excessive water pressure and eliminate damage to piping and weeping of the temperature and pressure relief valves. Tanks shall use a bladder or diaphragm for the separation of air and water. Tanks shall be listed and approved for use in the City of Austin. Size and install expansion tanks as recommended by the manufacturer.

- (1) Domestic hot water expansion tanks shall be constructed to ensure that all wetted components are of FDA approved materials.

3.0 EXECUTION

3.1 UTILITIES

- a. Connection to water main, service to water meter, and meter box will be provided by serving utility; however, contractor shall file proper notice and pay all fees and other costs required for complete water service.

3.2 INSTALLATION

- a. Make entire installation per local code requirements.
- b. Keep the inside of the piping free from foreign matter.
- c. Cut all piping neatly, using approved type mechanical cutters without damaging pipe. Use wheel cutters when applicable.
- d. Ream all pipe connections and remove all burrs.
- e. Properly flush all water lines adequately to remove all foreign matter from within plumbing systems prior to installation of fixtures.
- f. For sets of fixtures installed on 4-inch walls or in concrete masonry unit (CMU) walls, provide a separate hot and cold water supply line for each fixture (do not interconnect in wall). Connect the water supply lines above the ceiling. Maintain structural and aesthetic integrity of walls.
- g. Provide all valves, unions and appurtenances shown on floor plans, details, schematics and risers. Provide line-size shut-off valves for all groups of fixtures, each major equipment connection, each floor level and at all main branch connections to mains.
- h. Provide access doors to provide access to all valves and to all appurtenances requiring service or maintenance.
- i. Shutoff valves.
 - (1) Valves shown on drawings are partial requirements only. Contractor shall provide and install all valves shown on drawings, specified in this specification section as well as any additional valves required to isolate each fixture; if single fixture; each group and each battery of fixtures from the building main.

- (2) Provide valves wherever necessary to make repairable all parts of the water supply system without necessitating shutting off the main water supply to the building.
 - (3) Size. Provide full size shutoff valves. All valves shall be full size of the line served.
 - (4) Access door installation. Install shutoff valves such that valve handle is centered behind the door. Valves shall be installed within 6-inches (in depth) from access door and shall be centered in respect to access door opening for easy access.
 - (5) Provide a full size main shutoff valve in cast iron valve box for each water main entering the building. Locate approximately 2-feet from building.
 - (6) On buildings with multiple floors, provide a full size shutoff valve at the base of each water supply riser serving plumbing fixture on the upper floors.
- j. Balancing valves shall be installed where shown on the drawings and where required to properly balance the hot water return system. Reference water heater specifications for other balancing requirements.
- k. Provide all fittings and appurtenances required for a complete and working system.

3.3 MINIMUM COVER

- a. For piping located below floors or finished grade, install piping in trench to the required depth to insure two feet minimum cover over pipe.
- b. All underground piping shall be embedded in sand in accordance with section VIA-1.13a of the "Standard Construction Specifications of the Water and Wastewater Department.

3.4 DRAINAGE

- a. Install water piping systems with uniform horizontal grade of 1/8-inch per 10 feet, to low points to provide complete drainage of the system. Where constant pitch cannot be maintained for long runs, establish intermediate low points and rise to new level.
- b. Grade branches to drain to mains or risers. Unless otherwise indicated, terminate low points of risers with drain valve piped to nearest hub or floor drain. Install a 2-inch drain for pipes 2-inches in diameter and larger. Install line size drain valves for pipes smaller than 2-inches. As drain valves, use gate valves as specified in this section. Route drains to floor drains with adequate air gap for cross connection protection.

3.5 STERILIZATION

- a. Sterilize the main water system with solution containing not less than 50 parts per million available chlorine. Allow chlorinating solution to remain in system for period of 8 hours. Have valves and faucets opened and closed several times during the period. After sterilization, flush the solution from the system with clean water until residual chlorine content is less than 0.2 parts per million.

3.6 ROUGH-IN AND FINAL CONNECTIONS

- a. Make rough-in and final connection of all services to all fixtures requiring plumbing connections. Contractor shall be responsible for installing fixtures at locations shown on the Architectural drawings and providing all service connections at required locations.

- b. Provide service connections to all plumbing fixtures specified and to all equipment furnished by others. Reference section 23 21 00 for rough-in requirements of equipment furnished by others.

3.7 COORDINATION

- a. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.
- b. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical drawings to be knowledgeable of all plumbing connections required and space limitations.
- c. The drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid, costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.
- d. In any case where a pipe shown on a plan sheet differs from that shown on a riser, schematic or detail, use the larger of the two sizes shown.
- e. Do not route any piping above electrical control panels and related electrical equipment. Prior to installation of any piping, determine the actual space requirements and the location of all electrical panels and related electrical equipment. Make all offsets and adjustments as required.

3.8 TESTING

- a. Test under a cold water hydrostatic pressure of 1-1/2 times operating pressure (150 psig minimum) and carefully check for leaks. Repair all leaks and retest system until system holds for at least 24 hours and proven watertight.
- b. Testing shall be verified by Architect/Engineer or appointed Owners representative. At Architect's/Engineer's discretion, the General Contractor shall verify and document the test results. Test findings shall be documented and forwarded to the Architect.

End of Section 22 11 16

SECTION 22 13 16**SOIL, WASTE AND SANITARY PVC DRAIN PIPING,
VENT PIPING AND APPURTENANCES****1.0 GENERAL****1.1 SCOPE**

- a. This Section provides requirements for furnishing and installing piping within buildings and underground laterals.

1.2 RELATED WORK

- a. Division 22, PLUMBING
 - (1) Pipe and Pipe Fittings.
 - (2) Plumbing Fixtures and Fixture Carriers.
 - (3) Drains, Hydrants and Cleanouts.

1.3 STANDARDS

- a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.
- b. Resolve any code violation discovered in contract documents with the Engineer prior to award of the Contract. After award of the Contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.
- c. Obtain and pay for all permits and inspections.

2.0 PRODUCTS**2.1 DRAIN AND VENT PIPE AND FITTINGS**

- a. Waste and vent pipe and pipe fittings shall be:
 - (1) Material. Schedule 40 ASTM D-1784, D-2665, D-3311, FHA UM-79, Federal Specification L-P-320a, IAPMO IS 9-75, PS 27-69, NSF Standard No. 14, cell classification 12454-B (Type I, Grade 1) polyvinyl chloride - drain waste and vent (PVC-DWV) pipe and fittings.
 - (2) PVC pipe and pipe fittings shall have design stresses of 2000 psi at 73°F and shall be listed, tested, and approved for conveying sanitary waste by the Plastic Pipe Institute (PPI) and the National Foundation Testing Laboratory (NSF).
 - (3) Fittings shall conform to ASTM D-2466 and NSF Standard No.14.
 - (4) Solvent cement joints shall be made in accordance with ASTM D-2564 using Purple Primer meeting requirements of ASTM F-656, listed for use on PVC.
 - (5) All piping system components shall be the products of one manufacturer and shall be installed in accordance with the manufacturer's recommendations. Piping shall not be threaded.
 - (6) Fittings and pipe shall be clearly marked in accordance with the requirements of ASTM

standards.

3.0 EXECUTION

3.1 NOTICE AND FEES

- a. Give proper notice and pay all fees and other costs for complete sewer service.

3.2 GRADE AND COVER

- a. Give horizontal pipe a uniform grade of 1/4-inch per foot where possible, but not less than 1/8-inch per foot, unless otherwise shown. Verify all flowline elevations and pipe grades with local authorities for approval of all sanitary piping with grades less than 1/4-inch per foot. Field verify all flow lines shown on drawings.
- b. Prior to installation of any portion of piping, determine the actual space requirements including the space required for proper slope of pipe. Do not install any piping until such flow line elevations and offsets are determined to be acceptable within the limitations of these documents and local code requirements. Make all offsets and adjustments required for proper installation.

3.3 PIPE AND JOINT FABRICATION

- a. Cut plastic pipe with pipe cutters using a cutting wheel specifically designed for plastic pipes.
- b. Remove all burrs, chips, filings, etc. from both the I.D. and O.D. of the pipe before joining. Use a knife, deburring tool, or a half-pound coarse file to remove all burrs.
- c. Bevel all pipe ends to minimize the chances of wiping the solvent cement from the I.D. of the fitting as the pipe is socketed. Use a beveling tool designed to bevel pipe at a 10-degree to 15-degree angle and a depth of 1/16-inch to 3/32-inch.
- d. Using a clean, dry, cotton rag, wipe away all loose dirt and moisture from the I.D. and O.D. of the pipe end and the I.D. of the fitting. Do not solvent weld wet surfaces.
- e. Apply primer to the pipe surface in the same manner, making sure that the length of pipe evenly brushed is at least equal to the fitting socket depth.
- f. For checking penetration, scratch or scrape away the primed surface until a few thousandths of an inch can be removed. Repeat applications of primer to either or both surfaces as necessary. In cold weather, allow more time for proper penetration.
- g. Cover the outer pipe surface literally with solvent cement for a length at least equal to that of the fitting socket depth.
- h. Continue alternate application to the fitting socket with a medium layer of solvent cement. Avoid puddling in the socket. On belled end pipe, do not coat beyond the socket depth or allow cement to run beyond the bell.
- i. Apply a second coat of cement to the pipe. Cement layers must be without voids and sufficient to fill any gaps in the joints.
- j. Immediately upon finishing cement application and before it starts to set, insert the pipe to the full socket depth while rotating the pipe or fitting 1/4-turn to ensure complete and even distribution of the cement. Hold joint together for a minimum of 10 to 15 seconds to make sure that pipe does not move back out of the socket.

- k. Immediately after joining and before joint is set, gently place joint onto a level surface, and wipe off all excess cement from the circumference of the joint.
- l. Do not perform joining operations if ambient temperature is below 40-degrees Fahrenheit. Allow a minimum of 72 hours of joint drying time before subjecting joints to any appreciable internal pressure.

3.4 DRAIN PIPE AND FITTINGS

- a. Offsets and Fittings.
 - (1) Use reduction fittings to connect two pipes of different diameter.
 - (2) Change directions by appropriate use of 45-degree wyes, long-sweep quarter-bends, and sixth-, eighth-, and sixteenth-bends. Sanitary tees may be used on vertical stacks. Use long sweeps at the base of risers.
 - (3) Provide a separate trap at each fixture unless a trap is built into the fixture. Provide a Deep Seal trap at each floor drain and hub drain. Place traps so that the discharge from any fixture will pass through only one trap before reaching a building drain.
 - (4) For sets of fixtures installed in 4-inch walls, provide a separate waste and vent line for each fixture (do not interconnect in wall). Connect the waste lines underfloor and the vent lines above the ceiling. Maintain structural and aesthetic integrity of walls.
 - (5) Do not route any piping above electrical control panels and related electrical equipment. Prior to installation of any piping, determine the actual space requirements and the location of all electrical panels and related electrical equipment. Make all offsets and adjustments as required.
- b. Floor Drains. Provide all required floor drains complete with drain lines and vent lines as required by the section on Drains, Hydrants and Cleanouts.
- c. Cleanouts.
 - (1) Provide drainage lines with properly specified cleanouts. Provide all as required by the section on drains, hydrants, and cleanouts.

3.5 VENT PIPING

- a. Make vent connections to vent stacks with inverted wye fittings. Extend full-size vents through the roof to at least 6-inches above the roof.
- b. Coordinate location of vent penetrations with roofing trades; flashing to be done by roofer.
- c. Offset all vents located near building edge such that no vent through roof piping is located within 5-feet from the building edge (measured from building line not building eave). Make offsets in roof structure space.
- d. Terminate vent through roof not less than 15-feet away from any shaft, window, or outside air intake openings.
- e. All vent and vent branch pipes shall be graded and connected to drip back to sanitary waste piping by gravity.

3.6 ROUGH-IN AND FINAL CONNECTIONS

- a. Make rough-in and final connection of all services to all fixtures requiring plumbing connections.

Contractor shall be responsible for installing fixtures at locations shown on the Architectural drawings and providing all service connections at required locations.

- b. Rough-in and final connection of services to all equipment shall be installed in accordance with the latest edition of the manufacturer's rough-in measurements manual. Contractor shall obtain all such documents.
- c. Use threaded sanitary tapped tee pipe fittings for p-trap connections at walls.
- d. Provide service connections to all plumbing fixtures specified and to all equipment furnished by others. Reference section 23 21 00 for rough-in requirements of equipment furnished by others where applicable.
- e. Install all piping and associated equipment in accordance with manufacturer's recommendations using recommended tools.
- f. Provide all fittings and appurtenances required for a complete working system.

3.7 COORDINATION

- a. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.
- b. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical Drawings to be knowledgeable of all plumbing connections required and space limitations.
- c. The Drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractors shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.
- d. In any case where a pipe shown on a plan sheet differs from that shown on a riser, schematic or detail, use the larger of the two sizes shown.

3.8 PVC PIPE IN RETURN AIR PLENUMS.

- a. Insulate all waste and vent pipes located in return air plenums where pipes do not meet the flame/smoke rating of 25/50 requirements.

3.9 TESTING

- a. Under Floor.
 - (1) Test pipe under floors before connecting to sewers.
 - (2) Maintain not less than 15-feet of hydrostatic head.
 - (3) Repair all leaks and repeat until system holds for 2-hours without a drop in water level.
- b. System Test. After all the various sections of soil, waste and vent piping are installed, but before fixtures are connected, test the system by:
 - (1) Plugging all outlets.
 - (2) Filling the entire system with water and maintaining not less than 10-feet of hydrostatic head to

any portion of the sanitary or vent piping system. Apply water tests to drainage, waste, and vent systems either in its entirety or in sections. Provide extension pieces, wyes, supports, clamps, plugs and all other fittings and materials as required to facilitate plugging and testing.

- (3) Repair all leaks and repeat until system holds for 6-hours without a drop in water level.
- c. Furnish all equipment and labor required to conduct tests.
- d. Contractor shall notify Architect/Engineer or appointed Owner's representative for visual inspection of test. At Architect's/Engineer's discretion, the General Contractor shall verify and document the test results. Test findings shall be documented and forwarded to the Architect/Engineer.
- e. Prior to ceiling and wall cover-up, Contractor shall conduct smoke test of the entire waste and vent system to assure no leaks occur. Prior to test Contractor shall seal all vent through roofs, pump smoke in system. Once complete and accepted by the Architect/Engineer Team, Contractor shall unplug all vent through roofs. Contractor shall conduct a second smoke test when all plumbing fixtures are installed and introduce smoke in piping system as mentioned above. Both tests are to be witnessed and accepted by the Architect/Engineer Team prior to completion of the project.

End of Section 22 13 16pvc

SECTION 22 13 19.13**DRAINS, HYDRANTS, CLEANOUTS AND APPURTENANCES****1.0 GENERAL****1.1 SCOPE**

- a. This section provides requirements for furnishing and installing floor drains, cleanouts, hydrants, water hammer arresters and trap primers.

1.2 RELATED WORK

- a. Division 22 - PLUMBING.
 - (1) Access Doors.
 - (2) Pipe and Pipe Fittings - General
 - (3) Domestic Water Piping.
 - (4) Soil, Waste and Sanitary Drain Piping, Vent Piping.

1.3 JOB REQUIREMENTS

- a. Furnish drains, hydrants and cleanouts shown or specified with all necessary trimmings. Provide drains, drain bodies, hydrants, cleanouts, and similar devices of one manufacturer.
- b. Provide that all porcelain enameled surfaces are acid resistant.

1.4 STANDARDS

- a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.
- b. Resolve any code violation discovered in contract documents with the Engineer prior to award of the contract. After awarding the contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.

2.0 PRODUCTS**2.1 DRAINS**

- a. Floor Drains, Finished Areas, Square Top (FD-1). Furnish a primer coated cast iron floor drain with flashing flange, integral reversible clamping collar, bottom outlet, seepage openings and 8-inch square, adjustable, satin finish nickel bronze strainer head. J.R. Smith 2010B-8NB, Josam 30000-5(8), Wade W-1100-1-G8 or Zurn ZN-415-Y.
- b. Floor Drains, Mechanical Rooms, Shallow Type (FD-2). Furnish a primer coated cast iron floor drain with flashing flange, integral clamping collar, bottom outlet, seepage openings, secured/vandal proof, 9-inch diameter, satin finished nickel bronze, heavy duty/tractor grate and secondary strainer. J.R. Smith 2120-FBS-U-NB, Josam 36000-17-88, Wade W-1310-1-5-8-13 or Zurn ZN-508-VP-S.

2.2 CLEANOUTS

- a. Finished Floors and Concrete Floors, Round Top (FCO). Primer coated cast iron floor cleanout with SV hub outlet, taper thread bronze plug, threaded adjustable housing and ferrule, membrane flange, secured/vandal proof, round-heavy duty-satin finished nickel bronze scoriated top that adjusts to finished floor after concrete has set. For cleanouts located under carpet floors provide an integral carpet marker to indicate location after floor carpeting is installed. Reference Architectural drawings for areas with carpet floors. Jay R. Smith No. 4033L (service weight Speedi-Set hub outlet)-F-C-U (-Y, where applicable), Josam 5600-15-22-41-MODIFIED for Heavy Duty Top (-14, where applicable)-Y, Wade W-6030-D-X-5-26-75-Threaded/Machined for Clamp Device (-72, where applicable) or Zurn ZN-1400 (Neo-Loc)-BP-HD-KC-VP (-CM, where applicable). Set top of floor cleanouts such that top is flush with finished floor.
- b. Outside Areas, Round Top (EXTERIOR FCO). Primer coated cast iron, extra heavy traffic duty floor cleanout with taper thread bronze plug, threaded adjustable housing with flanged ferrule, secured/vandal proof, round, extra heavy duty, gasketed satin finished nickel bronze scoriated top that adjusts to finished grade in field after installation. Cast cleanouts flush in a 16" by 16" by 6" thick concrete pad. Concrete pad and cleanout shall be installed such that the top of pad and cleanout top are both set with top flush with finished grade. Jay R. Smith No. 4113L-U (service weight Speedi-Set hub outlet), Josam 56040-1-15-22-Y, Wade W-6030-Z-XS-1-5-75 or Zurn ZN-1400 (Neo-Loc)-BP-MODIFIED for Extra Heavy-Duty Top-VP. Set top of exterior floor cleanouts such that top is flush with finished grade.
- c. Finished Walls (WCO). Primer coated cast iron cleanout tee with countersunk head, taper thread bronze plug, No-Hub connections and 6-inch diameter-smooth-stainless steel secured access cover with secured/vandal proof screw. J.R. Smith 4532S-U-Y, Josam 58790-15-MODIFIED for No-Hub connections, Wade W-8460-R6-5-MODIFIED for No-Hub connections or Zurn Z-1446-NH-BP-VP.
- d. Unfinished Areas (WCO). Primer coated cast iron cleanout tee with countersunk head, taper thread bronze plug and No-Hub connections. J.R. Smith 4512S-Y, Josam 58910-Z, Wade W-8560-MODIFIED for No-Hub connections-D or Zurn Z-1445-NH-BP.

2.3 HYDRANTS

- a. Wall Hydrants, Non-Freeze, Encased (WH-1). Provide a Line-Guard, Enviro/Guard, Ecolotrol encased flush, anti-siphon, non-freeze wall hydrant with 3/4-inch IPS (threaded end) inlet (of length as required to fit wall construction), satin nickel bronze hinged cover and box face, bronze casing, all bronze interior parts, non-turning operating rod with free-floating compression closure valve, integral backflow preventer, hose connection and tee handle key. Provide to Owner one wall hydrant operating key for each wall hydrant. J.R. Smith 5509-NB, Wade W-8625 or Zurn ZN-1300.
- b. Hose Bibbs, Finished Areas, Polished Chrome Finish (HB-1). Provide a polished chrome plated, short-pattern single sink faucet/hose bibb with self-contained and interchangeable operating nut (quarter turn), 3/4-inch flanged female inlet, 3/4-inch hose thread outlet and polished chrome plated lever handle. Equip complete with non-removable, spout end vacuum breaker with 3/4-inch female hose thread inlet and 3/4-inch male hose thread outlet. Chicago Faucet No. 15-E27.

2.4 WATER HAMMER ARRESTERS

- a. Type. Plumbing and Drainage Institute (PDI) certified (Standard P.D.I. WH-201), American Society of Sanitary Engineering approved (ASSE Standard ASSE-1010), ANSI A112-26-1M, 350 PSI, piston type, O-ring sealed hydraulic water hammer arresters contained in a factory charged and sealed pressurized compression chamber. Chamber shall consist of a copper casing having sufficient displacement volume

to dissipate the calculated kinetic energy generated in the piping system. Units shall have lifetime warranty and shall be assembled with lead free solder. Sioux Chief "Hydra-Rester" 65X-Series (Josam, Precision Plumbing Products, Watts or Wilkins/Zurn equal).

- (1) Contractor shall be responsible for obtaining and installing the proper number and size of water hammer arresters, including all arresters where special requirements occur. Where fixture unit counts/totals exceed the scheduled ratings, provide factory engineered, rechargeable water hammer arrestors complete with pressure gauge and air valve.
- (2) Water Hammer Arrester sizes shown on drawings are minimum size requirements only (quantities are partial requirements only). Water hammer arresters shall be of sufficient size and shall be installed throughout the water systems such that there will be no noise, movement in the piping system or damage to equipment due to water hammer. Adequately protect all equipment and fixtures requiring water hammer protection.
- (3) Access Doors. Provide a 10-inch (minimum) square access door for single arrester installations and a 14-inch square (minimum) door for two arrester installations in walls. Provide minimum 14-inch square access door for all arresters located above ceilings except for arresters located directly above lay-in-place acoustic tile ceilings.

2.5 TRAP PRIMERS

- a. Provide UPC/IAPMO listed and approved, pressure actuated, automatic trap primers with integral air gap/vacuum breaker ports (near outlet opening). Provide a trap primer that automatically maintains a constant water seal in one to four drain traps and operates on the principle of differential pressure. The trap primer shall be made of corrosion resistant brass and shall not rely on springs or diaphragms for activation. Precision Plumbing Products Inc. "PRIME-RITE".
 - (1) Equip primers with distribution units as required to provide an individual drain line to each hub drain or floor drain. Trap primers are required on all floor drains and hub drains.
 - (2) Provide a trap primer, water supply line (from nearest available domestic cold water supply line), ball valve, union, trap primer, distribution unit, connector fittings, drain line to floor or hub drain and access door (12-inch by 24-inch minimum) for each floor drain and hub drain whether or not shown on drawings.
 - (3) Unless otherwise noted, for each floor drain and hub drain provide a galvanized cast iron trap primer connector fitting with 1/2-inch or 3/4-inch female thread side inlet trap primer connection. Do not use threaded or No-Hub connections on trap primer connector fittings located below floors. J.R. Smith 2695-G series, Josam, Wade W-2430-39 series or Zurn ZG-1023 series.
 - (a) All galvanizing shall be factory applied and performed, field or shop galvanizing is not acceptable.
 - (b) Floor drains with trap primer connections may be provided in lieu of auxiliary inlet fittings (if available as an option on floor drains).

2.6 WATERPROOFING MEMBRANE

- a. When a membrane is not provided in floor or roof construction, provide a membrane of size that extends a minimum of 12-inches on either side of floor drain, roof drain or cleanout.

- b. Membrane shall be 4-pound per square foot sheet lead, Number 24 B & S gauge sheet copper or three layers of standard grade 15-pound asphalt impregnated roofing felt with each layer thoroughly hot mopped to ensure a completely watertight installation.
- c. Coordinate waterproofing with appropriate trades.

3.0 EXECUTION

3.1 INSTALLATION

- a. General.
 - (1) Install in accordance with manufacturer's recommendations and as shown on the drawings.
- b. Floor Drains
 - (1) Coordinate flashing work with work of other trades. Coordinate with floor slab work to interface drains with concrete.
 - (2) Install floor drains at the low points of the surface areas to be drained. Set top of drains 1/2-inch below finished floor elevation unless otherwise shown on mechanical or structural drawings. Set floor drain grates such that top of grate is installed flush with surrounding floor elevation.
 - (3) Adequately grout around all floor drain tops. Fill in gaps between floor drain and floor with grout (or other rigid concrete-based material) that matches the surrounding finished flooring in both color and texture.
 - (4) Install drain flashing collar or flange such that no leakage occurs between drain and adjoining flooring. Maintain watertight integrity of penetrated waterproof membranes.
 - (5) Position drains such that installed drains are accessible and easy to maintain.
 - (6) All floor drains and hub drains shall be individually vented to outside or nearest vent of adequate size. Provide a vent line for each floor drain and hub drain whether or not shown on drawings. Provide a 2-inch diameter (minimum) individual vent line.
- c. Cleanouts.
 - (1) Location
 - (a) Cleanouts shown on drawings are partial requirements only. Contractor shall provide and install all cleanouts shown on drawings specified in this specification section as well as any additional cleanouts required by code authorities having jurisdiction.
 - (b) Provide cleanouts wherever necessary to make accessible all parts of the drainage soil or waste systems.
 - (c) Provide a line size cleanout on each horizontal drain line 5-feet or greater in length.
 - (d) Locate cleanouts in runs not more than 50 feet apart and provide all additional cleanouts required by local authority having jurisdiction. 50-foot spacing between cleanouts shall include length of vertical risers at cleanouts. All portions of the drain system shall be accessible to a 50-foot drain and sewer cleaning/rodding machine through cleanouts.

- (e) Provide cleanouts where soil or waste lines change in direction of more than 90° as well as any other cleanouts required by local authority having jurisdiction.
 - (f) Provide cleanouts at the end of each continuous waste line and at the end or each battery of fixtures.
 - (g) Provide a line size wall cleanout at each sink and each urinal.
 - (h) Provide cleanouts at the base of each soil or waste stack.
 - (i) Provide a full size upper terminal cleanout at each run of piping which is more than 50 feet in total developed length or fraction thereof, except on horizontal drain lines less than five feet in length unless such line is serving sinks or urinals (cleanouts are required at all sinks and at all urinals).
 - (j) Provide a full size, cast iron, double, two-way cleanout with two exterior floor cleanouts extended to grade and casted into an 18-inch by 24-inch by 6-inch concrete pad for each drain line extending from building. Risers from double two-way cleanout fitting to cleanouts shall be standard weight, cast iron, DWV, bell and spigot soil pipe and pipe fittings.
 - (2) Size. Install cleanouts the same size as the soil waste lines in which the cleanouts are placed; however, no cleanout should be larger than 4 inches in diameter.
 - (3) Installation.
 - (a) Set top of floor clean-outs such that top is flush with finished floor (including tile). Top of exterior floor cleanouts shall be installed flush with finished grade.
 - (b) Where cleanouts occur in pipe chases, bring the cleanouts through the walls, and install covers. Wall cleanout plugs shall be installed within 3-inches (in depth) from access door and shall be centered in respect to access door opening for easy access.
 - (c) Install cleanout flashing collar of flange such that no leakage occur between cleanout and adjoining flooring. Maintain watertight integrity of penetrated waterproof membranes.
 - (d) Cleanouts shall be readily accessible and shall be located at a minimum of 18-inches from any wall, fixture, equipment, or other obstruction.
 - (e) Adequately grout around all floor cleanout tops. Fill in gaps between cleanouts and floor with grout (or other rigid concrete-based material) that matches the surrounding finished flooring in both color and texture.
 - (4) Waterproofing. Coordinate flashing work with work of other trades.
- d. Hydrants.
- (1) Unless otherwise noted, install all hose bibbs at 16-inches above finished floor and all wall hydrants at 16-inches above finished grade.
- e. Water Hammer Arresters

- (1) Provide hydraulic water hammer arrestors in cold and hot water supply lines to each fixture, if single fixture, and to each battery of fixtures; and at each automatic, solenoid-operated, or quick-closing valve serving mechanical, kitchen or laundry equipment.
- (2) Hammer Arrestors shown on drawings are partial requirements only. Water hammer arrestors shall be installed throughout the water systems such that there will be no noise, movement in the piping system or damage to equipment due to water hammer. Adequately protect all equipment and fixtures requiring water hammer protection.
- (3) All water hammer arrestors shall be installed directly behind such access doors and shall be readily accessible for easy replacement.

f. Trap Primers.

- (1) Trap primers are required on all floor drains and hub drains. Install a trap primer, water supply line, ball valve, union, trap primer distribution unit, connector fittings, 1/2-inch copper drain line to floor or hub drain and access door (12-inch by 24-inch minimum) for each floor drain and hub drain whether or not shown on drawings.
- (2) Trap primers may be omitted on floor drains located in toilet rooms if first approved by authorities having jurisdiction.
- (3) Trap primers, trap primer drain lines and distribution units to floor drains or hub drains located in mechanical rooms may be installed exposed above the finished floor level. Auxiliary inlet fittings and access doors may be deleted. Provide a minimum 1-inch air gap between floor drain or hub drain and trap primer drain line.
- (4) Equip primers with distribution units as required to provide an individual drain line to each hub drain or floor drain.

3.2 PROTECTION OF FINISH

- a. All floor drains, cleanouts and wall hydrants shall be adequately protected from physical damage during construction. Grates, covers, and tops that have been marred or damaged shall be replaced with new or equal design, material, and finish at no cost to the Owner. Grates, covers and tops shall have a new and unmarred look at time of construction end.

3.3 COORDINATION

- a. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough-in locations but only for pipe sizing and general routing.
- b. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical drawings to be knowledgeable of all plumbing connections required and space limitations.
- c. The drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment, or other obstructions.

End of Section 22 13 19.13

SECTION 22 33 00**ELECTRIC DOMESTIC WATER HEATERS (LESS THAN 10 KW)****1.0 GENERAL****1.1 SCOPE**

- a. This section includes hot water heating systems complete as shown, including hot water heaters and pressure temperature relief valves as scheduled.

1.2 RELATED WORK

- a. Division 22, PLUMBING.
 - (1) Pipe and Pipe Fittings - General.
 - (2) High Temperature Piping Insulation.
 - (3) Domestic Water Piping and Appurtenances.

1.3 CERTIFICATION

- a. Provide a water heater tested, listed and labeled by the Underwriters (U.L.) Laboratories for 150 PSI standard working pressure and shall comply with the National Electrical Manufacturers Association (NEMA) standards.

2.0 PRODUCTS**2.1 CAPACITY**

- a. Water heaters shall have the storage capacity, efficiencies, and gallons per hour recovery at 100F rise as scheduled on drawings. Water heaters shall meet energy efficiency standards of ASHRAE 90A-1980 and the efficiency standards of the City of Austin Energy Conservation Code.

2.2 TANK

- a. Provide a glass-lined tank with an alkaline borosilicate composition that has been fused to steel by firing at a temperature range of 1400F to 1600F. Equip tank with extruded aluminum, sacrificial anode rods, required piping, piping connections, ASME rated ANSI Z 21.22 temperature and pressure relief valve, drain valve, thermometers, and all other required openings. Tank shall be rated for 150 PSI working pressure.

2.3 INSULATION

- a. Insulate the water heater with factory applied high density fiberglass (or similar product) and trim with a heavy-gauge, enameled steel jacket.

2.4 GUARANTEE

- a. Provide a 1-year limited warranty on water heater as available from manufacturer.

2.5 INSTALLATION AND TESTING

- a. Water heater shall be tested and installed according to the current installation instructions provided with the unit.

3.0 EXECUTION

3.1 INSTALLATION

- a. Install a line size shut-off valve in the cold-water supply close to each heater.
- b. Provide approved dielectric couplings for all cold water and hot water connections to storage tank, and at pressure and temperature relief valve connection.
- c. Check operation of safety controls and devices and proper settings of elements.
- d. Have the authorized representative of the water heater available if requested.
- e. Install according to manufacturer's specifications and pipe as shown.

3.2 DISCHARGE PIPING

- a. Discharge piping from temperature and pressure relief valve shall be routed to nearest floor drain, hub drain or other approved point of safe discharge. Discharge piping shall be full size, in diameter, of relief opening of temperature and pressure relief valve.

End of Section 22 33 00

SECTION 22 40 00
PLUMBING FIXTURES

1.0 GENERAL

1.1 SCOPE

- a. This section provides requirements for furnishing and installing water closets, lavatories, sinks, mop sinks, showers, thermostatic mixing valves, electric drinking fountains, and wall boxes.

1.2 APPLICABLE PROVISIONS

- a. Refer to Section 22, PLUMBING

1.3 JOB REQUIREMENTS

- a. Furnish plumbing fixtures shown or specified with all necessary trimming. Furnish faucets, fittings, supply stops and similar devices of one manufacturer.
- b. Unless otherwise specified, all sink faucets shall be washerless. Seats on faucets specified with renewable/replaceable seats shall be Monel.
- c. Furnish chair carriers for all walls hung fixtures.
- d. All porcelain enameled surfaces shall be acid resistant porcelain.
- e. All plumbing fixtures shall be new and unused, free from imperfections, true as to line, angles, curves, and color. Smooth, watertight and complete in every respect.

1.4 STANDARDS

- a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.
- b. Furnish and install required plumbing fixtures for use by handicapped as required by the latest edition of the Texas State Purchasing and General Services Commission Act or Elimination of Architectural Barriers and any other state or local code requirements.
- c. Obtain and pay for all permits and inspections.
- d. All fixtures shall comply with A112.19 and all subsections.
- e. All faucets, valves, stops, etc. conveying water for human ingestion shall conform to NSF 61, Section 9.

2.0 PRODUCTS

2.1 WATER CLOSETS

- a. Floor Mounted Water Closets, Wheelchair (WC-1). (Adult ADA/TAS)
 - (1) Fixture. Furnish and install a white vitreous china, siphon jet flushing action, elongated front, floor mounted measuring 16-1/2 inches high from finished floor to top of rim with 1-1/2-inch top

spud. Water closet fixture shall be designed to flush efficiently with a maximum 1.28 gallons per flush and shall be equipped with two (2) white bolt covers/caps. American Standard No. 3461.001 with two American Standard No. 48310 100 bolt covers or approved equivalent.

- (2) Trim. Equip fixture with a diaphragm quiet flush, exposed water closet flush valve made of brass with metal oscillating non hold open type handle, 1 inch IPS screw driver operated back check angle stop with protective cap, renewable main valve seat, adjustable threaded union tailpiece, vacuum breaker, 1 1/2 inch by 1 1/2 inch flush tube and connection with spud coupling for 1 1/2 inch top spud, spud securing nut, wall and spud flanges, 1.28 gallon flush regulator, solid ring pipe support all with polished chrome finish. Flush control shall be mounted on wide side of handicapped toilet area or as directed by Architect. Sloan No. 111 or approved equivalent.
- (3) Seat. Furnish and install a white, extra heavy duty/extra heavy weight, injection molded solid plastic, institutional/industrial grade toilet seat. Seat shall be manufactured of high impact resistant, polystyrene or polypropylene plastic with open front, elongated toilet seat design, less cover. Toilet seat shall be equipped with series 300 stainless steel combination self-sustaining/concealed check hinges. Self-sustaining mechanisms and hinge posts in both hinges shall be series 300 stainless steel and shall be integrally molded into seat assembly. Hinge posts shall be fitted Sta-Tite Fastening System. Toilet seats shall have integral bumpers permanently molded into the seat and shall be of color matched molded plastic. Church "MOLTEX" No. 9500SSC or approved equivalent.
- (4) Heavy duty Torque set cast iron flange with integral compression seal to waste line and test cap. Jonespec No. CF2982 and closet flange Jonespec No. 2980.
- (5) Closet Bolt Assemblies. Furnish and install two solid brass water closet floor flange bolt assemblies (plated brass is not acceptable). Each bolt assembly shall consist of a solid brass slotted head bolt, two solid brass nuts, two heavy solid brass washers and two resilient rubber washers.

2.2 LAVATORIES

a. Wall Hung Lavatories (LAV-1).

- (1) Fixture. Furnish and install a white vitreous china, wall hung, lavatory with back and side splash guards. Lavatory fixture shall measure 20 inches wide by 18 inches deep and shall be drilled for concealed arm carrier. Furnish fixture with faucet holes on 8-inch centers and front overflow ports. American Standard No. 0356.015 or approved equivalent.
- (2) Trim. Furnish and install solid brass all polished chrome 8-inch center, concealed mounted, 4-inch wrist blade and rigid copper tube inlets. Faucet shall be equipped with 1.5 gpm flow restricting aerator. Furnish complete with 1 1/4-inch polished chrome plated brass vandal proof grid assembly and tail piece. Chicago Faucet No. 404-317CP, or approved equivalent.
- (3) Supplies. Furnish and install 1/2-inch IPS, all brass lavatory supply assembly with 1/2-inch x 3/8 inch loose key handle angle valve with 1/2-inch IPS female thread inlet, 3/8-inch O.D. by 12-inch-long flexible tube riser and brass pipe escutcheon all with polished chrome finish. Entire assembly shall be made of brass. Supply stops with plastic internal parts are not acceptable. McGuire No. 2165 LK, Specified Trim No. ST2165LK, or approved equivalent. Equip each supply stop with a polished chrome plated, ASTM B 43 80, threaded, red brass pipe nipple.
- (4) Traps. Furnish and provide 1 1/2-inch adjustable cast brass "P" trap with tubing drain to wall, 1 1/4-inch inlet, 1 1/2-inch outlet, ground swivel joint, cast brass nuts, cast brass clean out plug and brass escutcheon, all with polished chrome finish. McGuire No. 8902, Specified Trim No. 8902C, or approved equivalent.

- (5) Mixing Valve. Furnish and install point of use valve, lead free, ASSE 1070 certified. Bradley S59-4016 or approved equivalent.
- (6) Insulate all exposed drainpipes and hot water supply piping as required by the latest edition of Texas State Purchasing and General Services Commission (Texas State Building Commission) Rules and Regulations on the Elimination of Architectural Barriers with Dearborn safety series ADA compliant tubular covers.

b. Wall Hung Lavatories (LAV-2).

- (1) Fixture. Furnish and install a white vitreous china, wall hung, lavatory with back and side splash guards. Lavatory fixture shall measure 20 inches wide by 18 inches deep and shall be drilled for concealed arm carrier. Furnish fixture with faucet holes on 4-inch centers and front overflow ports. American Standard No. 0355.012 or approved equivalent.
- (2) Trim. Furnish and install single control, deck mount metering, vandal resistant, 4-inch center, single supply lavatory faucet 1/2-inch O.D. copper tube inlets. Furnish faucet complete with 1-1/4-inch, polished chrome plated brass vandal proof grid drain assembly and tailpiece. Faucet shall be designed in accordance with ANSI A117.1 (handicap standards), shall operate with less than 5 pounds force and listed for handicap/barrier free use. Faucet spout shall be equipped with a 1.5 GPM flow restricting aerator. Chicago Faucet No. 857-665PSHABCP or approved equivalent.
- (3) Supplies. Furnish and install 1/2-inch IPS, all brass lavatory supply assembly with 1/2-inch x 3/8 inch loose key handle angle valve with 1/2-inch IPS female thread inlet, 3/8-inch O.D. by 12-inch-long flexible tube riser and brass pipe escutcheon all with polished chrome finish. Entire assembly shall be made of brass. Supply stops with plastic internal parts are not acceptable. McGuire No. 2165 LK, Specified Trim No. ST2165LK, or approved equivalent. Equip each supply stop with a polished chrome plated, ASTM B 43 80, threaded, red brass pipe nipple.
- (4) Traps. Furnish and provide 1 1/2-inch adjustable cast brass "P" trap with tubing drain to wall, 1 1/4-inch inlet, 1 1/2-inch outlet, ground swivel joint, cast brass nuts, cast brass clean out plug and brass escutcheon, all with polished chrome finish. McGuire No. 8902, Specified Trim No. 8902C, or approved equivalent.
- (5) Insulate all exposed drainpipes and hot water supply piping as required by the latest edition of Texas State Purchasing and General Services Commission (Texas State Building Commission) Rules and Regulations on the Elimination of Architectural Barriers with Dearborn safety series ADA compliant tubular covers.

c. Wall Hung Stainless Steel Lavatories (LAV-3).

- (1) Fixture. Furnish and install stainless steel, 18-gauge, type 304, wall hung, lavatory with back splash. Lavatory fixture shall measure 18 inches wide x 14 1/2 inches x 11" Deep deep. Elkay No. EHS-18X or approved equivalent.
- (2) Trim. Faucet included with sink.
- (3) Supplies. Furnish and install 1/2-inch IPS, all brass lavatory supply assembly with 1/2-inch x 3/8 inch loose key handle angle valve with 1/2-inch IPS female thread inlet, 3/8-inch O.D. by 12-inch-long flexible tube riser and brass pipe escutcheon all with polished chrome finish. Entire assembly shall be made of brass. Supply stops with plastic internal parts are not acceptable. McGuire No. 2165 LK, Specified Trim No. ST2165LK, or approved equivalent. Equip each supply stop with a polished chrome plated, ASTM B 43 80, threaded, red brass pipe nipple.

- (4) Traps. Furnish and provide 1 1/2-inch adjustable cast brass "P" trap with tubing drain to wall, 1 1/4-inch inlet, 1 1/2-inch outlet, ground swivel joint, cast brass nuts, cast brass clean out plug and brass escutcheon, all with polished chrome finish. McGuire No. 8902, Specified Trim No. 8902C, or approved equivalent.
- (5) Insulate all exposed drainpipes and hot water supply piping as required by the latest edition of Texas State Purchasing and General Services Commission (Texas State Building Commission) Rules and Regulations on the Elimination of Architectural Barriers with Dearborn safety series ADA compliant tubular covers.

2.3 SINKS

a. ADA Single Compartment Sink (SK 1).

- (1) Fixture. Furnish and install self rimming, ADA single compartment, 18-gauge type 302 stainless steel sink with 3 faucet holes and fully undercoated underside. Elkay No. LRAD 2219 55; 19-inch x 19-inch x 5 1/2-inch deep or approved equivalent.
- (2) Trim. Furnish and install concealed mount, 4-inch wrist blade handles, swing gooseneck, 1/2-inch inlets. Removable/replaceable cartridges, stainless steel cartridge system, 2.2 gpm flow restrictor, all polished chrome finish. Chicago Faucet No. 201-AGN2AE3-317CP, or approved equivalent.
- (3) Supplies. Furnish and install 1/2-inch IPS angle stops with 1/2-inch O.D. by 12-inch flexible tube riser, escutcheon and loose key control all with polished chrome finish. McGuire No. 2167 LK, Specified Trim No. ST2167LK, or approved equivalent.
- (4) Trap. Furnish and install 1 1/2-inch adjustable cast brass "P" trap with tubing drain to wall, ground swivel joint, clean out plug and brass escutcheon, all with polished chrome finish. McGuire No. 8912, Specified Trim No. ST8912C, or approved equivalent.
- (5) Strainer. Furnish and install sink complete with stainless steel strainer fitting with stainless steel conical strainer basket, neoprene stopper and stainless steel 1 1/2-inch tailpiece. Elkay "DUO STRAINER" No. LK 35B, Specified Trim No. ST151A, or approved equivalent.
- (6) Mixing Valve. Furnish and install point of use valve, lead free, ASSE 1070 certified. Bradley S59-4016 or approved equivalent

2.4 MOP SINKS (MS-1)

- a. Fixture. Furnish and install a terrazzo mop sink with stainless steel cap and 2 tiling flanges. Stern Williams No. CRS-2202 28-inch x 28-inch x 12 inch deep or approved equivalent.
- b. Equip fixture complete with nickel bronze strainer and Stern Williams "BP" stainless steel splash catcher panels on two sides.
- c. Trim. Furnish and install a Stern Williams No. T 15 VB, mop service sink faucet with integral stops, spout with bucket hook, 3/4-inch hose thread end, vacuum breaker, adjustable top brace, inlets on 8-inch centers, all with polished chrome finish. Furnish a Stern Williams No. T 35 36-inch-long hose with 3/4-inch polished chrome coupling and stainless-steel wall bracket with rubber grip and T 40, 24-inch-long stainless steel mop hanger with three rubber spring loaded grips.

2.5 SHOWERS**a. Stall Showers, (SH-1)**

- (1) Furnish and install shower panel, 18-gauge Type 304 stainless steel polished to a No. 4 finish. All exposed parts shall be chrome plated brass. Shower valve shall be a single temperature mixing valve. Bradley No. WS-1 WCA-TMV-S15-AKV-SD-SHV-VS or approved equivalent. Note: Shroud shall extend up to ceiling.

b. ADA Shower (SH-2)

- (1) Furnish and install barrier-free temperature mixing valve, vandal-resistant showerhead, 60-inch stainless steel hose with quick connect, vacuum breaker, shower spray at end of hose, hose hook, Bradley No. WS-1WCA-ADA-TMV-ST-SB-SHV-VS or approved equivalent. Note: Shroud shall extend to ceiling.

2.6 ELECTRIC DRINKING FOUNTAINS**a. Wall Hung Electric Drinking Fountains (EDF-1).**

- (1) Fixture. Furnish and install Vandal-Resistant Bottle Filling Station & Bi-Level Cooler Non-Filtered Refrigerated Stainless. Chilling Capacity of 8.0 GPH (gallons per hour) of 50° F drinking water, based on 80° F inlet water and 90° F ambient, per ASHRAE 18 testing. Laminar Flow, Real Drain, Vandal Resistant. Furnished with Vandal Resistant bubbler. Electronic Bottle Filler Button with Mechanical Front Bubbler Button activation. Elkay No. VRCTL8WSK with Elkay No. 98324C Cane Apron.
- (2) Supplies. Furnish and install straight screwdriver stop with 1/2-inch IPS inlet and outlet. Elkay No. LK 2680 or approved equivalent.
- (3) Trap. Furnish and install 1 1/4-inch adjustable cast brass "P" trap with tubing drain to wall, ground swivel joint, clean out plug and cast brass escutcheon, all with polished chrome finish. McGuire No. 8872 or approved equivalent.

2.7 WALL BOXES

- a. Wall Boxes, Refrigerator (WB 1). Furnish and install Oatey MODA ice maker box with brass angle valve with water hammer arrestor or approved equivalent. Use fire-rated boxes where installed in fire-rated walls.

2.8 FIXTURE CARRIERS

- a. Lavatory Carriers. For high back lavatories, furnish and install a ZURN ZR 1224 series concealed chair carriers with concealed arms or approved equivalent.
- b. Electric Drinking Fountain Carriers. Furnish and install a ZURN ZR 1225 series concealed drinking fountain carriers with adjustable support plates or approved equivalent.

2.9 PROTECTIVE DEVICES

- a. Approved backflow preventers shall be used to connect piping to plumbing fixtures or equipment that do not have an approved integral device for cross connection protection.
- b. Reduced Pressure Principal Type. Furnish a Watts Number U 909 S HW QT Reduced Pressure

Principal backflow preventer. Equip complete with bronze strainer, stainless steel check modules, quarter turn ball valves and integral body unions.

- (1) For each backflow preventer valve, furnish a Watts 909 AG Fixed Air Gap Fitting with inlet compatible with outlet of backflow preventer relief valve opening. Furnish a full-size drain line from air gap fitting to floor drain or hub drain.

2.10 FLOW RESTRICTORS AND TEMPERING VALVES

- a. Furnish and install flow restrictors and tempering valves to all fixtures requiring water flow and/or temperature regulation as required to meet local code requirements and to regulate water flow for instantaneous water heaters. Furnish either in line or faucet end type flow restrictors (Use of either type is acceptable). Furnish access to all in line flow restrictors located in walls or above ceilings.

2.11 CHROME FINISH

- a. All exposed fixture trim, including (but not limited to) p traps, supplies, riser supports, flex tube risers, etc. shall have a polished chrome finish. Furnish all polished chrome finished nipples, extension pieces, escutcheons, etc. required to meet this requirement.

3.0 EXECUTION

3.1 INSTALLATION

- a. Set fixtures at heights as directed and approved by Architect.
- b. Rigidly secure all water supply piping to wall structure. The piping in the wall shall be secured to wall such that flush valve or supply piping will not have any movement during valve activation or when jarred (typical for all plumbing fixtures).
- c. Furnish and install adequate pipe supports in walls at all supply and drain lines extending through walls to rigidly secure all supply lines to all fixtures with special concentration on water closet and urinal supply lines. Contractor shall install additional pipe supports, metal framing, Unistrut, nuts, bolts, clamps and metal channels as required to adequately and rigidly secure all valves and supply piping in pipe chases and to prevent damage to plumbing fixtures. Movement of piping within wall due to valve activation or jarring will not be acceptable.
- d. At each water supply stop serving lavatories and sinks, furnish and install a plastic support bracket as manufactured by P & M Company to adequately secure piping in wall. In lieu of such brackets, cast brass drop ear elbow fittings may be used when adequate blocking is installed in wall and brass elbow is rigidly secured to blocking in wall (secure to wall with brass screws or copper nails). In either case install an additional copper tubing strap located not more than 1 inch from elbow at supply stop and adequately secure to blocking in wall with brass screws or copper nails. Connect supply stop to elbow in wall using ASTM B 43 80, threaded, red brass pipe nipples. Conceal pipe nipples in wall. Where pipe nipples cannot be concealed, install polished chrome plated, threaded, red brass pipe nipples. Under no circumstances shall steel nipples be used.
- e. All escutcheons shall be installed flush to wall (no gap between wall and escutcheon plate). Caulk all wall penetrations behind pipe escutcheons. Air tight with Dow Corning No. 2000 Fire Stop Sealant or approved equivalent. Wall penetrations shall not be larger than the escutcheon installed. All escutcheons of same type of service shall be of same physical size. Reference the section on Pipe and Pipe Fittings General for additional requirements on pipe escutcheons.
- f. All plumbing trim shall be installed in a neat and well-organized manner with services running parallel with the primary lines of the building construction.

- g. Install all appurtenances required for a complete and working system.
- h. Install all fixtures and trim in accordance with the manufacturer's recommendations and as shown on drawings.

3.2 ROUGH-IN AND FINAL CONNECTIONS

- a. Make rough in and final connection of all services to all fixtures requiring plumbing connections. Contractor shall be responsible for installing fixtures at locations shown on the Architectural drawings and providing all service connections at required locations.
- b. Rough in and final connection of services to all equipment shall be installed in accordance with the latest edition of the manufacturer's rough in measurements manual. Contractor shall obtain all such documents.
- c. Install service connections to all plumbing fixtures specified and to all equipment furnished by others. Reference Section 15060 for rough in requirements of equipment furnished by others.

3.3 QUALITY AND PROTECTION

- a. All plumbing fixtures shall be free from imperfections, true as to line, angles, curves and color, smooth, watertight and complete in every respect. Chipped, scratched, marred or disfigured fixtures shall be replaced with new fixtures. Contractor shall replace all fixtures found to be damaged or defective.

3.4 COORDINATION

- a. Making adjustments to field conditions is considered a part of the work required. Do not use contract drawings accompanying these specifications for rough in locations but only for pipe sizing and general routing.
- b. Contractor shall examine and familiarize himself with the Architectural, Structural, Electrical and Mechanical drawings to be knowledgeable of all plumbing connections required and space limitations
- c. The Drawings are diagrammatic and are not intended to show all the fittings required. Contractor shall include in his bid costs for items of material and labor which are not specifically called for in drawings or specifications, but which are required to make plumbing installation. Contractor shall make any necessary changes to avoid beams, footings, columns, piers, vents, ducts, equipment or other obstructions.
- d. Contractor shall coordinate physical requirements of all countertop fixtures with all other trades. Prior to submittal on these fixtures, the contractor shall verify space limitations.

3.5 CLEANING AND ADJUSTING

- a. Thoroughly clean and disinfect all plumbing fixtures, including all exposed trim. At work completion all plumbing fixtures and trim shall be clean and free from any stains, sediment, waterspouts, oils, factory shipping wrapping/protective covers, installation instruction stickers/labels, etc. Disinfect all plumbing fixtures using commercial disinfecting agents.
- b. Properly flush all water systems, clean and service all strainers and plumbing connections to facilitate proper operation of fixture valves. Install servicing until all water systems and appurtenances prove to be clean, free of debris and operating properly.
- c. Adjust all flush valves and self-closing valves for proper flushing or operation, but without excess use of water. Water closets shall not exceed 1.28 gallons per flush, urinals shall not exceed 1 gallon per flush and lavatory faucets shall remain open for a minimum of 10 seconds, and a maximum of 20 seconds. Demonstrate to the Architect (or representative) that the entire system and all components thereof are

functioning properly.

- d. Install such equipment and personnel as required to conduct tests and demonstrate the acceptability of the various plumbing systems.
- e. Have the authorized representatives of the various manufacturers available if requested

End of Section 22 40 00

SECTION 23 00 00**MECHANICAL GENERAL PROVISIONS****1.0 GENERAL****1.1 SUMMARY**

- a. Except as modified in this section, General Conditions, Supplementary Conditions, applicable provisions of Division 01, General Requirements, and other provisions and requirements of the contract documents apply to work of Division 23, HVAC, Division 22, Plumbing, and Division 21, Fire Protection.
- b. Applicable provisions of this section apply to all sections of Division 23, HVAC.
- c. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details of special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems or required to complete the installation, whether mentioned or not.

1.2 CODE REQUIREMENTS AND PERMITS

- a. Perform work in accordance with applicable statutes, ordinances, codes, and regulations of governmental authorities having jurisdiction.
- b. Resolve any code violation discovered in contract documents with the Engineer prior to award of the contract. After award of the contract, make any correction or additions necessary for compliance with applicable codes at no additional cost to Owner.
- c. Obtain and pay for all permits and inspections.

1.3 REFERENCE SPECIFICATIONS AND STANDARDS

- a. Materials which are specified by reference to Federal Specifications; ASTM, ASME, ANSI, or AWWA Specifications; Federal Standards; or other standard specifications must comply with latest editions, revisions, amendments or supplements in effect on date bids are received. Requirements in reference specifications and standards are minimum for all equipment, material, and work. In instances where capacities, size or other feature of equipment, devices or materials exceed these minimums, meet listed or shown capacities.

1.4 CONTRACTOR QUALIFICATIONS

- a. An acceptable contractor for the work under this division shall be a specialist in this field and have the personal experience, training, skill and the organization to provide a practical working system. If required, he shall be able to furnish acceptable evidence of having contracted for and installed not less than three systems of comparable size and type to this one, that have served their owners satisfactorily for not less than three years.
- b. The foreman for this work shall have had experience in installing not less than three such systems and shall be approved before the work is begun. Adequate and competent supervision shall be provided to ensure first class workmanship and installation.

- c. Work shall be executed, and all materials installed in accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen, presenting a neat appearance when completed. Work shall be performed by mechanics skilled in the trade.
- d. The Contractor shall be responsible for all construction techniques required for all mechanical systems specified and shown on the drawings.

1.5 REQUEST FOR INFORMATION

- a. The Contractor may, after exercising due diligence to locate required information, request from the Consultant clarification or interpretation of the requirements of the Contract Documents. The consultant shall respond to such Contractor's requests for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract documents or is reasonably inferable from them, the Contractor shall be responsible to the Owner for all reasonable costs charged by the consultant to the Owner for the Additional Services required to provide such information.

1.6 CONTRACT DRAWINGS

- a. Contract drawings are diagrammatic only and do not give fully dimensioned locations of various elements of work or show all offsets or required fittings. Determine exact locations from field measurements. Making adjustments to field conditions is considered a part of the work required.
- b. When the mechanical and electrical Contract Documents do not give exact details to the elevation of pipe, conduit and ducts, the Contractor shall physically arrange the systems to fit in the space available at the elevations intended with proper grade for the functioning of the system involved. Piping, exposed conduit and the duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The Contract Documents do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas.
- c. Prior to locating mechanical equipment, plumbing fixtures, water heaters, water coolers and other plumbing or mechanical items, obtain approval as to exact method and exact placement and location of equipment in the various areas shown on the drawings. In no case shall the locations be determined by scaling the drawings. Plumbing fixtures shall be mounted at the heights directed by the Architect and local code authorities. Relocate equipment and devices and pay all costs of modifying work of all trades necessitated by failure to comply with this requirement.
- d. These specifications are accompanied by drawings of the building and details of the installation indicating the locations of equipment, piping, ductwork, outlets, switch controls, circuits, lines, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.
- e. It is the Contractor's responsibility to properly use all information found on the Architectural, Structural, Mechanical and Electrical Drawings where such information affects his work.
- f. The drawings show diagrammatically the location of the various outlets and apparatus. Exact locations of these outlets and apparatus shall be determined by reference to the general drawings and to all detail drawings, equipment drawings, rough-in drawings, etc., by measurements at the building, and in cooperation with the other trades. The Owner reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.

- g. Should the drawings or specifications disagree within themselves, or with each other, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished.

1.7 OFFSETS

- a. The Contract Documents are diagrammatic as stated above. Not all offsets are shown. This applies to all ductwork, piping, flues, or any other component that is routed underground or throughout the structure. The Contractor shall be responsible to layout all piping in a manner that allows for complete maintenance access. Contractor shall provide and install, without additional costs, all offsets necessary to complete this project and to provide a complete, working, accessible, and maintainable system.

1.8 BUILDING DEMOLITION

- a. Unless noted otherwise, remove all mechanical materials and equipment from areas designated for demolition.
- b. Where mechanical equipment is indicated for removal, the Contractor shall remove all associated piping, controls, etc. Where abandoned piping is concealed in walls, floors or ceilings the exposed portion of the abandoned piping shall be cut off flush with the building surface and the concealed portion shall be capped and abandoned in place. All voids left by the removal of mechanical equipment shall be filled with grout and finished to match existing adjacent surfaces. Removal of any mechanical equipment shall be performed in such a way not to interfere with ongoing daily building operations.
- c. All salvage shall remain the property of the Owner and be delivered to a location, on site, as designated by the Owner. In the event the Owner does not desire to retain the salvage material, the material becomes the property of the Contractor and shall be disposed of by the Contractor.
- d. Existing mechanical services and controls to items being removed by others must be disconnected as a requirement of this section.
- e. Wherever a new to existing mechanical connection is required, the Contractor shall provide all materials and labor required to make the connections.
- f. The Contractor shall be responsible to maintain all mechanical systems, in an operational condition, in all areas not included under this contract that may be affected during the demolition.
- g. All concrete slab penetrations shall be coordinated and approved by the structural engineer. The Contractor shall X-ray the proposed slab penetration area prior to performing any work, to ensure that there are no existing conduit systems, concrete load bearing structural members, etc., that may otherwise be damaged by core drilling the concrete slab.
- h. Equipment and devices not scheduled for removal and their associated mechanical systems shall remain in their original operating condition.

1.9 MOTORS CONTROLLED BY VFD

- a. General Requirements - Shaft Grounding:
 - (1) All motors operated on variable frequency drives shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of

circumferential micro fibers to discharge damaging shaft voltages away from the bearings to ground, AEGIS Bearing Protection Ring.

- (2) Application Note: Motors up to 100HP shall be provided with one shaft grounding ring installed either on the drive end or non-drive end. Motors over 100HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or contractor and shall be installed in accordance with the manufacturer's recommendations.

b. General Requirements - High Frequency Bonding

- (1) All motors operated on variable frequency drives shall be bonded from the motor foot to system ground with a high frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection.
- (2) Application Note: Proper grounding of motor frame for all inverter-driven induction motors.

- (a) References: ABB Technical Guide No. 5

Allen Bradley Publication 1770-4.1 Application Data, Industrial Automation Wiring and Grounding Guidelines

2.0 PRODUCTS

- 2.1 Per Senate Bill 1289 passed in 2017, all state entities are required to provide all iron and steel products to be manufactured in the United States.

3.0 EXECUTION

- 3.1 Consider space limitations imposed by contiguous work in selection and location of equipment and material. Do not provide equipment or material which is not suitable in this respect.

3.2 OBSTRUCTIONS

- a. The drawings indicate certain information pertaining to surface and subsurface obstructions which have been taken from available drawings. Such information is not guaranteed, however, as to accuracy of location or complete information.
- b. Before any cutting or trenching operations are begun, verify with Owner's representative, utility company, municipalities, and other interested parties that all available information has been provided. Verify locations given.
- c. Should obstruction be encountered, whether shown or not, alter routing of new work, reroute existing lines, remove obstruction where permitted, or otherwise perform whatever work is necessary to satisfy the purpose of the new work and leave existing services and structures in a satisfactory and serviceable condition.
- d. Assume total responsibility for and repair any damage to existing utilities or construction, whether or not such existing facilities are shown.

3.3 CUTTING AND PATCHING

- a. The Contractor shall be responsible for timely placing of all equipment and piping to avoid cutting new construction.

3.4 OPENINGS

- a. Framed, cast or masonry openings for piping or equipment is specified under other divisions. However, drawings and layout work for exact size and location of all such openings are included under this division.

3.5 COORDINATION

- a. Contract Documents are diagrammatic in showing certain physical relationships to other trades. Interface and coordination with other work including utilities and electrical work is the exclusive responsibility of the contractor.
- b. Contractor shall coordinate with Division 26 and other divisions as required. This is to include but not be limited to verification of power, voltage, phase and other characteristics as being compatible with that called for on the electrical drawings and Division 26 specifications, as well as that called for in Division 23 drawings and specifications or other divisions requiring electrical connections or interface with this division. This shall be done prior to placing orders for equipment. Controls contractor to coordinate with electrical contractor for all required 120 volt power for all DDC panels, 120 volt motor actuators, 120 volt motorized dampers, etc. prior to bids. If it is not coordinated prior to bid, mechanical is responsible for all 120 volt conduit, breakers, conductors, etc.
- c. Arrange mechanical work in a neat, well organized manner with services running parallel with primary lines of the building construction, and with the maximum overhead clearance possible.
- d. Locate operating and control equipment properly to provide easy access. Arrange entire mechanical work with adequate access for operation and maintenance.
- e. Advise other trades of openings required in their work for the subsequent move-in of large units of mechanical work.
- f. Verify exact locations of existing equipment and determine exact requirements for connections prior to routing services to equipment.

3.6 CONCEALED WORK

- a. Where the word "concealed" is used in connection with insulating, painting, piping, ducts and the like, the word is understood to mean hidden from sight as in chases, furred spaces or suspended ceilings. "Exposed" is understood to mean open to view.

3.7 PROTECTION

- a. The Contractor shall be responsible for the protection of all materials and equipment to be installed under this Division from physical and weather damage.
- b. Provide all hoisting and scaffolding equipment required for proper installation of equipment. The contractor shall take full responsibility for the safety of the materials and equipment using such hoisting equipment and scaffolding.
- c. Adequately protect work, equipment, fixtures, and materials. At work completion, all work shall be clean and in good condition.

3.8 AIR FILTERS AND PIPE STRAINERS

- a. Immediately prior to final acceptance of project, clean and service strainers and replace disposable type air filters. If air handling units are operating during construction, install high efficiency filters in units and replace at end of construction. High Efficiency filters in the air handling units consist of minimum 2" pleat Farr 30/30 prefilter and final filter of 12" thick (if air unit frame is for 6" filter than use 6" thick) and minimum 85% efficient. As far as plenum exposed heating coils in fan powered VAV boxes, the plenum inlet shall have a minimum 2" pleat Farr 30/30 filter with a prefilter attached (preferably, the contractor will cover the inlet when debris is present). However, if the air units, fans, VAV boxes are operated during construction, and if the fan wheels, fan housings, coils, etc. are fouled by dust or debris, the Contractor, at his expense, shall clean all fouled components.

3.9 GUARANTEE

- a. Guarantee work for 1 year from the date of final acceptance of the project and during that period make good any faults or imperfections that may arise due to defects or omissions in materials or workmanship.

3.10 MATERIALS AND EQUIPMENT

- a. Furnish new and unused materials and equipment of Domestic Manufacturers meeting requirements of the paragraph specifying acceptable manufacturers. Where two or more units of same type or class of equipment are required, provide units of a single manufacture.

3.11 ACCEPTABLE MANUFACTURERS

- a. The following is a list of acceptable manufacturers for items of equipment specified under Division 23, Mechanical. Manufacturers names and catalog numbers specified under sections of Division 23 are used to establish standards of design, performance, quality and serviceability and not to limit competition. Equipment of similar design, equal to that specified, manufactured by a manufacturer named below will be acceptable on approval.
- b. A request for prior approval of equipment not listed must be submitted 14 days before bid due date. Only manufacturers specified in sections of Division 23, on drawings or listed below (including subsequent addenda) will be acceptable. There will be no exceptions to this requirement. Submit complete design and performance data to the Architect.

Item	Manufacturer
Wall Penetration Seals	Link Seal
Access Doors	Inryco/Milicor, Karp
a	
Valves	Hammond, Nibco, Powell, Stockham, Walworth
Backflow Preventer Valves	Beeco/Hersey, Febco, Watts
Insulation	Certainteed, Johns-Manville, Knauf, Owens-Corning, Kingspan
Fire/Smoke Dampers	Nailor-Hart, Prefco, Ruskin, Greenheck

Filters	American Air Filter, Farr
Air Devices	Krueger, Envirotec, Titus, Price, Metalaire
Vibration Isolation	Amber-Booth, Mason Industries
Gas Unit Heaters	Hastings, Modine, Trane, Reznor
Electric Unit Heaters	Chromalox, Modine, Markel
Split System DX Units	Daikin, Trane, York
Variable Frequency Drives	ABB, Danfoss, Magnatek, Robicon
Fans	Greenheck, Cook
Flexible Duct	Flexmaster (<u>only</u>)
Mini-Splits	Mitsubishi/Trane, Daikin, LG

- c. Manufacturers listed in schedules, on the drawings or in a specific section of the specifications for a specific product is the basis of design. Any other submitted product will be construed to be a proposed substitute, even if listed in the acceptable manufacturers list, and must comply with the following paragraphs.
- d. Acceptance of materials and equipment will be based on manufacturer's published data and will be tentative subject to the submission of complete shop drawings indicating compliance with the contract documents and that adequate and acceptable clearances for entry, servicing, and maintenance will exist. Acceptance of materials and equipment under this provision shall not be construed as authorizing any deviations from the contract documents, unless the attention of the Architect has been directed in writing to the deviations.
- e. Each proposed substitute shall be referenced to the trade name of the specified product, and the paragraph and page number of the specifications where the specified items occur. Each proposed substitute shall be accompanied by adequate supporting information including catalog cuts, diagrams, representative samples, published ratings, drawings, and other such descriptive information as may be required to properly illustrate the complete characteristics of materials and equipment. In addition, a detailed statement indicating item-by-item and paragraph-by-paragraph wherein the product to be offered deviates from the specification shall be submitted for each proposed alternate. Any such alternate proposal must include all necessary changes and additions to other work occasioned by such substitution. In addition, each alternate proposal must stipulate that the substituted product will fit the space allotted the specified product and provide the same or greater clearances for maintenance, removal and/or access.
- f. When requested by the Architect, the Contractor shall provide a sample of the proposed substitute item. In some cases, samples of both the specified item and the proposed item shall be provided for comparison purposes.
- g. Should a substitution be accepted, and should the substitute material prove defective, or otherwise unsatisfactorily for the service intended within the guarantee period, this material or equipment shall be replaced with the material or equipment specified at no additional cost to the Owner.

3.12 SUBMITTAL DATA AND SHOP DRAWINGS

The submittals shall include a specification compliance analysis for review and approval before work shall begin. The compliance document shall address each paragraph of the specification by indicating COMPLY, EXCEED, or EXCEPTION. Do not indicate COMPLY unless the proposed system exactly meets the paragraph requirement. If EXCEED or EXCEPTION is indicated, then provide a clear and concise explanation of the variance from the specifications and the net effect this would have on the specified system performance. This is to be included with each submittal.

- a. Submittal data. Submit descriptive literature, physical data, and performance data by the appropriate specification section or the specific sheet where products are shown on the contract drawings that are not referenced by the specification for review. All specification sections require a submittal. Submit each spec section separately but at one time. Submittals can be contained in one binder or binders, however, each specification section must be submitted as a single submittal and each section must be clearly marked or tagged with the specification section number. Each submittal shall bear the specification section number it is related to. Any submittal received without referring to the appropriate specification section number will be returned without review. Include identifying symbols and equipment numbers used in plans and specifications, with reference to specification paragraphs, and drawing numbers of all equipment and material submitted. Submittal data shall specifically list all proposed deviations from the contract documents. Submittals that are not clearly marked will be rejected for that reason.
- b. Contractor's Check. Shop drawings and submittal data will be submitted only by the Contractor. Indicate by signed stamp that the drawings and submittal data have been checked, that the work shown on the drawings and submittal data is in accordance with contract requirements and that dimensions and relationship with work of other trades have been checked. If drawings and submittal data are submitted for approval that have not been checked and signed by the Contractor, they will be returned for checking before being considered by the Architect.
- c. Equipment Rooms. Submit shop drawings of mechanical equipment rooms, mechanical yards, and HVAC closets, and where directed, other complex areas. Shop drawings shall include plan views and elevations, show actual equipment to be installed, with piping fully detailed to show clearances, headroom, pipe routing, valve positions, pipe hangars, insulation, and other pertinent information. Prepare drawings to a scale of at least 3/8 inch per foot.
- d. Coordination Drawings: Coordination Drawings in electronic media and hard copy shall be prepared by the Contractor indicating Mechanical, Plumbing, Fire Protection, Electrical work, low voltage cable management systems (or cable tray, as applicable) miscellaneous steel for the general work, lights, air devices, speakers, ceiling heights, etc., drawings shall indicate all duct work, mechanical lines 2" and greater (except all lines that require gravity draining are to be shown), all plumbing lines 2" and greater, trunk lines of fire protection system, and all sprinkler heads. Electrical conduit 2" and greater as well as pull boxes or other elements over 6" x 6" shall be shown. Major pieces of equipment by all trades are to be indicated.

Coordination drawings shall depict the routing of all above ceiling items and shall identify elevations of these items as necessary to fit above specified ceiling systems. Preparation of section details at certain congested corridor locations will be required. The Contractor shall identify which, if any, above ceiling items cannot be installed as schematically shown on the Contract Documents and shall timely notify the Designer of these items with proposed resolution. Contractor shall submit to the designer a complete set of coordination drawings for all of this project, showing non-conflicting routing of all above-ceiling items. No above-ceiling installations shall proceed in any project area until the coordination drawing for that area is completed. These drawings shall bear the original signature of all Contractor (trade) superintendents, indicating that they agree with the routing of above-ceiling items shown. Dimensions are not required and will not be reviewed. Spool drawings

are not required. Showing pipe joints and duct joints is not required or desired and will not be reviewed.

It is preferred that the Contractor provide these services with in-house personnel. If this is not possible, Contractor must submit at least two (2) firms or individuals proposed to provide these documents. The Engineer will advise the Contractor which firm or individual is acceptable, prior to services being procured. The Contractor's bid shall include all costs for those services noted herein.

The Contractor may obtain Revit files (if available) or AutoCAD files from the Engineer after signing the Engineer's release and receipt of \$250 paid to the Engineer. In addition, the Contractor cannot produce submittals and shop drawings by copying sealed engineering plans in whole or in part. The Contractor must produce their own shop drawings, no exceptions.

The Revit files from the Engineer will contain some clashes and it is important to note the engineers Revit files will not include fire sprinkler, electrical conduit, miscellaneous steel, etc. that may require the Contractor to modify routing/sizing of MEP systems to account for these additional systems. It is the Contractor's responsibility to recommend any required changes and update their Revit/Navisworks/AutoCAD 3-D models. At the completion of construction, Contractor shall provide the updated Revit file which shall include all changes/modifications due to RFI's, ASI's, change orders, etc. and will serve as as-built files (also provide 3 sets of full size prints). If 3-D drawings are not required by the Engineer, AutoCAD drawings must be provided by the Contractor for coordination and as-builts.

- (1) Drawings shall be produced in CAD at 1/4" scale, except that mechanical rooms, air handling equipment rooms, and the like, shall be produced in 1/2" scale.
 - (a) Single line drawing shall not be acceptable.
- (2) The suggested production of Drawings is as follows, however, the Contractor is solely responsible for the means, methods and sequences used:
 - (a) Mechanical trade shall initiate these drawings including furnishing of floor plan backgrounds. Sequence of preparation shall be:
 - i) Ductwork
 - ii) Remainder of mechanical work including equipment and piping.
 - (b) Plumbing trade shall show piping (supply, waste, vent, etc.) overlaid on the floor plan furnished by mechanical trade.
 - (c) Fire protection work shall be shown on the same floor plan after completion of plumbing work drawings.
 - (d) Electrical trade work shall be shown on the same floor plan after completion of the above.
 - (e) General trade work shall be shown on the same floor plan after completion of the above.
- (3) Upon completion of coordination drawings, the project manager or superintendent for the HVAC, Plumbing, Fire Protection, Electrical, and General trades shall be required to sign each sheet of the coordination drawings. Signature shall attest to a diligent review and agreement to alleviate future space conflicts at no cost to the Owner. Any trade that

installs elements of its work in locations other than those indicated on the coordination drawings that impacts the work of other trades, or installs elements of its work that is not shown on the coordination drawings, the trade in violation of the coordination drawings shall be required to either:

- (a) Move his work to resolve the conflict, or
- (b) Reimburse the affected trade(s) to move his work to resolve the conflict, or
- (c) Reimburse the Owner to move his work to resolve the conflict.

For record only, Coordination Drawings must be complete and submitted to the Designer within 90 days of award of contract. No review or approval will be forthcoming. Coordination drawings are required for the benefit of the Contractor and all trades as an aid to coordination of their work so as to eliminate or reduce conflicts that may arise during the installation of their work.

Copies of the project coordination drawings shall be submitted as part of the required closeout document package.

Owner:	1 copy
Architect:	1 copy
MEP Engineers:	1 copy

- e. Engineer's approval of submitted material constitutes an acknowledgment only and in no way relieves the contractor of full responsibility for providing all systems complete in accordance with the intent of the drawings and specifications. Contractor is responsible for confirming and correlating dimensions at job site, for information which pertains to fabrication processes or construction techniques and for coordination of work with all other trades. Any materials or equipment provided by this contractor without approved shop drawings constitutes the contractor's agreement to comply with the engineer's intent whether specified, shown or implied.

3.13 OPERATING AND MAINTENANCE INSTRUCTIONS

- a. Secure three copies of operating and maintenance instructions, service manuals, and parts listed applicable to each item of equipment furnished. Deliver three bound sets for the Owner's use. Include nameplate data and design parameters in operation and maintenance manuals. Clearly distinguish between information which applies to the equipment and information which does not apply. Also include all approved submitted data, all warranties on equipment, contractor's warranty and all test and balance reports. Delivery of required documents is a condition of final acceptance.
- b. Upon completion of work, and at time designated by Architect, provide services of a competent representative of the contractor for a period of at least 24 hours to instruct the owner's representative in the operation and maintenance of the entire system.

3.14 PROJECT RECORD DOCUMENTS

- a. Preparation. Maintain at the job site a separate set of white prints of the contract drawings for the sole purpose of recording the "as built" changes and diagrams of those portions of work in which actual construction is significantly at variance with the contract drawings. Mark the drawings with a colored pencil. Prepare, as the work progresses and upon completion of work, drawings clearly indicating locations of various lines, valves, traps, equipment, and other pertinent items, as

- installed. Include flow-line elevation of sewer lines. Record underground and underslab piping installed, dimensioning exact location and elevation of such piping.
- b. Deliver. At conclusion of project, obtain without cost to Owner, sepia of original mechanical drawings and transfer as-built changes to these. Delivery of as-built prints and reproducible is a condition of final acceptance.
- c. Throughout progress of the work of this Contract, maintain an accurate record of all changes in the Contract Documents. Upon completion of the Work of this Contract, transfer the recorded changes the AutoCAD drawing files and specification word processing files. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff. Thoroughly coordinate all changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to properly show the change. Include all addenda items, request for information Architect's Supplemental Instructions and any other document that causes a change in the Construction Documents. Accuracy of records shall be such that future search for items shown in the Contract Documents may reasonably rely on information obtained from the approved Record Documents.
- d. The Contractor shall mark any deviations on a daily basis. The Architect will visit the site and will require to see the "As-Built" documentation periodically. If the Contractor does not keep an accurate set of as-built drawings, the pay request may be altered or delayed at the request of the Architect. Mark the drawings with a colored pencil. Record installed feeder conduits. Dimension the location and elevation of the conduit.
- e. Record Documents shall consist of the following:
- (1) Job Set: Promptly following award of Contract, secure from the Architect, at no charge to the Architect, one complete set of all mechanical documents comprising the Contract.
 - (2) Final Record Documents: Obtain the AutoCAD drawings files at the Contractor's expense (\$200 and signed release form).
 - (a) The Contractor shall transfer all change data shown on the job set of to the corresponding electronic files, coordinating the changes as required, and clearly indicating at each affected detail and other drawing the full description of all changes made during construction and the actual location of items. Call attention to each entry by drawing a "cloud" around the area or areas affected.
 - (3) Submit the completed total set of Record Documents to the Engineer as described above. Participate in review meeting or meetings as required by the Engineer, make all required changes in the Record Documents, and promptly deliver the final Record Documents to the Architect. Upon completion of Work, the Contractor shall certify the "Record Drawings" for correctness by signing the following certification:

CERTIFIED CORRECT (3/8" high letters)

(Name of the Contractor)

By
Date

(Name of the Sub-Contractor)

By

Date

- f. Deliver record drawings to the Architect in the number and manner specified in Division 01 - General Requirements.

3.15 NOISE AND VIBRATION

- a. Select equipment to operate with minimum noise and vibration. If objectionable noise or vibration is produced or transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions without cost to the Owner.

3.16 OPERATING TESTS

- a. After all mechanical systems have been completed and put into operation, subject each system to an operating test under design conditions to ensure proper sequence and operation throughout the range of operation. Make adjustments as required to ensure proper functioning of all systems. Special tests on individual systems are specified under individual sections.

3.17 LUBRICATION, REFRIGERANT AND OIL

- a. Provide a complete charge of correct lubricant for each item of equipment requiring lubrication.
- b. Provide complete and working charge of proper refrigerant, free of contaminants, into each refrigerant system. After each system has been in operation long enough to ensure completely balanced conditions, check the charge and modify it for proper operation as required.

3.18 EQUIPMENT NAMEPLATES

- a. All air handling units, fan-coil units, air terminal boxes, VAV boxes, condensing units, chillers and furnaces shall have an engraved Setonply Nameplate, black background, white letters, 1-1/2" x 4". Nameplate shall have equipment mark (same as indicated on drawings) in white. Plate shall be attached to equipment mark (same as indicated on drawings) in white. Plate shall be attached to equipment without using screws, per manufacturer's recommendations. All fans shall have an engraved aluminum plate with fan number, black background, white letters, 3/4" x 2-1/2". Fan nameplate shall also list rooms served by fan on one line and the service on the third line. Attach to fan per manufacturer's recommendations.

3.19 SUBSTITUTIONS REQUIRING CHANGES

- a. Manufacturers and power requirements indicated on the mechanical and electrical drawings are the basis of design. If changes are required for the equipment submitted, such as changes in conduit size, conductors, breakers, disconnects, panels, etc., it shall be made at no additional cost to the Owner.

3.20 PIPE SLEEVES

- a. Fit with sleeves all pipes passing through masonry and concrete construction. Fabricate sleeves of schedule 40 galvanized steel pipe. Size sleeve for minimum clearance between pipe or insulation and sleeve.

- b. Extend each sleeve through the floor or wall. Cut the sleeve flush with each surface, except that in exposed locations, extend floor sleeves 3 inches from finished wall or above finished floor line.
- c. Caulk all sleeves water and airtight. Seal annular space between pipes and sleeves with fire stop material, see specification on fire stopping found elsewhere in this specification. Install per manufacturer's recommendations to meet or exceed fire rating of penetrated wall (minimum 1-1/2 hour). Reference architectural drawings for wall fire ratings.
- d. Sleeve pipe through concrete foundations, below grade with Thunderline Link-Seal wall penetration seals. Equip seals with stainless steel nuts , bolts and pressure plate.

3.21 FIRESTOPPING

- a. All piping, tubing, ductwork, conduit, etc. passing through fire rated floors and/or walls shall have the void area between the material passing through floor and/or wall sealed with an approved fire-stop material to maintain the fire rating of the floor and/or wall. Depending on the particular installation, the contractor shall use FS900 series fire stop caulk or FS500/600 series fire-stop components as manufactured by International Protective Coatings or approved equivalent.
- b. All fire stop systems shall be installed as required by the manufacturer and U.L. requirements for each application.
- c. The Contractor shall procure the services of an independent inspection service to review and provide a certified letter to the Contractor, Engineer and the City of Austin, stating all firestopping has been installed per UL listing and the manufacturer's recommendations. Independent service shall have experience in the inspection of firestopping materials and methods installed.

3.22 EXISTING FACILITIES

- a. The Contractor shall be responsible for loss or damage to the existing facilities as used by his workmen, and shall be responsible for repairing or replacing such loss or damage. The Contractor shall send proper notices and receive written permission from the Owner to enter existing areas. Before beginning work in existing areas, make the necessary arrangements and perform other services required for the care, protection, and in service maintenance of all electrical, communication, plumbing, heating, air conditioning, and ventilating services for existing facilities. The Contractor shall erect temporary barricades with necessary safety devices, as required to protect personnel from injury, removing all such temporary protection upon completion of the work.
- b. The Contractor shall provide temporary or new services to all existing facilities as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.
- c. Where existing construction is removed to provide working and extension access to existing utilities, the Contractor shall remove doors, piping, conduit, outlet boxes, wiring, light fixtures, air conditioning ductwork, and equipment, etc., to provide this access and shall reinstall same upon completion of work in the areas affected.
- d. Where partitions, walls, floors, or ceilings of existing construction are indicated to be removed and equipment located in these areas is required to remain in operation, the Contractor shall remove and reinstall all equipment required for the operation of the remaining electrical systems. This is to include but is not limited to electrical switches, relays, fixtures, conduit, etc.

3.23 OUTAGES

- a. Outages of services as required by the project will be permitted but only at time approved by the Owner. The Contractor shall notify the Owner in writing two weeks in advance of the requested outage in order to schedule required outages. No outages shall be taken unless written approval has first been received from the Owner. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

3.24 PRECEDENCE OF MATERIALS

- a. The specifications determine the nature and setting of materials and equipment. The drawings establish quantities, dimensions and details.
- b. The installation precedence of materials shall be as follows. Note that if an interference is encountered, this shall guide the Contractor in the determination of which trade shall be given the "Right-of-Way".

Building lines
Structural Members
Soil and Drain Piping
Condensate Drains
Vent Piping
Supply, Return, and Outside Air Ductwork
Exhaust Ductwork
Fire Protection Piping
Natural Gas Piping
Domestic Water (Cold and Hot)
Refrigerant Piping
Electrical Conduit

3.25 THIRD PARTY INSPECTIONS

- a. Where a project is outside a municipal jurisdiction where there are not city inspectors, the mechanical and plumbing subcontractor shall include in their bids the cost to hire a third party inspector for the mechanical and plumbing systems.

End of Section 23 00 00

SECTION 23 00 00.A**FRACTIONAL AND SMALL INTEGRAL HP ELECTRIC MOTORS****1.0 GENERAL****1.1 SCOPE**

- a. Equipment. This section specifies general requirements for fractional and small integral horsepower electric motors with NEMA frame sizes corresponding to 4-pole (1800 rpm at 60 hertz) machines sized not larger than 10 horsepower. Unless otherwise specified, provide motors meeting the basic requirements for general-purpose alternating current motors, as defined in NEMA MG 1-1.05.
- b. Unit Responsibility. Motors are to be furnished under other sections of this specification as a part of the driven equipment. The contractor is responsible for all coordination between the various components, as well as for the warranty.
- c. Exceptions. Exceptions to this section are listed in the various sections that specify motor-driven equipment or are indicated on the drawings.

1.2 REFERENCE STANDARDS

- a. ANSI/NEMA MG-1 - Motors and Generators, Sections 1 and 2.
- b. ANSI/UL 674(A) - Safety Standard for Electric Motors and Generators for Use in Hazardous Locations, Class II, Groups E, F, and G.
- c. ANSI/UL 674(B) - Safety Standard for Electric Motors and Generators for Use in Hazardous Locations, Class I, Groups C and D.
- d. UL 1004 - Standard for Safety for Electric Motors.

1.3 APPLICABLE PROVISIONS

- a. Refer to Section 26 00 00- Electrical General Provisions.

1.4 RELATED WORK

- a. Division 08 - Doors and Windows.
- b. Division 11 - Equipment.
- c. Division 14 - Conveying Systems.
- d. Division 23 - Mechanical.

1.5 SUBMITTALS

- a. Requirements. Refer to Section 26 00 00, paragraph 1.9, and to the specific driven equipment sections.
- b. Information. Include the following information in the submittal:

- (1) Manufacturer.
 - (2) Rated full load horsepower.
 - (3) Rated volts.
 - (4) Number of phases.
 - (5) Frequency in hertz.
 - (6) Locked rotor amperes (LRA) at rated voltage or NEMA code letter.
 - (7) NEMA design letter.
- c. Integral Horsepower Motors. In addition to the information listed above, include:
- (1) Full load amperes (FLA).
 - (2) Nominal speed at full load.
 - (3) Service factor.
 - (4) NEMA machine type (ODP, WP -1, TEFC, etc).

2.0 PRODUCTS

2.1 RATING

- a. Speed and Size. For motors 1/6 horsepower and larger, speed and horsepower sizes are specified in the driven equipment specification sections or are indicated on the drawings. Furnish motors sufficiently sized for the particular application and with full-load rating not less than required by the driven equipment at specified capacity. Size motors so as not to overload at any point throughout the normal operating range.
- b. Voltage.
- (1) Single phase: 115 volts.
 - (2) Three phase: 200, 230, 230/460, 460 volts.
- c. Frequency. 60 hertz.
- d. Service Factor. According to NEMA MG 1-12.47.

2.2 DESIGN TYPE

- a. Motors Smaller than 1/6 Horsepower. Provide single-phase, squirrel-cage induction motors with integral thermal protectors.
- b. Motors 1/6 through 1/2 Horsepower. Provide single-phase NEMA Design, squirrel-cage induction motors.
- c. Motors Larger than 1/2 Horsepower. Provide 3-phase, NEMA Design B, squirrel-cage induction motors.

2.3 MOTOR INSULATION

- a. Class. Use a Class B insulation system meeting the requirements of NEMA MG 1-1.65 and made of nonhygroscopic materials.
- b. Temperature Rise. According to NEMA MG 1-12.42.

2.4 LEADS

- a. For motor leads, use not less than ASTM B 173, Class G, stranded copper conductors with insulation the same as or better than specified in the preceding Motor Insulation paragraph. Provide permanent identification numbers on leads according to NEMA MG 1-2.02. Use crimp-on, solderless copper terminals on leads and place heat-shrink insulation sleeves or covers between leads and terminals.

2.5 ENCLOSURES

- a. Use enclosure type as follows:
 - (1) Indoors. Open drip-proof (ODP).
 - (2) Outdoors. Totally enclosed, fan cooled (TEFC).
 - (3) Hazardous Areas. Provide motors suitable for use in the classified area.

2.6 MOTORS CONTROLLED BY VFD

- a. General Requirements - Shaft Grounding:
 - (1) All motors operated on variable frequency drives shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of circumferential micro fibers to discharge damaging shaft voltages away from the bearings to ground, AEGIS Bearing Protection Ring.
 - (2) Application Note: Motors up to 100HP shall be provided with one shaft grounding ring installed either on the drive end or non-drive end. Motors over 100HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or contractor and shall be installed in accordance with the manufacturer's recommendations.
- b. General Requirements - High Frequency Bonding:
 - (1) All motors operated on variable frequency drives shall be bonded from the motor foot to system ground with a high frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection.
 - (2) Application Note: Proper grounding of motor frame for all inverter-driven induction motors.
 - (a) References: ABB Technical Guide No. 5
Allen Bradley Publication 1770-4.1 Application Data, Industrial Automation Wiring and Grounding Guidelines

2.7 BEARINGS

- a. Motors Smaller Than 1/6 Horsepower. Motor manufacturer's standard bearing is acceptable.
- b. Motors 1/6 Horsepower and Larger. Supply these motors with grease-lubricated antifriction ball bearings conservatively rated for long life under the total radial and thrust loads produced by the actual combination of motor driven equipment. Provide each motor with suitable lubrication fittings and pressure relief devices.

2.8 NAMEPLATE

- a. Provide each motor with a stainless steel or aluminum nameplate meeting the requirements of NEMA MG 1-10.38, and the National Electrical Code, Section 430-7. Attach the nameplate to the motor with corrosion-resistant fastening pins or screws.

2.9 CONDUIT BOX

- a. Provide each motor not supplied with a cord and plug with a conduit box amply dimensioned for the motor lead terminations. Include a grounding lug on motors 1/6 horsepower and larger. Supply a gasket suitable for the motor enclosure type and application.

2.10 PAINT

- a. Manufacturer's standard shop paints for prime and finish coats are acceptable.

3.0 EXECUTION

3.1 INSTALLATION

- a. Properly install and align motors in the locations shown, except motors which are factory mounted on the driven equipment. When the motor and equipment are installed, the nameplate must be in full view. Make electrical connections under Division 16 - Electrical.

3.2 LARGER MOTORS

- a. If a motor horsepower rating larger than indicated is offered as a substitute and accepted, provide required changes in conductors, motor controllers, overload relays, fuses, switches and other related items with no change in the contract price.

3.3 TESTING

- a. General. Provide all necessary instruments, labor and personnel required to perform motor inspection and testing.
- b. Inspection. Inspect all motors for damage, moisture, alignment, freedom of rotation, proper lubrication, phase identification and cleanliness, and report any abnormalities to engineer before energizing.
- c. Energizing. After installation has been thoroughly checked and found to be in proper condition, with thermal overloads in motor controllers properly rated and all controls in place, energize the equipment at system voltage for operational testing.

End of Section 23 00 00.A

SECTION 23 05 29**EQUIPMENT SUPPORT****1.0 GENERAL****1.1 WORK INCLUDED**

- a. This section specifies furnishing and installation of concrete equipment pads for all direct and isolated floor mounted equipment, and structural equipment supports for horizontal tanks, heat exchangers and similar equipment, where required.

1.2 RELATED WORK

- a. Division 03 - Cast-in-Place Concrete.
- b. Division 05 - Miscellaneous Metals.
- c. Division 09 - Painting.
- d. Division 23 - HVAC. Inertia blocks are specified in the section on Vibration Isolation.

1.3 SUBMITTALS

- a. Submit shop drawings on all structural supports in accordance with Division 01 - General Requirements.

2.0 PRODUCTS**2.1 CONCRETE**

- a. Provide Class A concrete as specified in Division 03 - Concrete.

2.2 STRUCTURAL METAL

- a. Furnish structural metal as specified in Division 05 - Metals.

3.0 EXECUTION**3.1 CONCRETE PADS**

- a. Pour 4-inch pads on roughened floor slabs unless otherwise noted. Extend outer edges of pads a minimum of 2 inches beyond equipment. Secure equipment with anchor bolts in accordance with equipment installation instructions.

3.2 STRUCTURAL SUPPORTS

- a. Construct floor stands of structural members or steel pipe. Bolt the floor stands to 6-inch concrete pads.
- b. Install ceiling-mounted equipment from suitable brackets, platform framing or similar supports fabricated of structural members.

- c. Paint all steel with minimum two coats of primer. Finish coats shall be in accordance with Division 09.

3.3 FAN AND EQUIPMENT SUPPORTS

- a. If fan curbs or equipment curbs are not furnished with the equipment, provide prefabricated roof curbs, compatible with the roofing system installed (metal material to be modified if required); slope curbs for sloped roofs so top of curb is parallel with floor below (level). Curbs to be similar to Thycurb model TEMS; attenuated curbs to be similar to Thycurb model TC-VB (24" height). All seams and joints to be welded and hot dip galvanized. No shop fabricated products allowed.

End of Section 23 05 29

SECTION 23 05 48**VIBRATION ISOLATION****1.0 GENERAL**

Refer to Section 23 00 00 for General Requirements for Mechanical Work.

1.1 SCOPE OF WORK

- a. Unless otherwise noted on the equipment schedule, all mechanical equipment shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure.
- b. Vibration isolators shall be selected in accordance with weight distribution so as to produce reasonably uniform deflection. Deflections shall be as noted on the equipment isolator schedule noted here in.
- c. All vibration isolation devices, including steel bases/forms shall be designed and furnished by a single manufacturer or his qualified representative.

1.2 RELATED WORK

- a. Division 23 - HVAC.
 - (1) Refer to the section on Ductwork for flexible connections between fans and ducts.
 - (2) Refer to the section on equipment Supports for equipment foundation pads.

1.3 SUBMITTALS

- a. Submit product data showing type, size, load, deflection and other information required. Include clearly outlined procedures for installing and adjusting isolators.
- b. Completely detail concrete bases including the 6-inch-thick foundation pad.

2.0 PRODUCTS**2.1 ISOLATOR DESIGN**

- a. Materials. Design and treat vibration isolators for resistance to corrosion. Furnish phosphatized steel components with industrial-grade, corrosion-resistant material. Coat components exposed to the weather with PVC coating or fabricate of galvanized steel. Furnish zinc electroplated nuts, bolts and washers. Clean steel bases thoroughly of welding slag and prime with zinc-chromate or metal etching primer.
- b. Design.
 - (1) Unless otherwise instructed, use spring-type vibration isolators for all equipment driven by motors of 3 horsepower and larger. The isolator manufacturer must calculate the amount of spring deflection required for each isolator to achieve optimum performance and to prevent the transmission of objectionable vibration and noise.

- (2) All spring isolators must be completely stable in operation and must be designed for not less than 30% reserve deflection beyond actual operating condition.
- (3) Design isolators for equipment installed outdoors to provide adequate restraint due to normal wind conditions. The isolators must withstand wind loads of 30 pounds per square foot applied to any exposed surface of the isolated equipment.
- (4) Air handling equipment subjected to excessive horizontal air thrust shall be furnished with isolated thrust resisters to limit displacement to 1/4 inch.
- (5) Height saving brackets used with isolators having 2-1/2-inch deflection or greater shall be of the precompression type to limit exposed bolt length.

2.2 ISOLATOR TYPES

a. Type MH-1 Mountings

- (1) Neoprene mountings shall have a minimum static deflection of 0.35". All metal surfaces shall be neoprene covered and have friction pads both top and bottom. Bolt holes shall be provided on the bottom and a tapped hole and cap screw on top. Steel rails shall be used above the mountings under equipment such as small vent sets to compensate for the Overhang. Mountings shall be type ND or rails type DNR as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

b. Type MH-2 Mountings

- (1) Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cap or 1/4" neoprene acoustical friction pad between the base plate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Installed and operating heights shall be equal. The ratio of the spring diameter divided by the compressed spring height shall be no less than 0.8. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height. Mountings shall be type SLF, as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

c. Type MH-3 Mountings

- (1) Equipment with large variations in the operating and installed weight, such as chillers, boilers, etc., and equipment exposed to the wind such as cooling towers, roof mounted fans and roof mounted air handling equipment shall be mounted on spring mountings, as described in Engineering Specification B, including the neoprene acoustical pad within a rigid sided housing that includes vertical limit stops to prevent spring extensions when weight is removed and temporary steel spacers between the upper and lower housings. Housings shall serve as blocking during erection. When the equipment is at full operating weight, the springs shall be adjusted to assume the weight and the spacers removed, without changing the installed and operating heights. All restraining bolts shall have large rubber grommets to provide cushioning in the vertical as well as horizontal modes. The hole through the bushing shall be a minimum of 0.75" larger in diameter than the restraining bolt. Horizontal clearance on the sides between the spring assembly and the housing shall be a minimum of 0.5" to avoid bumping and interfering with the spring action. Vertical limit stops shall be out of contact during normal operation. Cooling tower mounts are to be located between the supporting steel and the roof or the grillage and dunnage as shown on the drawings when there is no provision for direct mounting.

Housings and springs shall be powder coated and hardware electro-galvanized. Mountings shall be SLR as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

d. Type MH-2 Hangers

- (1) Vibration hangers shall contain a steel spring and 0.2" deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Hangers shall be type **DNHS** as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

e. Type MH-4 Horizontal Thrust Restraints

- (1) When total air thrust exceeds 10% of the isolated weight, floor mounted or suspended air handling equipment shall be protected against excessive displacement by the use of horizontal thrust restraints. The restraint shall consist of a modified Specification B spring mounting. Restraint springs shall have the same deflection as the isolator springs. The assembly shall be preset at the factory and fine tuned in the field to allow for a maximum of 1/4" movement from stop to maximum thrust. The assemblies shall be furnished with rod and angle brackets for attachments to both the equipment and duct work or the equipment and the structure. Restraints shall be attached at the center line of thrust and symmetrically on both sides of the unit. Horizontal thrust restraints shall be WB as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

f. Type R-1 All-Directional Acoustical Pipe Anchors

- (1) All directional acoustical pipe anchors, consist of two sizes of steel tubing separated by a minimum 1/2" thickness of 60 durometer or softer neoprene. Vertical restraint shall be provided by similar material arranged to prevent up or down vertical travel. Allowable loads on the isolation material shall not exceed 500 psi and the design shall be balanced for equal resistance in any direction. All directional anchors shall be type ADA as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

g. Type R-2 Acoustical Pipe Guides

- (1) Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum 1/2" thickness of 60 durometer or softer neoprene. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Guides shall be capable of $\pm 1 \frac{5}{8}$ " motion, or to meet location requirements. Pipe guides shall be type VSG as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

h. Type IB-1 Bases

- (1) Vibration isolator manufacturer shall furnish rectangular structural beam or channel concrete forms for floating foundations. Bases for split case pumps shall be large enough to provide support for suction and discharge base flanges.
- (2) The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity. In general, bases shall be a minimum of 1/12th of the longest dimension of the base, but not less than 6". Forms shall include minimum concrete reinforcement consisting of 3/8" bars or angles welded in place on 6" centers running both ways in a layer 1 1/2" above the bottom, or additional steel as is required by

the structural conditions. Height saving brackets shall be employed in all mounting locations to maintain a 2" clearance below the base. Bases shall be type KSL/BMK as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

- i. Type FC-1 for Following: Locations Within MER & Water Applications up to 180 Degrees
- (1) Rubber expansion joints shall be peroxide cured EPDM throughout with Kevlar tire cord reinforcement. Substitutions must have certifiable equal or superior characteristics. The raised face rubber flanges must encase solid steel rings to prevent pull out. Flexible cable wire is not acceptable. Size 1½" through 14" shall have a ductile iron external ring between the two spheres. Sizes 16" through 24" may be single sphere. Sizes ¾" through 2" may have one sphere, bolted threaded flange assemblies and cable retention.
 - (2) Minimum ratings through 14" shall be 250psi at 170F and 215psi at 250F. 16" through 24" 180psi at 170F and 150psi at 250F. Higher published rated connectors may be used where required.
 - (3) Safety factors shall be a minimum of 3/1. All expansion joints must be factory tested to 150% of maximum pressure for 12 minutes before shipment.
 - (4) The piping gap (distance between companion flanges) shall be equal to the length of the expansion joint under pressure. Control rods passing through ½" thick Neoprene washer bushing large enough to take the thrust at 1,000psi of surface area may be used on unanchored piping where the manufacturer determines the condition exceeds the expansion joint rating without them. Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer. All expansion joints shall be installed on the equipment side of the shut off valves. Expansion joints shall be SAFEFLEX SFDEJ, SFEJ, SFDCR or SFU and Control Rods CR as furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.
- j. Type FC-2 – (Steel Pipe) for Following: Locations Outside MER, Water Applications (over 180 degrees), Air and Steams
- (1) Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples.
 - (2) Length shall be as tabulated:

<u>FLANGED</u>		<u>MALE NIPPLES</u>
3 X 14	10 X 2 ½ X 9	1½ X 13
4 X 15	12 X 28 ¾ X 10	2 X 14
5 X 19	14 X 30 1 X 11	2½ X 18
6 X 20	16 X 32	1¼ X 12
8 X 22		

Hoses shall be type BSS or UPCS furnished by As furnished by Mason-Dallas, Inc. or equivalent product by Kinetics.

- a. Type FC-3 – (Copper Lines)

- (1) Flexible bronze hose shall have bronze braid with sweat connections for copper piping up to 3" diameter. Above 3" diameter, both hose and braid shall be stainless steel with brass sweat ends.

1.2 ISOLATOR APPLICATIONS

<u>EQUIPMENT</u>	<u>BASE TYPE</u>	<u>FLEX TYPE</u>	<u>ISOLATOR TYPE</u>	<u>DEFLECTION</u>
Packaged AHU:				
Indoors	***	* FC-1/2	MH-2	1.50"
Fans:			MH-2	
In-line/Cabinet - up to 5HP	—	—	MH-2	0.75"
Condensing Units/Condensers (Slab on grade or basement)	—	* FC-1/2	MH-1	0.35"
Dry Type Transformers	—	—	MH-2/3	0.75"
Piping	(Refer to Specification Paragraph for Requirements)			

- * Note Location, Temperature and Pressure Limitations noted in Specification Paragraphs listed above.
- ** If System Static Pressure is 3.5 inches or greater, install Horizontal Thrust Restraints MH-4.
- *** Where necessary, unit manufacturer shall provide base rail assembly to allow attachment of external isolators.

2.0 PRODUCTS (NOT USED)

3.0 EXECUTION

- a. Stock Requirements. The isolation manufacturer's representative must maintain an adequate stock of springs and isolators of type used so that changes made during construction and installation can be made.
- b. Factory Representation. After installation, furnish factory-trained representative of the isolation manufacturer to check various isolators and report measured versus anticipated deflection on all isolators. Have the representative certify that isolators have been installed in accordance with manufacturer's recommendations and approved submittals.

End of Section 23 05 48

SECTION 23 05 53**MECHANICAL IDENTIFICATION****1.0 GENERAL**

1.1 The following sections are to be included as if written herein:

- a. Section 23 00 00 – Basic Mechanical Requirements
- b. Section 23 05 29 – Sleeves, Flashings, Supports and Anchors

1.2 SECTION INCLUDES

- a. Nameplates
- b. Tags
- c. Stencils
- d. Pipe Markers

1.3 RELATED SECTIONS

- a. Section 09 91 00 - Painting: Identification painting

1.4 REFERENCES

- a. ASME A13.1 - Scheme for the Identification of Piping Systems

1.5 SUBMITTALS

- a. Submit under provisions of Section 23 00 00.
- b. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- c. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- d. Product Data: Provide manufacturers catalog literature for each product required.
- e. Samples: Submit two of each type of label, tag, etc., of the approximate size specified or implied in the specification.
- f. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

1.6 PROJECT RECORD DOCUMENTS

- a. Submit under provisions of Section 23 00 00.
- b. Record actual locations of tagged valves.

2.0 PRODUCTS

2.1 NAMEPLATES

- a. Manufacturers:
 - (1) Seton.
 - (2) Brady.
- b. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.2 TAGS

- a. Manufacturers:
 - (1) Seton.
 - (2) Brady.
- b. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.
- c. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 PIPE MARKERS

- a. Manufacturers:
 - (1) Seton.
 - (2) Brady.
- b. Color: Conform to 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.

2.4 CEILING TACKS

a. Manufacturers:

- (1) Seton.
- (2) Brady.

b. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

c. Color code as follows:

- (1) Yellow - HVAC equipment
- (2) Red - Fire dampers/smoke dampers
- (3) Green - Plumbing valves
- (4) Blue - Heating/cooling valves

2.5 GENERAL: The Contractor shall make it possible for the personnel operating and maintaining the equipment and systems in this project to readily identify the various pieces of equipment, valves, piping, etc., by marking them. All items of equipment such as fans, pumps, etc., shall be clearly marked using engraved nameplates as hereinafter specified. The item of equipment shall indicate the same number as shown on the Drawings. For example, pumps will be identified as 3A, 3B, 3C, etc.; exhaust fans will be E-1, E-2, etc.; supply fans will be S-1, S-2, etc.

2.6 MECHANICAL: All items of mechanical equipment shall be identified by the attachment of engraved nameplates constructed from laminated phenolic plastic, at least 1/16" thick, 3-ply, with black surfaces and white core. Engraving shall be condensed Gothic, at least 1/2" high, appropriately spaced. Nomenclature on the label shall include the name of the item, its mark number, area, space, or equipment served, and other pertinent information. Equipment to be labeled shall include but not be limited to the following:

Pumps	Exhaust Fans	
Fan and Coil Units	Hot Water Generators	
Condensing Units	Storage Tanks	
Converters	Compressors	
Air Conditioning	Control	Miscellaneous - similar and/or related items
Panels and Switches		

2.7 PIPING: Pipe markers and arrow markers also shall be provided on but not limited to the piping of the following systems:

Primary Chilled Water Supply Primary Chilled Water Return

Plumbing Piping Systems Roof Drain

Domestic Hot
Water Supply

Domestic Hot
Water Return

Domestic Cold
Water Supply

Domestic Cold
Water Return

- 2.8 ELECTRICAL: Nameplates shall be 2 or 3 ply laminated plastic, a minimum of 3/32" thick, such that letters will be white on black background. Letters shall be similar to Roman Gothic of a size that is legible and appropriate to the application. Attachment of nameplates shall be by screws. Rivets or adhesives are not acceptable.

- a. Electrical equipment to be identified includes: All switchgear, distribution panels, transformers, motor control centers, panel boards, disconnect switches, starters, contactors and time switches.
- b. Nameplates on distribution panels, motor control centers and panel boards shall give voltage characteristics.

Example:

PANEL

LA

120/208V, 3 PH, 4

W

served from .

- c. Individual circuit breakers in distribution panels, individual units in motor control centers, disconnecting means, and motor starters, shall have nameplates showing the load served.
- d. Branch circuit panel boards shall have neatly typed circuit directories behind clean plastic. Identify circuits by room numbers. Room numbers shall be those finally selected by the Owner, not necessarily those given on contract Drawings. If a circuit serves more than one room, list each room. Spares and spaces shall be indicated with erasable pencil, not typed.

- 2.9 The Contractor shall prepare and install, in a suitable glazed frame, typewritten valve charts giving the number, location and function of each line valve installed under this Contract. Each valve shall be numbered on these charts in accordance with the system of which it is a part of its location. For example, valves in different systems would be designated as follows:

HPS-1-3 High Pressure Steam
3 CHS-2-4 Chilled Water Supply
4

1st Level - Valve No.
2nd Level - Valve No.

- 2.10 VALVE TAGS:

- a. The Contractor shall provide and install identification tags lettered and numbered to correspond to the information shown on the charts described above. These tags are to be affixed to all valves except simple service and drain valves located within 10' and within sight of the device or equipment served. For example, it would not be expected that valves at a pressure reducing station in a machine room would be tagged. These tags shall be 1/8" thick brass discs, 1 1/2" in diameter. Each tag shall be attached to its valve with copper clad annealed iron wire or other approved material.

- b. Valves at water headers and steam PRV stations, valves associated with condensate, gas, water meters, and other valves as specified shall also be tagged with standardized color coded plastic tags. These tags shall be 2 1/2" wide by 1 1/2" high with these color codings: Red = normally closed; Green = normally open; Blue = open in winter, closed in summer; and Yellow = closed in winter, open in summer. Tags should be engraved on both sides.
- 2.11 In addition, pipe runs throughout the building including those above lift out ceilings, under floor, and those exposed to view when access doors or access panels are opened shall be identified by means of Mechanical Pipe Markers from approved vendors. Concealed areas, for purposes of this identification section, are those areas which cannot be seen except by demolition of the building elements. In addition to the pipe markers, arrow markers shall be used to indicate direction of flow. The following specific instructions shall apply to the application of these markers:
- a. Provide a pipe marker at each valve to indicate proper identification of pipe contents. Where several valves exist on one header, it is necessary to mark only the header.
 - b. Provide an arrow marker with each pipe marker pointing away from the pipe marker to indicate direction of flow.
 - c. Provide a double ended arrow marker when flow can be in either or both directions.
 - d. Provide a pipe marker and an arrow marker at every point of pipe entry or exit where line goes through a wall or service column.
 - e. Provide pipe markers and arrow markers at intervals not exceeding 50 feet.
 - f. Markers shall be located on the two lower quarters of the pipe where view is unobstructed.
 - g. Use snap-on type identification for all piping systems, 3/4" thru 6". For piping systems larger than 6", use strap on markers.
 - h. Pipe Markers shall conform to ANSI A 13.1-1981 "Scheme for the Identification of Piping Systems." Arrow markers must have same ANSI background colors as their companion pipe markers, or be incorporated into the pipe identification marker.
 - i. Locate markers to be visible from floor.
- 2.12 SPECIALS: Refer to special requirements noted in the various sections hereinafter bound.

3.0 EXECUTION

3.1 PREPARATION

- a. Degrease and clean surfaces to receive adhesive for identification materials.
- b. Prepare surfaces in accordance with Section 09 91 00 for stencil painting.

3.2 INSTALLATION

- a. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer. **Adhesive to comply with South Coast Air Quality Management District Standards rule 1168.**
- b. Install tags with corrosion resistant chain.
- c. Apply stencil painting in accordance with Section 09 91 00.
- d. Install plastic pipe markers in accordance with manufacturer's instructions.
- e. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- f. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- g. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with [plastic nameplates.] [stencil painting.] Small devices, such as in-line pumps, may be identified with tags.
- h. Identify control panels and major control components outside panels with plastic nameplates.
- i. Identify thermostats relating to terminal boxes or valves with nameplates.
- j. Identify valves in main and branch piping with tags.
- k. Identify air terminal units and radiator valves with numbered tags.
- l. Tag automatic controls, instruments, and relays. Key to control schematic.
- m. Provide ceiling tacks to locate valves, dampers or other concealed equipment above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

End of Section 23 05 53

SECTION 23 07 00**INSULATION - GENERAL****1.0 GENERAL****1.1 SCOPE**

- a. This section specifies the general requirements for furnishing and installing insulation. These requirements apply to all other Mechanical Division sections specifying insulation.

1.2 INTENT

- a. The intent of insulation specifications is to obtain superior quality workmanship resulting in an installation which is absolutely satisfactory in both function and appearance. Provide insulation in strict accordance with the specifications for each type of service and apply as recommended by the manufacturer.

1.3 RELATED WORK

- a. Division 09, Finishes. Painting and color coding.
- b. Division 23, HVAC.
 - (1) Air Handling Units. Internal insulation for air units is specified in the sections on air handling units. The units do not require external insulation.
 - (2) Insulation. Refer to specific sections on individual insulation types.

1.4 APPROVALS

- a. Submittals. Submit product data on each insulation type, adhesive, and finish to be used in the work. Make the submittal as specified in Division 01, General Requirements and obtain approval before beginning installation.
- b. Sample Application. Make an application of each type of insulation to display the material, quality and application method. Obtain approval of the sample application before proceeding with the work.

1.5 FIRE HAZARD RATING

- a. All duct and piping insulation used on the project must have a flame spread rating not exceeding 25 and a smoke developed rating not exceeding 50 as determined by test procedures ASTM E 84, NFPA 255 and UL 723. These ratings must be as tested on the Composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics and cements must meet the same individual ratings as the minimum requirements.

2.0 PRODUCTS – NOT USED**3.0 EXECUTION****3.1 INSULATION**

- a. Insulate valves, fittings, flanges, and special items to the full thickness required for corresponding piping.
- b. Replace insulation damaged by either moisture or other means. Insulation which has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also repair any damage caused by the condensation.
- c. Do not insulate any piping until all pressure tests have been performed in accordance with specifications.
- d. Where existing insulated piping, ductwork or other surfaces are tapped or damaged, remove existing insulation back to undamaged sections and replace with new insulation of the same type and thickness as existing insulation. Apply as specified for insulation of the same service.

End of Section 23 07 00

SECTION 23 07 13**EXTERNAL DUCT INSULATION****1.0 GENERAL****1.1 WORK INCLUDED**

- a. This section provides for the furnishing and installation of external insulation on low-velocity supply, return and outside air ducts, and all round low-velocity supply ductwork.
- b. External fire rated wrapping for ductwork is included in this section.

1.2 RELATED WORK

- a. Division 23 - HVAC. Insulation - General.

2.0 PRODUCTS**2.1 INSULATION**

- a. Concealed Duct, Round, Flat Oval, or Rectangular. Insulation R-values shall comply with the current International Energy Conservation Code requirements. Provide flexible glass fiber insulation with factory-applied, reinforced Foil-Kraft vapor retarder facing. A minimum thermal resistance of 6.0 (sq.ft. x degrees F x hrs. per BTU) at 75F is required, after installation (not in bag). Provide minimum 1-pound density insulation, which complies with ASTM C1290, C1136, C553.
- b. Exposed Round and Flat Oval Duct. Provide flexible fiberglass insulation with glass cloth vapor barrier. A minimum thermal resistance of 6.0 (sq. ft. x degrees F x hrs. BTU) at 75F is required.
- c. Exposed Rectangular Duct. Provide rigid board duct insulation with minimum R = 6.0. A minimum density of three pounds per cubic foot and minimum 1 ½" thick insulation is required. Provide an integral, UL labeled, reinforced Foil-Kraft facing on the outside surface.
- d. Grease Duct Wrap. Grease ducts to be wrapped per requirements of NFPA 96, UBC, UMC, SBC for 1- and 2-hour enclosures. Duct wrap to be similar to Premier Refractories Pyroscat FP fire barrier, duct wrap, 1-1/2" thick per 1-hour requirement. Requirement of 1-hour or 2-hour to be per local code authority. Insulation to meet requirements of UL 263, UL 723, UL 1479, UL 1978, ISO6944, UL-C FRD 6. Wrap to be listed for zero clearance. Install per UL listings and manufacturer's recommendations. Flexible fire rated duct wraps shall comply with ASTM E2336-04. (Comply with 2006 IMC, 2004 NFPA 96, 2006 UMC). When ducts penetrate a fire-rated partition, the penetration must be fire stopped to the rating of the partition.
- e. 1- and 2-Hour Duct Wrap. Ducts serving pressurized stairwells and ducts supplying air to atriums to have wrap equal to the fire rating of the enclosures they are serving. Air ducts to be wrapped per requirements of NFPA 96, UBC, UMC, SBC for 1- and 2-hour enclosures. Duct wrap to be similar to Premier Refractories Pyroscat FP fire barrier, duct wrap, 1-1/2" thick per 1-hour requirement. Requirement of 1-hour or 2-hour to be per local code authority. Insulation to meet requirements of UL 263, UL 723, UL 1479, ISO6944, UL-C FRD 6. Wrap to be listed for zero clearance.
- f. Standing Seams. Insulate standing seams and stiffeners that protrude through the insulation with 0.6-pound-per-cubic-foot density, 1 ½ inch thick, unfaced, flexible blanket insulation. As a vapor

seal, use 8-ounce canvas with vapor barrier coating. Insulation should not prevent adjustment of damper operators.

2.2 COATING AND ADHESIVE

- a. Coating. Provide Foster 30-65 or Childers CP-34 vapor barrier coating.
- b. Adhesive. Provide Foster 85-60 or Childers CP-127 vapor barrier adhesive.

3.0 EXECUTION

3.1 FIRE SAFETY REQUIREMENTS

- a. Do not extend duct coverings through walls or floors required to be firestopped or required to have a fire resistance rating. Interrupt duct coverings in the immediate vicinity of heat sources, such as electric resistance or fuel-burning heaters.

3.2 CONCEALED DUCT, ROUND, FLAT OVAL OR RECTANGULAR

- a. Insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2 inches. In addition, secure insulation to the bottom of rectangular ductwork over 24 inches wide by the use of mechanical fasteners at no more than 18 inches on center.
- b. On circumferential joints, the 2-inch flange on the facing shall be stapled with 9/16-inch flare-door staples on 6-inch centers, and taped with a minimum 3-inch-wide strip of glass fabric and coating, or a 3-inch-wide strip of 8-ounce canvas adhered with adhesive. Cover all seams, joints, pin penetrations and other breaks with coating reinforced with glass fabric.
- c. On circumferential joints, the 2-inch flange on the facing shall be stapled with 9/16-inch flare-door staples on 6-inch centers, and taped with a minimum 3-inch-wide strip of glass fabric and coating, or a 3-inch-wide strip of 8-ounce canvas adhered with adhesive. Adhesive systems employing release paper will not be acceptable.

3.3 EXPOSED ROUND AND FLAT OVAL DUCT

- a. Apply insulation to dry duct. Firmly butt all joints together. Seal longitudinal laps of factory-applied vapor barrier jacket with adhesive. Cover butt joints with a 3-inch-wide strip of factory-supplied vapor barrier jacket adhered with adhesive. Adhesive systems employing release paper will not be acceptable.

3.4 EXPOSED RECTANGULAR DUCT

- a. Fill and point up all joints, perforations and exposed edges with coating reinforced with glass fabric or a 3-inch-wide strip of 8-ounce canvas adhered with adhesive. Securely fasten insulation to metal surface with adhesive and mechanical fasteners on 12-inch centers. Sheet metal screws and discs or other approved fasteners may be used.

3.5 INSTALLATION OF GREASE DUCT AND 1- AND 2-HOUR AIR DUCT WRAP

- a. Installation to be per UL listing and manufacturer's recommendations. When duct width or height is 18" or wider, use pins and clips on bottom of duct evenly spaced 8-to-12" apart from each other on all vertical duct sections, sides and bottoms. At overlaps, install pins and clips per manufacturer. Access doors to be installed with two metal access door plates, threaded studs

welded around perimeter and sealed CLK Firestop Sealant, three layers of Pyroscat FP Duct Wrap and 2-mil aluminum foil tape, all per manufacturer's recommendations. Floor and wall penetrations to be per manufacturer's recommendations. Repair damaged duct wrap, rod penetrations, etc., per manufacturer's recommendations.

End of Section 23 07 13

SECTION 23 08 00**AIR BALANCE****1.0 GENERAL****1.1 SCOPE**

This section covers final air balance operations after construction of the air system.

- a. **Testing Agency.** The contractor shall secure the services of an independent air balance and testing agency to perform complete balance, adjustment and testing of air moving equipment and air distribution systems, including terminal units. Agency shall have on its staff at least one certified member of NEBB or AABC, who has been a member in good standing for at least 3 years, and the balancing agency shall be NEBB or AABC certified for a period of at least three years. Approved firms to provide this work are PHI Service Agency, Texas Energy Planners, Engineered Air Balance, and TAB Technologies.

- b. **Equipment.** Instruments used shall be accurately calibrated and maintained in good working condition. Equipment shall be as listed by the Associated Air Balance Council or NEBB for this type work.

- c. The items requiring testing, adjusting and balancing include the following:

AIR SYSTEMS:

Supply Fan AHU

Exhaust Fans

Zone branch and main ducts

Diffusers, Registers and Grilles

Coils (Air Temperatures)

- d. The balancing contractor shall provide tests to demonstrate the specified capacities and operation of all equipment and materials comprising the systems. Such tests other than as described herein, which are deemed necessary by the Engineer to indicate the fulfillment of the contract, shall be made. The Balancing (HVAC) Contractor shall then make available to the Engineer such instruments and technicians as are required for spot checks of the system.
- e. The drawings and specifications indicate valves, dampers, sheaves and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions, and it will be the responsibility of the Mechanical Subcontractor to install these devices in a manner that will leave them accessible and readily adjustable. The Balancing (HVAC) Contractor may be consulted if there is a questionable arrangement of a control or adjustable device.
- f. The balancing contractor shall be responsible for inspecting, balancing, adjusting, testing and logging the data of the performance of fans, all dampers in the duct systems, all air distribution devices or heat exchangers and the flows of water through all coils. The General Contractor, the Mechanical Subcontractor and the suppliers of the equipment installed shall all cooperate with the Balancing (HVAC) Contractor to provide all necessary equipment cutsheets.
- g. The Balancing (HVAC) Contractor shall provide the following services:
 - (1) During construction, inspect the installation of heating and cooling pipe systems, sheet metal work, temperature controls and other component parts of the heating, air conditioning and ventilating systems. The inspection of the work will cover that part

relating to proper arrangement and adequate provisions for the testing and balancing. The inspections shall be performed periodically as the work progresses. A minimum of three inspections are required as follows:

- (a) When 60% of ductwork is installed.
- (b) When 90% of ductwork is installed.
- (2) Submit brief written report of each inspection to A/E, with copies to Contractor, Mechanical Engineer, Inspector, and Owner's Representative.
- (3) Upon completion of the installation and start-up of the mechanical equipment by the Mechanical Subcontractor, the Balancing (HVAC) Contractor will balance, test and adjust the systemic components to obtain optimum conditions in each conditioned space in the building. If construction deficiencies are encountered which preclude obtaining optimum conditions, and the deficiencies cannot be corrected by the Contractor within a reasonable period of time, cease TAB services and advise the Architect in writing with an information copy to the Owner's Representative. The Balancing (HVAC) Contractor is advised that deficiencies in HVAC construction are often encountered during final TAB services and he should include in his bid an amount he deems advisable to compensate for his time in identifying the deficiencies to the Mechanical Contractor and awaiting their correction.
- (4) Fourteen (14) days, or earlier, prior to the Owner's Final Inspection, as requested by the General Contractor, the TAB shall prepare seven (7) copies of the completed Balancing (HVAC) Test and Balance Report. The Report shall be complete with logs, data, and records as required herein and all logs, data, and records shall be typed, produced on white bond paper, and bound with plastic spiral. The Reports shall be certified accurate and complete by a principal Engineer of the Balancing (HVAC) Contractor. Transmit one (1) copy direct to the Owner's Representative and the remaining six (6) copies to the Architect. The Architect will, in coordination with the Engineer, review the report. Upon approval, two (2) copies will be submitted to the Owner's Representative and two (2) copies transmitted to the Contractor.
- (5) The Report shall contain the following general data in a format selected by the TAB Agency for clarity and ease of reference.

Project No.

Contract No.

Project Title:

Project Location:

Project Mechanical Engineer: (Name)

TAB Field Test Engineer: (Name)

TAB Testing Diagnosis and Analysis by : (Name)

TAB Agency: (Firm name and address)

Mechanical Subcontractor: (Name and address)

General Contractor: (Name and address)

Inclusive dates tests were performed and date of Report

Test Certification Number:

Certification by principal engineer

The TAB Report shall normally contain the following sections:

Table of Contents

General data and certification

Brief Description of Tests and Test Procedures (including instruments used)

Summary of Test Results (note deficiencies, if any, and action taken for correction)

Logs, Data, and Records

h. REPORTS

- (1) Final TAB Report - The TAB agency shall submit the final TAB report for review by the engineer. All outlets, devices, HVAC equipment, etc., shall be identified, along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC "National Project Performance Guaranty" assuring the project systems were tested, adjusted and balanced in accordance with the project specifications and AABC National Standards or NEBB procedures.

1.2 RELATED WORK

a. Division 23 - Mechanical.

- (1) Ductwork.
- (2) Fans.
- (3) Air Devices.

1.3 PROCEDURES

- a. Operating Tests. After all mechanical systems have been completed, and prior to air balance, subject each system to an operating test under design conditions to ensure proper sequence of operation in all operating modes. Make adjustments as required to ensure proper functioning of all systems.
- b. Certified Data. The contractor shall provide the balance and testing agency the certified data on fans, grilles, coils, filters and other equipment required for proper balancing of the system.
- c. Adjustment. The balance and testing agency shall provide necessary adjustments to air flow dampers, fans, sheaves, extractors, splitters, and other controls as required to properly balance the system. TAB firm to include in his bid, all belts and sheaves, and labor to replace and adjust all sheaves to obtain scheduled air flow.
- d. Balancing. The balance agency shall follow balancing and testing procedures published by the Associated Air Balance Council, or NEBB.
- e. Reports. Compile the test data on report forms as listed in the AABC "National Standards for Total System Balance". Include data on air volume at supply and return grilles and diffusers. Include exhaust air volume. Contractor's forms are not acceptable unless all data included is in the latest "National Standards" by AABC.
- f. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC National Standards. Adjustment tolerances shall be + or - 10% unless otherwise stated.
- g. Equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levels, and similar controls and devices shall be marked to show final settings.

2.0 PRODUCTS (NOT USED)

3.0 EXECUTION

3.1 AIR BALANCE (BY AIR BALANCE AGENCY)

a. General Requirements.

- (1) Do all work required for complete testing and adjusting of all HVAC systems.
- (2) Provide all instruments and equipment required to accomplish necessary testing, adjusting, and as required by the engineer to verify performance. All instruments shall be in accurate calibration and shall be calibrated in ranges that will be expected.
- (3) Prior to final observation, submit to the owner a letter certifying:
 - (a) That all balancing is complete.
 - (b) That all controls are calibrated and functioning properly.
 - (c) That all parts of the various systems are complete and ready to be turned over to the owner for continuous operation. Submit with letter a report tabulating data requested by the Engineer.

b. Design Conditions. The HVAC systems have been designed to maintain the inside conditions indicated below when operating with the outside conditions stated. Install, test and adjust the systems so that they will produce the inside conditions for design; however, contractor must be prepared to provide a suitable test to prove that equipment is producing capacities scheduled.

(1) Inside Conditions.

Summer: 75 F.D.B. 50% R.H.
Winter: 72 F.D.B.

(2) Outside Conditions.

Summer: 98 F.D.B. 78 F.W.B.
Winter: 20 F.D.B.

- c. Adjust all air system dampers and volume controllers to obtain proper air balance throughout the conditioned area. The air quantities shown on the drawings for individual outlets may be changed to obtain uniform temperature within each zone, but the total air quantity shown for each zone must be obtained. Maximum temperature variation within a zone to be 2°F.
- d. Adjust all blower drives to obtain proper total amounts of air. Change drive if necessary to accomplish proper air flow. Costs for drive changes, including belts and sheaves will be borne by the TAB contractor.
- e. Adjust all valves in the various water systems to obtain proper amount of water to each piece of equipment.
- f. Calibrate, set and adjust all automatic temperature controls. Check proper amount of water to each piece of equipment.

g. AIR SYSTEMS

The TAB agency shall verify that all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the full open position. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards:

- (1) For supply fans:

- (a) Fan speeds - test and adjust fan RPM to achieve maximum or design cfm.
 - (b) Current and voltage - test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
 - (c) Pitot-Tube traverse - perform a Pitot-tube traverse of main supply and return ducts, as applicable to obtain total cfm.
 - (d) Outside air - test and adjust the outside air on applicable equipment using a pitot-traverse. If a traverse is not practical use the mixed air temperature method if the inside and outside temperature difference is at least 20 degrees Fahrenheit or use the difference between pitot-tube traverses of the supply and return air ducts.
 - (e) Static pressure - test and record system static profile of each supply fan.
 - (2) For exhaust fans:
 - (a) Fan speeds - test and adjust fan RPM to achieve maximum or design cfm.
 - (b) Current and voltage - test and record motor voltage and amperage, and compare data with the nameplate limits to ensure motor is not in or above the service factor.
 - (c) Pitot-tube traverse - perform a pitot-tube traverse of main exhaust ducts to obtain total cfm.
 - (d) Static pressure - test and record system static profile of each exhaust fan.
 - (3) For zone, branch and main ducts:
 - (a) Adjust ducts to within design cfm requirements. As applicable, at least one zone balancing damper shall be completely open. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
 - (4) For diffusers, registers and grilles:
 - (a) Tolerances - test, adjust and balance each diffuser, grille, and register to within 10% of design requirements. Minimize drafts.
 - (b) Identification - identify the type, location and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.
 - (5) For coils:
 - (a) Air temperature - once air flows are set to acceptable limits, take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry bulb temperature shall be taken on the entering and leaving side of each heating coil.
- h. **SOUND TESTING.** The TAB agency shall conduct sound testing in the following areas per AABC National Standards and to the criteria listed, using sound meter with octave band analyzer:

TEST AREA	NUMBER OF LOCATIONS	NC LEVEL ACCEPTABLE
General Offices	0	30-35
Executive Offices	0	25-30
Computer/Equipment Rooms	0	40-45
Hospitals	0	30-40
Churches	0	25-30
Libraries	0	35-40
Schools/Classrooms	0	25-30

- i. VIBRATION TESTING. The TAB agency shall conduct vibration testing on the following equipment per AABC National Standards. Test deflection in mils and velocity in inches per second shall be measured and the results compared to requirements in equipment specification sections.

EQUIPMENT

Fans over 3.0 horsepower

pumps over 3.0 horsepower

- j. INDOOR AIR QUALITY VERIFICATION

- (1) The TAB agency shall take measurements at design outside air. It shall measure temperature and humidity uniformity throughout the space, check filter installation for proper fit, seal, and operation, and verify condensate drain operation. The TAB agency shall note any water damage or obvious contamination sources from inside or outside.
- (2) The TAB agency shall conduct the following air sampling tests for every 2,500 square feet of space:

Chemical Name	Chemical Symbol	TLV-TWA (1) (PPM)	C-STEEL (2) (PPM)	Dreager Tube Range (PPM)
Carbon Dioxide	CO ²	5000	-	100-3000
Carbon Monoxide	CO	25	-	2-300
Ozone	O ³	0.10	-	0.005-1.4
Nitric Oxide	NO	25	-	0.5-25
Nitrogen Dioxide	NO ²	3	-	0.5-25
Formaldehyde	HCHO	-	0.3	0.2-5

[1] TWA - Time Weighted Average: Compound concentrations to be controlled during a continuous 8-hour period to within this TWA value, measured in parts per million (PPM).

[2] C-STEEL - Ceiling-short Term Exposure Limit: Compound conc

- (3) The TAB agency shall prepare a report showing the results, location, time and date of each test. A summary of the HVAC operating conditions, and a listing of any discrepancies shall be provided.
 - (4) All IAQ readings are applicable only to the date and time noted above.
- k. DUCT LEAKAGE TESTING. The installing contractor shall isolate and seal sections of ductwork for testing. The test pressures required and the amount of duct to be tested shall be described by the engineer in the appropriate duct classification section. All testing shall be based on one test per section only unless otherwise noted.
- l. VERIFICATION OF HVAC CONTROLS. The TAB agency shall be assisted by the building control systems contractor in verifying the operation and calibration of all HVAC and temperature control systems. The following tests shall be conducted:
 - (1) Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, and other safety devices.
 - (2) Verify that all controlling instruments are calibrated and set for design operating conditions.
- m. TEMPERATURE TESTING. To verify system control and operation, a series of three temperature tests shall be taken at approximately two-hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two degrees Fahrenheit from the thermostat or control setpoint during the tests. Outside temperature and humidity shall also be recorded during the testing periods.
- n. TAB REPORT VERIFICATION. At the time of final inspection, the TAB agency may be required to recheck, in the presence of the Owner's representative, specific or random selections of data recorded in the certified report. Points and areas for recheck shall be selected by the Owner's representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, will not exceed 10% of the total number tabulated in the report.
- o. BUILDING/ZONE PRESSURIZATION. The TAB agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differential. For positive pressure areas, it shall set the supply air to design flow, and gradually reduce the exhaust air rate to obtain the required flow or pressure difference. For negative pressure areas, it shall set the supply air to design flow, and gradually increase the exhaust air rate to obtain the required flow or pressure difference.
- p. FIRE AND SMOKE TESTING. The TAB agency shall test fire/smoke dampers to assure operation. It shall verify that an access door has been installed for each fire and smoke damper. For fire dampers, the TAB agency shall open the access door, disconnect the fusible link, and allow the damper to close. Operation should be smooth and all dampers must close completely. The TAB agency shall then reset the damper. For the smoke damper, the TAB agency shall open the access door, activate the damper, and observe operation. The damper must close quickly and completely. The TAB agency shall then reset the damper and observe its complete opening.
- q. LIFE SAFETY CONTROLS. The TAB agency shall test and record life safety control operation on the HVAC equipment. It shall verify the installation of required smoke detectors in air handling equipment (AHE), and shall verify operation of the smoke detector by activating the smoke detector and observing air handler shutdown. With the controls and alarm contractors, the TAB agency shall verify the operation of interconnected systems such as the AHE smoke detector's

activation of the fire alarm system and the alarm system's activation of the life safety control sequences.

- (1) After balancing is complete and before calling for final observation, record, and submit for record reports as noted herein and per recommendations of AABC or NEBB.
 - (2) For each air unit:
 - (a) Suction and discharge static pressure, and total static.
 - (b) Fan rpm, measured by tachometer; verify rotation.
 - (c) Motor nameplate F.L.A., actual amps, voltage.
 - (d) Measured cfm for total supply, return and outside air.
 - (e) Entering and leaving air temperature for each coil.
 - (f) Entering and leaving water temperatures for each water coil.
 - (g) Entering and leaving water pressures for each water coil.
 - (3) Each condenser unit:
 - (a) Ambient air temperature, condenser discharge temperature.
 - (b) Motor nameplate F.L.A., actual amp, voltage.
 - (c) Suction and discharge pressures, temperature.
 - (4) Other reports and forms to be completed and submitted. Provide instrument list, air moving test sheet, exhaust fan data sheet, static pressure profile, return air/outside air data, fan and motor pulley, duct traverse readings, duct traverse zone totals, air monitoring station data, air distribution test sheet, terminal units, pump data sheet, chillers, air cooled condensers, cooling coil data, heating coil data, flow measuring station, duct leak test. All forms shall be as listed in the latest "National Standards for Total System Balance", or shall be similar, but must note same information.
- r. After Owner Occupancy. After owner has occupied and is using the building, make three additional inspections of the system (at 1 month intervals) to:
- (1) Correct any owner observed temperature imbalances.
 - (2) Check correct operation of equipment and verify by letter to the engineer on each trip. List in the letter corrections made.
- s. At Time of Job Completion.
- (1) Provide such tools, equipment and personnel as required to conduct tests and demonstrate the acceptability of the various systems.
 - (2) Have the authorized representatives of the various manufacturers available if requested.

End of Section 23 08 00

SECTION 23 21 13.02**PIPING AND PIPING APPURTENANCES FOR
EQUIPMENT DRAINS****1.0 GENERAL****1.1 SCOPE**

- a. This section provides for furnishing and installing piping and piping appurtenances to drain air handlers, and other equipment requiring drains.

1.2 RELATED WORK

- a. Division 23 - HVAC.

- (1) Pipe and Pipe Fittings.

- (2) Insulation.

2.0 PRODUCTS**2.1 PIPE AND FITTINGS**

- a. Provide seamless, hard-drawn, Type L, copper water tube conforming to ASTM B 88, and wrought copper fittings.

2.2 TRAPS

- a. On each air handling unit condensate drain, provide a trap deep enough to overcome pressure of the unit.
- b. controls.

3.0 EXECUTION

- a. Install according to manufacturer's recommendations.

End Of Section 23 21 13.02

SECTION 23 23 00**REFRIGERANT PIPING AND APPURTENANCES****1.0 GENERAL****1.1 WORK INCLUDED**

- a. This section specifies the furnishing and installation of copper tubing, valves, strainers and sight glass for refrigerant piping.

1.2 RELATED WORK

- a. Division 23 - HVAC.
 - (1) Pipe and Pipe Fittings.
 - (2) Valves, Strainers, and Vents.
 - (3) Low Temperature Piping Insulation.

2.0 PRODUCTS**2.1 PIPE AND FITTINGS**

- a. Furnish refrigerant piping of Type L-ACR, hard-drawn copper tubing with sweat-type, wrought copper fittings. Cast fittings are not permitted.

2.2 SERVICE VALVES

- a. Provide angle or globe service valves, with sweat connections. Use packed-type valves with gasketed seal cap and back seat feature. Valves must be wrench operated. Furnish valves especially designed for refrigerant service, in conformance with the ARI code.
- b. Place service valves at the inlet and outlet of each compressor, on both sides of each strainer and solenoid valve, and as otherwise shown and specified.

2.3 SIGHT GLASSES

- a. Provide suitable double-window sight glass in the liquid line leaving the condenser.

2.4 SOLENOID VALVES

- a. Furnish pilot-operated, floating piston solenoid valves suitable for operation with refrigerant.
- b. Use valves with a bronze body and sweat-type connections.
- c. Provide stainless steel stem and plunger assembly, and a stainless-steel piston.

- d. Furnish solenoid coils which are sealed and moisture proof.
- e. Use electrical characteristics of 115-volt, 60 hertz.

3.0 EXECUTION

3.1 PRESSURE TEST

After all refrigerant equipment and piping are installed, charge the system with the proper refrigerant and dry nitrogen to 300 psig.

- a. Test all joints with a Halide torch or an electronic leak detector.
- b. Repair all leaks and retest each system until proved absolutely tight.

3.2 EVACUATION AND DRYING

After refrigerant system has been pressure tested, connect a suitable vacuum pump, and evacuate piping system, including all lines and equipment. Verify all equipment, gauges, hoses, hose gaskets, etc., are airtight and leak free. Using a calibrated micron gauge (Bacharach, J.B., Ronaire) triple evacuate refrigerant system as follows:

- a. Evacuate refrigerant to 1500 microns, break vacuum using dry nitrogen. Do not allow any air to enter system.
- b. Evacuate refrigerant system for the 2nd time to 1500 microns. Break vacuum using dry nitrogen. Do not allow any air to enter system.
- c. Evacuate refrigerant system for the 3rd time to 500 microns. Maintain vacuum for a minimum of four hours at 500 microns.
- d. Document all stages of evacuation and submit a brief written report to the Engineer.
- e. Charge refrigerant system with the proper refrigerant. Do not allow any air or nitrogen to enter the system.

End Of Section 23 23 00

SECTION 23 30 00**DUCTWORK****1.0 GENERAL****1.1 WORK INCLUDED**

- a. This section provides for furnishing and installing low pressure ductwork and includes duct construction and accessories.

1.2 RELATED WORK

- a. Division 23 - HVAC.

- (1) Air Devices
- (2) Air Balance
- (3) Fans
- (4) Insulation
- (5) Emergency Generator Exhaust Piping, if required, is specified in drawing detail.

1.3 GUARANTEE

- a. Guarantee all ductwork for one year from the date of final acceptance. The guarantee will cover workmanship, noise, chatter, whistling, or vibration. Ductwork must be free from pulsation under all conditions of operation.

1.4 CONTRACTOR COORDINATION

- a. Erect all ducts in the general locations shown, but conform to all structural and finish conditions of the building. Before fabricating any ductwork, check the physical conditions at the job site and make all necessary changes in cross sections, offsets, aspect ratio, areas, and similar items, whether they are specifically indicated or not at no additional cost.

1.5 STANDARD AND CODES

- a. Except as otherwise indicated, sheet metal ductwork material and installation shall comply with the latest edition of the SMACNA HVAC Duct Construction Standards. Fiberglass ductwork material and installation shall comply with the latest edition of SMACNA Fibrous Glass Duct Construction Standards and NFPA Bulletin 90A. All air distribution devices (such as dampers) included in this specification shall comply with the latest applicable SMACNA manual and NFPA 90A.

2.0 PRODUCTS**2.1 DUCT MATERIAL**

- a. Except for the special ducts specified elsewhere, use prime galvanized steel sheets or coils up to 60 inches wide. Stencil each sheet with proper gauge and manufacturer's name. Stencil coils of sheet steel throughout on 10-foot centers with gauge and manufacturer's name. Contractor shall be cautioned that Engineer may random check duct and strap gauges with a micrometer to verify compliance with the specifications.

2.2 SEALING OF SEAMS AND JOINTS (LOW VOC)

- a. The entire duct system shall be sealed. The seams and joints shall be sealed by use of low VOC Hardcast DT tape with FTA-20 (indoor) adhesive or low VOC RTA-50 adhesive for outdoor applications. Duct shall be thoroughly cleaned prior to application.
- b. Provide Seal Class A to all transverse and longitudinal joints and all openings for all locations. Joints includes additional sealing of TDF, duct-mate or other mechanical/gasketed joints. Spiral lock seams in round and flat oval duct need not be sealed.

2.3 LOW PRESSURE DUCTWORK (LESS THAN 2 INCHES STATIC PRESSURE)

Low pressure ductwork is defined as all exhaust ductwork downstream of fans and supply ductwork downstream of terminal units and fan-coil units.

- a. Rectangular. Provide rectangular, low-pressure duct construction, gauges and reinforcing in accordance with the latest edition of the SMACNA HVAC Duct Construction Standards for 2" w.g. static pressure class (positive or negative), however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 84".

<u>Largest Dimension</u>	<u>U.S. Gauge</u>
12" and less	No. 26
13" to 30"	No. 24
31" to 54"	No. 22
55" to 84"	No. 20
85" and above	No. 18

- b. Round. Furnish round, low-pressure ducts which are spiral wound, such as manufactured by United McGill Sheet Metal Company, or shop fabricated round ducts with Pittsburgh lock longitudinal seams. Use the following minimum gauges for shop fabricated spiral wound ducts under positive pressure, however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 84".

<u>Diameter</u>	<u>U.S. Gauge</u>
26 " and less	No. 26
27 " to 36 "	No. 24
37 " to 50 "	No. 22
51 " to 60 "	No. 20
61" to 84"	No. 18

Use the following minimum gauges for shop fabricated spiral wound ducts under negative pressure, however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 84".

<u>Diameter</u>	<u>U.S. Gauge</u>
17" and less	No. 26
18" to 23"	No. 24
24" to 30"	No. 22
31" to 48"	No. 20
49" to 60"	No. 18
61" to 72"	No. 16

Use the following minimum gauges for shop fabricated ducts with Pittsburgh lock longitudinal seams under positive pressure, however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 84".

<u>Diameter</u>	<u>U.S. Gauge</u>
14" and less	No. 26
15" to 26"	No. 24
27" to 36"	No. 22
37" to 50"	No. 20
51" to 60"	No. 18
61" to 84"	No. 16

Use the following minimum gauges for shop fabricated ducts with Pittsburgh lock longitudinal seams under negative pressure, however, the gauges listed below are the minimum gauges to be used. Internal rod reinforcement will not be allowed for any ductwork with a largest dimension of less than 84".

<u>Diameter</u>	<u>U.S. Gauge</u>
13" and less	No. 26
14" to 17"	No. 24
18" to 20"	No. 22
21" to 26"	No. 20
27" to 34"	No. 18
35" to 42"	No. 16
43" to 48"	No. 18 A6*
49" to 60"	No. 18 B4**

* A6 indicates that 1"x1"x1/8" reinforcement angles shall be used at minimum 6'-0 intervals and installed per latest edition of SMACNA HVAC Duct Construction Standards.

** B4 indicates that 1-1/4"x1-1/4"x3/16" reinforcement angles shall be used at minimum 4'-0 intervals and installed per latest edition of SMACNA HVAC Duct Construction Standards.

- c. Fiberglass Duct Option. As an option, provide fiberglass duct in lieu of sheet metal for all concealed ductwork up to 36 inches wide. All duct board must have anti-microbial coating. No fiberglass ductwork will be allowed within the confines of any mechanical room. Select heavy-density, nonmetallic duct system using 2-inch-thick fibrous glass board, with a glass fabric reinforced, embossed aluminum surface. The product must have UL Standard 181, Class I Commercial Air Duct approval. Each board must bear a UL label.
- d. Flexible Ducts. Low pressure insulated flexible duct may be used where shown on the drawings. Duct shall be made with factory preinsulated duct, covered with a minimum of 2" thick, R6 fiberglass blanket sheathed in a vapor barrier of fiberglass reinforced aluminized polyester laminate. The insulation shall have a minimum "K" factor of 0.29 at 60 degrees F mean and a vapor barrier permeability rating of 0.05 per ASTM method E96-66, Procedure A. The C factor shall be 0.24 to meet HUD requirements. The duct shall be rated for a positive working pressure of 6" w.g. and a temperature of up to 250 degrees F. The duct must comply with the latest NFPA Bulletin 90A and be listed and labeled by Underwriters™ Laboratories, Inc., as Class I Air Duct, Standard 181, and meet GSA, FHA and other U.S. Government standards; flame spread, not over 25; smoke developed, not over 50. Provide Flexmaster 1M, 8M or PeppertreeAir Solutions Type HM only (no substitutions) for flex duct at air devices, and Flexmaster Type TLM or PeppertreeAir Solutions Type TFT-M for medium and high pressure applications i.e., connection to VAV boxes.

Low Pressure Acoustic Performance:

- (1) The straight duct insertion loss (db) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 2500 feet per minute shall be at least:

- | | | | | | | | |
|-----|---------|---------------|---------------|---------------|----------------|----------------|----------------|
| | | <u>125 Hz</u> | <u>250 Hz</u> | <u>500 Hz</u> | <u>1000 Hz</u> | <u>2000 Hz</u> | <u>4000 Hz</u> |
| (a) | 8" dia. | 12 | 29 | 36 | 35 | 38 | 22 |
| (b) | 12" dia | 21 | 28 | 29 | 33 | 26 | 12 |
- (2) The radiated noise reduction (db) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 2500 feet per minute shall be at least:
- | | | | | | | | |
|-----|---------|---------------|---------------|---------------|----------------|----------------|----------------|
| | | <u>125 Hz</u> | <u>250 Hz</u> | <u>500 Hz</u> | <u>1000 Hz</u> | <u>2000 Hz</u> | <u>4000 Hz</u> |
| (a) | 8" dia. | 10 | 7 | 7 | 8 | 10 | 13 |
| (b) | 12" dia | 9 | 6 | 6 | 5 | 9 | 13 |
- (3) The terminal ends of the duct core shall be secured by stainless steel worm gear type clamp equal to Ideal Series 56 Snaplock. The fittings on air mixing devices and on sheet metal duct shall be coated with the sealant specified for low pressure ductwork, then flexible duct core slipped over duct and coupling or clamp tightened, then connection sealed with more sealant. Insulation of flexible duct shall be slipped over connection to point where insulation abuts mixing box or insulation on duct. These insulation connections shall be sealed by imbedding fiberglass tape in the sealant specified for medium pressure ductwork and coating with more sealant to provide a vapor barrier. (This applies to all flex connections to diffusers, grilles, etc., when allowed on the drawings.)
- e. Medium and High Pressure Insulated Flexible Duct shall be the same construction as the Low Pressure Duct, factory applied insulation of 2" minimum thickness, R6 with a permeability rating of 0.30. The duct shall be supported by a corrosion resistant metal spiral, or a coated spring steel helix and solid inner liner mechanically interlocked or permanently bonded to the helix wire. Ratings shall be as described for Low Pressure Duct above. Flexible ducts shall be not more than 3' - 0" in length, used for alignment or sound/vibration purposes only, and may only be installed in straight runs. Flexible duct shall NOT be used for changes of direction of air flow. Installation, clamps and sealing shall be the same as specified for rigid duct and Flexmaster Type TLM or PeppertreeAir Solutions Type TFT-M for medium and high pressure applications i.e., connection to VAV boxes.
- f. Support flexible ductwork such that there is no more than 1/2" per foot deflection of duct between support points.

2.4 DUCTWORK FOR REMOVAL OF GREASE-LADEN VAPORS

- a. Ductwork removing grease-laden vapors such as those from cooking equipment should be:
- (1) Listed grease ducts acceptable to the authority having jurisdiction, or 16-gauge black steel, with liquid-tight continuous external weld on all seams and joints, complying with NFPA 96 and UMC.
 - (2) Ductwork joints shall only be telescoping welded duct joints or welded bell duct joints, and no butt weld joints allowed. Duct to fan connections shall be as depicted in 2006 UMC, figure 5-6. Slope ducts per 2006 UMC, Section 510. Support ducts 24" and larger in any dimension shall support minimum 800 pounds at any point in the duct systems (NFPA 96: 7.4.1.3). Openings/access to ductwork for inspection/cleaning to be maximum 12 ft. on centers (NFPA 96: 7.4.1.2). Access panels shall have a gasket/sealant rated for 1500°F and shall be grease tight. Fasteners used to secure access panels shall be carbon steel or stainless steel and shall not penetrate duct walls.

2.5 FIRE AND SMOKE DAMPERS

- a. Quality Standards. Furnish and Install fire and smoke dampers according to NFPA Standards and SMACNA Duct Manual. Dampers must bear UL label. Use blade dampers when blade width exceeds 12 inches. Provide access doors in attached ductwork for inspection. Stencil each door "FIRE DAMPER ACCESS."
- b. Fire Dampers. Use fire dampers that are 95% minimum free area, as manufactured by Greenheck, or approved equal. Dampers to be similar to Ruskin DIBD2, Styles C, CR, CO, dynamic dampers, listed per latest edition of UL 555, listed for two-way airflow and vertical or horizontal mounting, or Greenheck FSD. Closure springs to be stainless steel. Dampers shall be activated by a fusible link designed to react at 165°F or as required by code. Code (UBC) requires 165°F, but minimum 50°F above maximum operating conditions. Links for smoke control may be up to 365°F per code official. Coordinate requirements with the code official.
- c. Combination Fire and Smoke Dampers. Provide parallel blade UL listed dynamic damper and assembly with 120 volt motor, and sleeve assembly, similar to Ruskin FSD 60 with Class I leakage per UBC or Greenheck FSD series. Rate dampers for 2000 FPM up to 8 s.f. and 4000 FPM when larger than 8 s.f. and pressure level of minimum 4" w.c. Temperature rating to be as recommended by the manufacturer for the application. Dampers to be rated for airflow in both directions. Accessories to be provided are:
 - (1) Heat activated release devices, which are automatically resettable after test, smoke detection or power failure conditions.
 - (2) E/P switch on pneumatically controlled dampers.
 - (3) TS150 fire stat to provide remote override of fire-induced closure when F/SD is used in smoke management system for hi-rise buildings or buildings with atriums. When this feature is used, provide with switch package to remotely indicate damper blade position.

Coordinate the location of motor actuators to provide adequate maintenance access.

For three-hour applications, provide same as above except FSD60-3, three-hour rated fire/smoke damper.
 - (4) Provide with blade position indicator and blade position indicator switch.
 - (5) All motors for F/SD in stairwells and vestibules for stairwell pressurization shall have motors which are UL listed for modulating service, but can be used for open/closed positions also.

2.6 WALL LOUVERS

- a. Louvers are provided under other sections of these specifications.

2.7 TEST OPENINGS:

- a. Furnish and install in the return air duct and in the discharge duct of each fan unit Ventlok No. 699 instrument test holes. The test holes shall be installed in locations as required to measure pressure drops across each item in the system, e.g., O.A. louvers, filters, fans, coils, intermediate points in duct runs, etc.

3.0 EXECUTION

3.1 INSTALLATION

- a. Construction Standards. Use construction methods which follow the requirements outlined in paragraph 1.5, as well as SMACNA Balancing and Adjusting publications, unless otherwise indicated in these specifications or accompanying drawings.
- b. Reinforcement. Reinforce ducts having one side equal to 25 inches or more in accordance with recommended construction practice of SMACNA.
- c. Plenum Construction. Construct Plenum chambers of not less than No. 20 U.S. gauge metal reinforced with galvanized structural angles.
- d. Cross Breaking or Beading. Cross break or bead sheet metal for rigidity, except ducts which are 12 inches or less in the longest dimension.
- e. Wall Penetrations. Where ducts pass through walls in exposed areas, install suitable escutcheons made of sheet metal angles as closers. At all locations where ductwork passes through floors, provide watertight sleeves projecting 3 inches above finished floor and flush with bottom of floor slab. Fabricate sleeves of 1/8-inch thick steel, galvanized after fabrication. Anchor into adjacent floor slab as required. Sleeves are required inside as well as outside chases. Support ducts where passing through floors with steel structural angles of adequate bearing surface, galvanized after fabrication and resting on top of the sleeve.
- f. Interior Painting. Interior painting of metal ductwork exposed to view through grilles, registers, and other openings is specified in the section on painting. Do not install grilles, registers, or similar items until painting is complete.

3.2 LOW PRESSURE DUCTWORK

- a. Construction. Construct rectangular ducts in accordance with the SMACNA Duct Manual.
- b. Splitters. Provide adjustable, galvanized splitter-dampers pivoted at the downstream end with appropriate control device at each supply duct split, in accordance with SMACNA Duct Manual. Provide a splitter for each duct branch to two or more outlets.
- c. Extractors. Provide Titus AG225 or equal extractors with an appropriate control device at each rectangular zone or branch supply duct connection in accordance with SMACNA Duct Manual.
- d. Volume Dampers. Provide opposed-blade volume dampers with an appropriate control device in each return air, outside air and exhaust branch duct, in exhaust connections to hoods or equipment, in each zone at multizone unit discharge, and where otherwise indicated, in accordance with SMACNA Duct Manual. Manual balancing damper to be similar to Greenheck Model MBD-15, multi-blade, 6" maximum blade height, 16-gauge galvanized steel reinforced blades, 20-gauge frame, manual hand quadrant with standoff for externally insulated ductwork, synthetic sleeve. Dampers suitable for service to 4" w.c. for 12" width, 3" w.c. for 24" width, 2" w.c. for 36" width, 2" w.c. for 48" width and rated for 2000 fpm. Dampers larger than 96" x 96" to be similar to Greenheck Model VCD-20 series.
- e. Manual low-leakage volume dampers shall be similar to Greenheck Model VCD-33, ultra low-leakage damper, rated for 6 cfm per s.f. at 4" w.c. and rated for up to 4000 fpm and up to 8" w.c. Frame to be 16-gauge galvanized, blades to be 14-gauge airfoil. Seals to be silicone-rubber for blades and flexible metal compression jamb seals. Bearings to be synthetic type. Maximum blade height is 6". Provide with manual hand quadrant with 1 1/2" standoff. All volume dampers used for stairwell and vestibule pressurization shall be low leakage with blade and jamb seals.

f. Elbows.

- (1) Rectangular. Where square elbows are shown, or are required for good air flow, provide and install Barber-Colman or equal double-wall air foil turning vanes. Job-fabricated turning vanes, if used, must be double thickness vanes of galvanized steel sheets of the same gauge metal as the duct in which they are installed. Furnish vanes fabricated for the same angle as the duct offset. Use radius elbows with a center line radius of not less than 1-1/2 times the duct width. Radius elbows may be provided in lieu of vaned elbows where space and air flow requirements permit.
- (2) Round and Oval Duct. Provide elbows with a centerline radius of 1-1/2 times the duct diameter or duct width. For round ducts, furnish smooth elbows or 5-piece, 90° elbows and 3-piece, 45° elbows.

g. Controls. For control devices concealed by ceilings, furring, or in other inaccessible locations, furnish extension rods and appropriate recessed-type Young regulators, mounted on the surface of the ceiling or the furring, unless specified, or shown otherwise. For ducts which are not concealed, or ducts which are above lay-in ceiling but accessible, provide heavy-duty, quadrant-type, adjustable regulators having wing nuts for locking in position. Saw-mark the ends of all operating rods for dampers and air control devices to indicate damper position.

h. Obstruction. Install streamline deflectors at any point where dividing a sheet metal duct around piping or where other such obstruction is permitted. Where such obstructions occur in insulated ducts, fill space inside streamliner and around obstructions with glass fiber insulation.

i. Remote Operated Dampers. Provide factory-fabricated volume dampers for remote, manual volume control. Use opposed-blade, balanced type, pivoted in bronze bearings and mounted in a channel frame. Operate damper through a flexible-drive cable from a wall-mounted operating knob. Remote operated dampers to be ultra low-leakage dampers similar to Greenheck VCD-33.

j. Fiberglass Duct.

- (1) Joints. Make duct system joints with mastic and tape. Reinforce according to the manufacturer's recommendations and instructions. Plain end butt joints are not acceptable.
- (2) Hangers. Install hangers at turns and transitions, and on not more than 6-foot centers on straight runs. Use saddle-type hangers with 3/4-inch perforated, 24-gauge straps either 22-gauge, 4-inch-long metal angles at the duct corners, or No. 12 wire, securely anchored to 2" by 1" x 24-gauge angle cross support under the duct.
- (3) Installation. Fabricate at job site and install according to manufacturer's application manual and paragraph 1.5. Provide all accessories such as turning vanes, dampers, extractors, and the like, as specified for sheet metal ductwork. Off-site fabrication of ductwork or large stockpiling of fabricated sections at the job site will not be acceptable. Radius turns will not be acceptable.

k. Low Pressure Insulated Flexible Duct. Do not exceed 6 feet in length with any flexible duct. Support duct independently of lights, ceiling and piping.

l. Low Pressure Duct Supports.

- (1) Horizontal Ducts Up To 40 Inch. Support horizontal ducts up to and including 40 inches in their greater dimension by means of No. 22 U.S. gauge band iron hangers attached to the ducts by means of screws, rivets or clamps, and fastened to inserts with toggle bolts,

beamclamps or other approved means. Place supports on at least 8'-0" centers. Use clamps to fasten hangers to reinforcing on sealed ducts.

- (2) Horizontal Ducts Larger Than 40 Inch. Support horizontal ducts larger than 40 inches in their greatest dimension by means of hanger rods bolted to angle iron trapeze hangers. Place supports on at least 8'-0" centers according to the following:

<u>Angle Length</u>	<u>Angle</u>	<u>Rod Diameter</u>
4'-0"	1-1/2" x 1-1/2" x 1/8"	1/4"
6'-0"	1-1/2" x 1-1/2" X 1/8"	1/4"
8'-0"	2" X 2" X 1/8"	5/16"
10'-0"	3" X 3" X 1/8"	3/8"

- (3) Vertical Ducts. Support vertical ducts where they pass through the floor lines with 1-1/2" x 1-1/2" x 1/4" angles for ducts up to 60 inches. Above 60 inches the angles must be increased in strength and sized on an individual basis considering space requirements.

3.3 KITCHEN, DISHWASHER, AND SHOWER ROOM EXHAUST DUCTWORK

- a. Provide kitchen, dishwasher and shower room exhaust ductwork as specified for sheet metal ductwork. In addition, make all joints in the bottom of horizontal runs watertight. Slope horizontal runs to exhaust outlet. Use unlined duct in all such installations. Support grease ducts per latest addition of the mechanical code for point loading.

3.4 FLEXIBLE CONNECTIONS

- a. Where ducts connect to fans or air handling units, make flexible airtight connections using "Ventglas" fabric. The fabric must be fire-resistant, waterproof and mildew resistant with a weight of approximately 30 ounces per square yard. Provide a minimum of 1/2-inch slack in the connections, and a minimum of 2-1/2-inches distance between the edges of the ducts. Also provide a minimum of 1-inch slack for each inch of static pressure on the fan system. Securely fasten fabric to apparatus and to adjacent ductwork by means of galvanized flats or draw bands. Where rectangular connections are made in outdoor locations, seal fabric to metal with mastic. For connections to belted vent sets outdoors, provide Duall fan connector, Koroseal, black with UV inhibitors. Secure with stainless steel bands.

3.5 ACCESS DOORS

- a. Install ductwork access doors in structural angle frames and provide with sash locks and hinges arranged for convenient access. Construct doors which occur in insulated ducts with an insulation filler.

3.6 FLASHING

- a. Where ducts pass through roofs or exterior walls, provide suitable flashing to prevent rain or air currents from entering the building. Provide flashing not less than No. 26 gauge stainless steel or 16-ounce copper.

3.7 DUCT LEAKAGE TESTS

- a. Unless noted otherwise in paragraph below, all ductwork operating less than 2'in. w.c., to be less than 5% leakage, per SMACNA Duct Leakage Test Manual 1985. Document all tests, and forward to Engineer.

- b. For ductwork operating in excess of 2-in. w.c., and all ductwork from air units/fans to VAV boxes, and from exhaust air valves to exhaust fans, it shall be tested at 1 1/2 times operating pressure, minimum 3" w.c. and shall be leak tested per sections 5 and 6, SMACNA HVAC Air Duct Leakage Test Manual, 1985. Tests must be performed only for representative sections of ductwork, minimum 33% of the installed ductwork areas for the tested pressure class. Document all tests, and forward to Engineer. Maximum leakage to be Lmax per below:

$$L_{max} = C_L P^{0.65}$$

Where Lmax = maximum permitted leakage in CFM per 100 s.f. duct surface area.

Where CL = 6 for rectangular sheet metal or fireglass duct and round flex ducts.

Where CL = 3 for round/flat oval sheetmetal ducts.

Where P = test pressure (design class pressure rating in in. w.c., min. 3")

- c. Mains. Test mains after risers and branches are tied in and all equipment set. Close runout connections and place fan in operation. Provide pressure in mains above design pressure. Visually inspect joints. Repair leaks detected by sound or touch. Release mains for completion after joints are tight.

End of Section 23 30 00

SECTION 23 33 00**AIR DEVICES****1.0 GENERAL****1.1 WORK INCLUDED**

- a. This section provides for the furnishing and installation of air distribution devices, including grilles, diffusers, registers, dampers, extractors, and sound attenuators.

1.2 RELATED WORK

- a. Division 23 - HVAC.

- (1) Ductwork.

- (2) Air Balance.

1.3 COOPERATION WITH OTHER TRADES

- a. Coordinate this work with work under Division 26 Electrical, to ensure that intended functions of lighting and air systems are achieved.

1.4 SUBMITTALS

- a. Submit product data for outlets, grilles, registers, control devices, sound attenuators, and similar equipment for review prior to placement of purchase order.

1.5 FINISHES

- a. Paint devices with factory standard white enamel finish.

2.0 PRODUCTS**2.1 DIFFUSERS**

- a. Louvered. Provide louvered, fixed-pattern, multiple cone diffusers with removable center cone, frames and white factory finish.

- (1) Select faces and necks that are circular, rectangular or square, of the size and configuration indicated.

- (2) Construct diffusers and frames of aluminum.

- (3) Use a frame compatible with the type of ceiling in which the diffuser is installed.

- b. Perforated. Provide adjustable-pattern, aluminum diffusers and frames with white factory finish. Frame the diffuser face with a mitered and welded frame fitted with controllers of adjustable pattern.

- c. Dampers. Furnish an opposed-blade damper easily adjustable through the outlet for all diffusers. Provide operating rod extensions as required for damper adjustment.

2.2 GRILLES

- a. Supply. Use double-deflection supply grilles made of aluminum.
 - (1) Install vertical face blades and horizontal rear blades. Provide solid, extruded aluminum blades which are individually adjustable. Space at not more than 3/4-inch centers for rear blades and 1/2-inch centers for face blades and not less than 5/8-inch deep.
 - (2) Employ grille frames of extruded aluminum with welded and mitered corners and mounting gaskets.
- b. Return.
 - (1) For ceiling return, provide aluminum egg-crate or louvered type as scheduled, with white factory finish. Use construction and frame styles as specified for ceiling diffusers. Use neck sizes as shown.
 - (2) For wall return, provide a fixed-blade, aluminum grille, essentially sightproof, having curved or angular break, inclined blades. Space the blades at 1/2-inch centers to achieve sightproof feature. Furnish hemmed or fully rounded leading edges. Provide extruded aluminum grille frames with welded and mitered corners. Include mounting gaskets.
- c. Door Grilles. Furnish sightproof door grilles of aluminum construction for core only. Finish with prime coat suitable for field painting.

2.3 REGISTERS

- a. Supply. Provide double-deflection supply registers with aluminum, vertical face blades and horizontal rear blades. Use an integral, key-operated, opposed blade damper.
 - (1) Furnish solid, extruded aluminum blades which are individually adjustable. Space not more than 3/4-inch centers for rear blades and 1/2-inch centers for face blades and not less than 5/8-inch deep.
 - (2) Employ grille frames of extruded aluminum with welded and mitered corners and mounting gaskets.
- b. Return and Exhaust. Furnish return and exhaust registers identical to return grilles except for the addition of an integral key-operated, opposed-blade damper.

2.4 PLENUM SLOT DIFFUSER

- a. Plenum slot diffusers shall be insulated. Plenum slot diffuser shall be of the sizes shown on the plans and schedule. Diffusers shall have 3/4" slot width and shall be available in multiple four parallel slots. Discharge deflectors shall be fixed in 1-way or 2-way blow directions. Provide with adjustable center slot. Provide with adjustable center slot. The diffuser face shall be constructed of extruded aluminum with a white finish on the exposed surfaces. The overall diffuser height must be no greater than 10 inches. The plenum must be detachable from the diffuser face to allow the inlet direction to be changed in the field. Fibre-Free internal insulation (3/8") shall be provided. Fiberglass type insulation is not acceptable. Factory furnished plaster frames to be provided for all air devices in sheetrock, plaster type ceilings (non lay-in). The finish shall be black unless noted otherwise.

Support slots from structure above. The manufacturer shall provide published data for the plenum slot diffuser. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

2.5 ACCESSORIES

- a. Mounting Frames. Provide each grille or register not equipped with a removable core with a companion, all-purpose mounting frame constructed like a grille frame to facilitate installation and removal of the grille or register without marring adjacent mounting surfaces.

- (1) Furnish frames with 1/2-inch-thick sponge rubber gasket to prevent air leakage.
- (2) Provide a frame that neatly fits the grille. Mounting frames will not be required for grilles or registers mounted directly on exposed ductwork.

2.6 SUPPLY AIR SOUND ATTENUATORS

- a. Construct casings of not less than 22-gauge galvanized steel for diameters up to 36- inches, and 18-gauge for diameters up to 48-inches. Furnish perforated face sheets over acoustical material of not less than 5.0 pounds per cubic foot of compressed density glass fiber or mineral wool.
- b. Provide acoustical liners of the same density around the outside perimeter and in the center baffle of the silencer. Use attenuators with capacity to handle air quantities scheduled at no more than 0.50-inch of water pressure drop with acoustic performance as tabulated below:

Octave Pass Bands (Hz)	63	125	250	500	1000	2000	4000	8000
Attenuation (dB)	4	8	13	25	28	25	20	17

2.7 RETURN AIR SOUND ATTENUATORS

- a. Construct casings of not less than 22-gauge galvanized steel. Provide perforated face sheets over the acoustical material of not less than 24-gauge galvanized steel. Use mineral fiber or organic glass acoustical material. Apply fiberglass cloth between filler material and face sheets.
- b. Coat solid surfaces with vibration-dampening material to assure that equal attenuation will be provided not only in the direction of air flow, but also through duct silencer walls. Provide attenuators to handle air quantities as scheduled at no more than 0.25-inch of water pressure drop with acoustic performance as tabulated below.

Octave Pass Bands (Hz)		125	250	500	1000	2000	4000	8000
Attenuation (dB):	3' long:	11	16	23	36	42	34	28
	5' long:	16	25	37	45	44	38	22

3.0 EXECUTION

3.1 INSTALLATION

- a. Diffusers. Attach the frame assembly by a concealed hinge assembly to an outer frame compatible with the type of ceiling on which the diffuser is installed.

End of Section 23 33 00

SECTION 23 33 33**ACCESS DOORS****1.0 GENERAL****1.1 SCOPE**

- a. This section provides for furnishing and installing access doors in all wall or ceiling locations as required or shown for access to valves, controls, regulating devices, water hammer arrestors, trap primers, fire dampers, air distribution boxes and other equipment requiring maintenance, adjustment or operation. Provide access doors to provide access to all mechanical items requiring service or maintenance, whether shown on drawings or not.

1.2 WORK NOT INCLUDED

- a. Doors or panels required in acoustical ceilings are provided for under Division 09. However doors required in plaster, gypboard, masonry, or other solid wall or ceiling are included under this section.

2.0 PRODUCTS**2.1 NON-FIRE-RATED ACCESS DOORS**

- a. Furnish INRYCO/MILCOR approved equal with 16- frames, 14- panels, and 22- casing bead. Provide continuous concealed hinges and flush screwdriver cam lock. Use Style K access doors for plastered surfaces, Style M for masonry or gypboard surfaces, and Style AP for acoustical plaster ceilings, with 18- panel and all galvanized construction.

2.2 FIRE-RATED ACCESS DOORS (1-1/2 HOUR LABEL DOORS)

- a. Furnish INRYCO/MILCOR or approved equal UL-listed 1-1/2 HR Label "B". Access doors with 16- steel frames, and 20- insulated sandwich type door panel. Provide door with an automatic closing and latching mechanism. Fire-rated access doors are required.

3.0 EXECUTION

- a. Doors furnished by this contractor will be installed by this contractor. Not all required access doors are shown. The contractor will be responsible for proper coordination in locating access doors for ease of operation and maintenance of concealed equipment.

End of Section 23 33 33

SECTION 23 34 00**FANS****1.0 GENERAL**

- a. This section provides for furnishing and installing fans with all supplemental equipment.

1.2 RELATED WORK

- a. Division 23 - HVAC.
 - (1) Ductwork.
 - (2) Vibration Isolation.
 - (3) Air Balance.

1.3 PERFORMANCE

- a. Provide fan type, arrangement, rotation, capacity, size, motor horsepower, and motor voltage as shown. Fan capacities and characteristics are scheduled on the drawings.
- b. Rate fans according to appropriate Air Moving and Conditioning Association, Inc. (AMCA), approved test codes and procedures. Supply fans with sound ratings below the maximums permitted by AMCA standards. All fans provided must be licensed to bear the Certified Ratings Seal.
- c. Statically and dynamically balance all fans.

2.0 PRODUCTS**2.1 PROTECTIVE COATINGS**

- a. Manufacturer's Standard. Apply to all fans, motors and accessories, the manufacturer's standard prime coat and finish, except on aluminum surfaces or where special coatings are required.
- b. Galvanizing. After fabrication of the parts, hot-dip all surfaces which require galvanizing. Where galvanizing is specified, a zinc coating may be used. After fabrication, apply the zinc coating and air-dry the coating to 95% pure zinc. Acceptable zinc coatings include Zincilate, Sealube, Amercoat, Diametcoat, or an approved equal.
- c. Vinyl Plastic. Coat surfaces, where required, with vinyl plastic, air-dried Heresite, or an approved equal. Have the product factory-applied to fan wheels and interior surfaces of casings. apply a minimum of three coats.

- d.

2.2 SUPPLEMENTAL EQUIPMENT

- a. Motor Covers. Provide weatherproof motor covers for installation out of doors. Apply the same finish as used on the fan.

b. Belt Drives.

- (1) Unless otherwise specified for belt-driven fans, equip the fan motors with variable pitch sheaves. Select the sheave size for the approximate midpoint of adjustment and to provide not less than 20% speed variation from full open to full closed size drives for 150% of rated horsepower.
- (2) Provide belt guards and apply the same finish as used for the fan.

c. Safety Disconnect Switch. Provide a factory-wired, safety disconnect switch on each unit equipped with a 115/1/60 motor.

d. Relief Vents and Air Inlets. Provide vents and inlets with aluminum frames and ½-inch mesh, galvanized bird screens. Include with dampers.

e. Prefabricated Roof Curbs. Furnish prefabricated roof curbs with built in cant strips and lined with glass fiber insulation. Curbs may be made of No. 18 U.S. standard gauge galvanized steel or 0.063-inch aluminum. The minimum height is 8-inch. Include on each roof curb a resilient pad for equipment mounting on the top flange. Curbs to be compatible with roofing system.

f. Sound Attenuating Bases. Construct sound attenuating bases of No. 18 U.S. standard gauge galvanized steel or 0.063-inch aluminum. Include a built-in cant strip for curb mounting and a resilient pad for equipment mounting on the top flange. Line the base with two inches of glass fiber insulation and fit internally with glass fiber acoustical baffles.

2.3 CABINET-ENCLOSED FAN

a. Fan Section.

- (1) Casing. Fabricate a casing from galvanized steel sheets reinforced as required with structural members. Provide access panels to permit inspection and maintenance.
- (2) Fan. Supply double-inlet, squirrel-cage, centrifugal fans with die-formed impeller blades. Use rigid galvanized steel or aluminum fan wheels which are statically and dynamically balanced. Mount the wheels on a common shaft and fasten the wheels mechanically to the shaft. Provide galvanized steel fan scrolls in a secured casing to prevent vibration. Design fans for quiet, slow speed operation at specified rating conditions.
- (3) Shaft. Provide a shaft with adequate stiffness to prevent deflection and vibration. Rate the shaft at maximum rpm 10% below the first critical speed. Make a tachometer groove in the drive end of the shaft.
- (4) Bearings. Install antifriction ball bearings, selected for 200,000 hours minimum average life under actual load and speed conditions. Locate the bearing to be adjustable for accurate alignment of fan wheels in scrolls. Provide remote grease fittings on the accessible side of the unit for ease of lubrication.

b. Motors. Furnish motors in accordance with the section on Motors and Motor Starters. Motors must have grease lubricated ball bearings with alemite fittings. Mount the fan drive motor on a vibration isolating adjustable base, arranged for positive adjustment of drive alignment and belt tension. Select fan motors to be nonoverloading at design rpm and at static pressure 15% under design.

- c. Belt Guard. Provide a substantial, removable belt guard for drives on the unit exterior. Leave a hole over the tachometer groove.
- d. Filter Section.
 - (1) Slide Racks. Provide and arrange suitable galvanized filter slide racks to permit easy removal of filters from the accessible side of unit.
 - (2) Glass Fiber Filter. Furnish a replaceable, high-velocity filter of glass fiber with gradient density, 2-inches thick.
 - (a) Make frames of channel construction, rigid and square with a nominal 2-inch thickness.
 - (b) Design filtering element for low pressure drop and high efficiency at net face velocity of 500 feet per minute. The element must also have a high dust load capacity.
 - (c) Fabricate filters using dimensions to suit the arrangement and size of filter slides or racks in which filters are installed.
 - (3) Low Velocity Glass Media Filter. Furnish filters 2-inches thick. Design the filtering element for a low pressure drop and high efficiency at net face velocity of 300 feet per minute. The filter must have a high dust load capacity. Fabricate filters using dimensions to suit the arrangement of the filter slides or rack in which they are installed.
 - (4) Permanent, Cleanable, High-Velocity Filters. Provide filters 2-inches thick. Construct the filter throughout of galvanized or other equivalent corrosion-resistant materials and parts.
 - (a) Make frames of channel construction, rigid and square.
 - (b) Design the filtering element for low pressure drop and high efficiency at net face velocity of 500 feet per minute. The element must have a high dust load capacity. Fabricate filters using dimensions to suit the arrangement and size of the filter slides or racks in which they are to be installed.
 - (5) High Efficiency Particulate Air Type. Provide a filter with a steel holding frame, separators to support and hold the filter open, a sealer frame, and a disposable, glass fiber filter cartridge. Select a cartridge with an average efficiency of 95% by Discoloration Test (NBS type) and with 500 feet per minute face velocity. Supply a high velocity prefilter of 2-inch replaceable media. House the filter assembly in a filter box constructed of heavy galvanized steel. Use hinged access doors at each end, extruded aluminum filter tracks, and woven pile gasketed on track.
 - (6) Replacement Filters. Furnish one spare set of all air conditioning system filters or filter media. Cut media to required size.

2.4 ACCEPTABLE MOTOR MANUFACTURERS

- a. Baldor
- b. Marathon

- c. Reliance
- d. Century

3.0 EXECUTION

- a. Install fans according to the manufacturer's instructions and in the locations shown on the drawings.

End of Section 23 34 00

SECTION 23 73 00**DX AIR HANDLING UNITS****1.0 GENERAL****1.1 WORK INCLUDED**

- a. This section specifies furnishing and installing factory standard air handling units and includes casing, fans, coils, filters and special items.

1.2 PERFORMANCE

- a. Unit capacities and characteristics are as scheduled on the drawings. Units must be UL or ETL listed and display the appropriate label as a complete assembly. Units must be certified in accordance with ARI Standard 210/240.

1.3 SUBMITTALS, INSTALLATION AND OPERATION MANUALS

- a. Shop Drawings: Show assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.
- b. Product Data: Show dimensions, weights, capacities, ratings, fan performance, motor electrical performance, motor electrical characteristic for heater and the fan. Include all scheduled data. ALSO, provide manufacturer's recommended breaker/overcurrent protection size.
- c. Operation and Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists and wiring diagrams.
- d. Comply with specification 018113, paragraph 1.4 Submittals, and obtain approval before beginning installation.

1.4 DELIVERY, STORAGE, AND HANDLING

- a. Seal fluid and air openings prior to shipment.
- b. Deliver Products in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs.

2.0 PRODUCTS**2.1 GENERAL**

- a. Provide factory-assembled unit.
- b. Furnish unit with sealing and fastening hardware supplied by the manufacturer. Include written instructions needed to complete field assembly of the components.

2.2 ACCEPTABLE MANUFACTURERS

- a. Trane
- b. Daikin

- c. York

2.3 WARRANTY

- a. Provide 1-year parts and labor warranty.

2.4 CASING

- a. Construction. Provide a painted metal cabinet with cleanable foil faced or double wall construction.
- b. Casing shall be designed to have 2% or less air leakage at design static pressure.
- c. Access. Provide access panels to fan / coil section. Filter section shall have hinged access.
- d. Insulation. Provide minimum R4.2 insulation valve.

2.5 FAN SECTION

- a. Fan shall be variable speed ECM fan motor capable of modulating, based on factory algorithm, with compressor stages.

2.6 COILS

- a. Provide all aluminum coil with enhanced DX coil and integral refrigerant thermal expansion valve. Provide non-corrosive or stainless-steel drain pan. Galvanized drain pan or coated galvanized drain pan is not acceptable.
- b. Electric Heating Coils.
 - (1) Provide electric heater with factory provided polarized plugs for single point power with fan. Include NEC fusing where required.

2.7 FILTERS

- a. Provide 1" MERV 13 filters with hinged access.
- b. Replacement Filters. Furnish one spare set of all air conditioning system filters.

3.0 EXECUTION

3.1 INSTALLATION

- a. Install air handling unit according to manufacturer's instructions.

3.2 START-UP

- a. Equipment start-up: When installed and connected, the unit shall be inspected, checked, and approved as ready for operation by the mechanical contractor before unit is initially operated. The contractor shall then initiate and thoroughly check the unit operation, make, or direct all adjustments necessary to place the unit in satisfactory operation, and certify in writing that the unit is properly installed, connected and operating. Included with the certification shall be the manufacturer's recommended line sizes with the Cu to FCU orientation noted (above, below, or level), the line length and number of elbows. The refrigerant charge, subcooling, superheat, DX

coil entering, DX coil leaving and outdoor ambient shall be noted on the start-up report. The equipment shall not be turned over to the owner until this is provided. Also provide instruction of Owner's personnel on operation and maintenance after certification.

- b. Owner's Instruction: After the AHU is operating normally, provide instructional time with the Owner's personnel to review the maintenance manuals and perform each step necessary for startup, shutdown, troubleshooting, and routine maintenance. This service orientation shall be scheduled through the contractor so that they may observe the training sessions.

End Of Section 23 73 00

SECTION 23 81 26**AIR COOLED CONDENSING UNITS****1.0 GENERAL****1.1 WORK INCLUDED**

- a. This section specifies air-cooled condensing units complete with casing, compressor, condenser coil, condenser fan and controls required for a split air conditioning system.

1.2 RELATED WORK

- a. Division 23 - HVAC. Refrigerant Piping.
- b. Division 26 - Electrical. Motors.

1.3 PERFORMANCE

- a. Provide performance as scheduled on drawings, and head pressure control to enable unit to operate in temperatures as low as 55F.

1.4 SUBMITTALS

- a. Submit manufacturer's technical product data, including specifications and installation instructions, for each system provided.
- b. Comply with specification 018113, paragraph 1.4 Submittals, and obtain approval before beginning installation.

2.0 PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS**

- a. Trane
- b. Daikin
- c. York

2.2 WARRANTY

- a. Provide 1- year parts and labor warranty, 5- year compressor warranty.

2.3 COMPRESSOR

- a. Provide a hermetic or semi-hermetic compressor with crankcase heaters, inherently protected motors and capacity staging.
- b. Provide stages of cooling as scheduled.

2.4 CONDENSER COILS

- a. Provide all aluminum condenser coil with spin fin or provide copper tubes with mechanically bonded aluminum fins.
- b. Provide louvered hail guard painted to match the unit. Maximum opening size is $\frac{3}{4}$ ". Wire guards are not acceptable.

2.5 FANS AND MOTORS

- a. Provide propeller-type fans with direct drive or belt drive and vertical discharge. Protect fan with a heavy-gauge wire guard. Provide motors which are inherently protected, permanently lubricated, and weatherproof.

2.6 CASING

- a. Furnish a unit designed for outdoor mounting. Fabricate the casing of heavy gauge steel which is zinc coated and finished with enamel. Provide removable access panels.

2.7 Hot Gas Reheat

- a. Provide hot gas reheat where scheduled.

2.8 CONTROLS

- a. Provide safety and operating controls factory wired and mounted in a separate enclosure. Include high- and low-pressure switches and compressor motor overload devices. Furnish a time delay device to prevent short cycling. Suction and service valves so unit can be manually pumped down.
- b. Thermostat. Low voltage programmable thermostat with separate heat/cool set point, fan-on-off-auto, dead-band, after hours set points, 0-4 hr. manual override, heat-cool-off-auto.
- c. If DDC option is required, provide terminal strip for field provided / installed DDC controller.

3.0 EXECUTION

- a. Mount condensing units on 6-inch foundation pads and pipe as shown on drawing.

End Of Section 23 81 26

SECTION 23 82 19.A**DUCTLESS MINI SPLITS****1.0 GENERAL****1.1 SUMMARY**

- a. This section includes the ductless minisplit systems and accessories. It includes the ductless wall mounted indoor unit and an outdoor heat pump, similar to LG Series LS, high efficiency.

1.2 DELIVERY, STORAGE AND HANDLING

- a. Unit shall be handled and stored in accordance with the manufacturer's instructions.

2.0 PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS**

- a. LG, Mitsubishi, Sanyo.

2.2 CASING / FRAME

- a. Outdoor unit is constructed with pre-coated metal (PCM).
- b. Indoor unit is constructed of heavy-duty Acrylonitrile Butadiene Styrene (ABS) and High Impact Polystyrene (HIPS) plastic.

2.3 REFRIGERANT SYSTEM

- a. The refrigeration system consists of a single refrigeration circuit and uses R410A refrigerant. The outdoor unit is provided with factory installed components, including a refrigerant strainer, four-way reversing valve, electronic controlled expansion valve (EEV), high and low side charging ports, service valves, and interconnecting piping.

2.4 REFRIGERATION OIL CONTROL

- a. Heat pump outdoor units have a centrifugal oil separator and controls to ensure sufficient oil supply is maintained, and that oil does not travel with the refrigerant.

2.5 COMPRESSORS

- a. The outdoor unit is equipped with one hermetic digitally controlled inverter driven rotary or twin rotary compressor to modulate capacity (modulation in 1 Hz increments).
- b. Overcurrent protection and vibration isolation are integrated with the compressor.

2.6 OUTDOOR UNIT COIL

- a. Heat pump outdoor unit coils are made of a nonferrous construction with louvered fins on copper tubing, and are protected with an integral coil guard. Coil fans have a factory applied corrosion resistant material with hydrophilic coating.

2.7 FANS AND MOTORS

- a. The outdoor unit includes one direct fan drive, variable speed propeller type fan.

- b. The Brushless Digitally Controlled fan motor shall have inherent protection, permanently lubricated bearings, and variable speed with a maximum speed up to 950 rpm. Raised guards are provided to limit contact with moving parts. The outdoor unit has horizontal discharge airflow.

2.8 ELECTRICAL

- a. These units are available in 208-230V, 60 Hz, 1-phase power supply. These units are capable of operating within voltage limits of $\pm 10\%$ rated voltage, and include overcurrent protection.

2.9 CONTROLS

- a. These units are factory wired with necessary electrical components, integral microprocessors, printed circuit boards, thermistors, sensors, terminal blocks, and lugs for power wiring.
- b. Microprocessor-based algorithms provide component protection, soft-start capability, refrigeration system pressure, temperature, defrost, and ambient control.

3.0 EXECUTION

- a. Install all components, piping, power, and control wiring, per manufacturer's installation instructions. Install outdoor unit on Thycurb equipment pads.

End of Section 23 82 19.A

SECTION 26 00 00**ELECTRICAL GENERAL PROVISIONS****1.0 GENERAL****1.1 RELATED DOCUMENTS**

- a. The Architectural Plans and Specifications, the General Conditions, Supplementary General Conditions and other requirements of Division 01, the Structural Plans and Specifications, the Mechanical Plans and Specifications, the Civil Plans and Specifications, Special Systems Drawings, and Specifications: Communication Drawings (T), Audio-Visual Drawings (AV), Security Drawings (SC), and the Electrical Plans apply to the work specified in the Electrical Sections, and shall be complied with in every respect. The Contractor shall examine all of these documents, which make up the Contract Documents, and shall coordinate them with all electrical work on the Electrical plans and in the Electrical Sections of these Specifications.

1.2 SUMMARY

- a. The work covered by the electrical specifications shall include the furnishing of all materials, labor, transportation, tools, permits, fees, electrical utilities, and incidentals necessary for the complete installation of all electrical work required in the contract documents and specified herein. The intent of the contract documents is to provide an installation complete in every respect. In the event that additional details or special construction may be required for the work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide all material and labor which is usually furnished with such systems in order to make the installation complete and operative.
- b. The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of other trades. The Contractor shall visit the site and thoroughly familiarize himself with the existing conditions that affect the work and to verify all dimensions. The Contractor shall advise the Architect of any discrepancy prior to bidding. The submission of a bid shall be deemed evidence of the Contractors site visit, the coordination of all existing conditions, and the inclusion of all consideration for existing conditions.
- c. Electrical services and connections to motors and appliances furnished by others including, but not limited to, heating ventilation and air conditioning equipment, plumbing equipment and associated controls, and equipment specified by other specification divisions included in the Construction Documents.

1.3 DRAWINGS AND SPECIFICATIONS

- a. These Specifications are accompanied by Drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, light fixtures, switch controls, receptacles, etc. The Drawings and these Specifications are complementary to each other, and what is required by one shall be as binding as if required by both. Phase, neutral and switch leg indications are shown only where it is considered that clarification is required to indicate typical wiring methods required.
- b. If any departures from the contract documents are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted in writing to the Architect for review. No departures shall be made without prior written approval of the Architect.
- c. The interrelation of the Specifications, the Drawings, and the Schedules is as follows: The Specifications determine the nature and quality of the materials, the Drawings establish the quantities,

approximate dimensions and details, and the Schedules give the performance characteristics. Should the Drawings disagree in themselves, or with the Specifications, the better quality or greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished. In case the Specifications should not fully agree with the Schedules, the latter shall govern. Figures indicated on Drawings govern scale measurements and large scale details govern small scale Drawings. Do not scale from drawings, all dimensions must be field verified. In case of disagreement between Specifications and Drawings, see Division 1 of these Specifications for clarification.

- d. Items specifically mentioned in the specifications but not shown on the contract drawings and/or items shown on the contract drawings but not specifically mentioned in the specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

1.4 REFERENCE CODES AND STANDARDS, REGULATORY REQUIREMENTS

- a. Standards of the following organizations as well as those listed in Division 01, may be referenced in the specification. Unless noted otherwise, references are to standards or codes current at the time of bidding.

1. National Electrical Code (NEC) - 2023 Edition.
2. Electrical Safety in the Workplace - NFPA 70E, 2021 Edition.
3. Occupational Safety and Health Act (OSHA).
4. NFPA 101 - Life Safety Code - 2021 Edition.
5. International Energy Conservation Code IECC-2021 Edition.
6. International Building Code (IBC) - 2021 Edition.
7. Texas Accessibility Standards TAS - TDLR - 2012 Edition.
8. ASHRAE 90.1 Energy Standards for Buildings except Low-Rise Residential Building - 2015 Edition.
9. NEMA - National Electrical Manufacturer's Association.
10. NECA - National Electrical Contractors Association.
11. IEEE Standard 1100 - Powering and Grounding Sensitive Electronic Equipment.
12. IEEE Standard 142 - Grounding of Industrial and Commercial Power Systems.
13. IEEE Standard 241 - Electric Power Systems in Commercial Buildings.
14. IEEE Standard 242 - Protection and Coordination of Industrial and Commercial Power Systems.

- b. Work, materials and equipment must comply with the latest rules and regulations of the following.

1. National Electrical Code (NEC) and the City of Castroville Electrical Code and Ordinances.
2. Electrical Safety in the Workplace (NESC).

3. Occupational Safety and Health Act (OSHA).
 4. American with Disability Act (ADA) and Texas Accessibility Standards (TAS-TDLR).
 5. American Society for Testing and Materials (ASTM).
 6. Applicable local state and federal codes, ordinances and regulations.
 7. CPS Energy Design Criteria Latest Edition.
- c. Discrepancies. The drawings and specifications are intended to comply with listed codes, ordinances, regulations and standards. Where discrepancies occur, immediately notify the Owner's representative in writing and ask for an interpretation. Should installed materials or workmanship fail to comply, the Contractor is responsible for correcting the improper installation. Additionally, where sizes, capacities, or other such features are required in excess of minimum code or standards requirements, provide those specified.
- d. Contractor shall obtain permits and arrange inspections required by codes applicable to this Section and shall submit written evidence to the Owner and Engineer that the required permits, inspections and code requirements have been secured.
- e. The Contractor shall resolve any code violation discovered in the contract documents with the Architect prior to award of the contract.
- f. In any instance where these Specifications call for materials of a better quality or larger size than required by the codes, the provisions of these Specifications shall take precedence. The codes shall govern in case of direct conflict between the codes and the specifications.

1.5 REQUEST FOR INFORMATION

- a. The Contractor may, after exercising due diligence to locate required information, request from the Consultant clarification or interpretation of the requirements of the Contract Documents. The consultant shall respond to such Contractor's requests for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract documents or is reasonably inferable from them, the Contractor shall be responsible to the Owner for all reasonable costs charged by the consultant to the Owner for the Additional Services required to provide such information.

1.6 CONTRACT CHANGES

- a. When submitting proposed changes, both additive and deductive, the Contractor shall include and set forth in clear and precise detail, a breakdown of labor and materials along with estimated impact on the construction schedule. Contractor shall furnish spreadsheets that include quantities, unit costs and extensions. Any special equipment, i.e., fixtures, switchgear, special systems included in change proposal, shall be listed separately on vendor-supplied quote with detailed itemization and unit costs, with additions and deletions listed separately. All vendor supply quotes shall be notarized by a notary public licensed in the State of Texas.

1.7 ELECTRICAL UTILITIES

- a. The contract documents reflect the general location, voltage, ampacity, size and manner of routing for all utilities known to be required on this project. It shall be the responsibility of the Contractor to visit the site, meet with the local Electrical, Telephone Company, Cable TV, and Internet service providers cable television in order to coordinate and confirm the exact requirements for all utilities. The bid submitted by the Contractor shall include costs for all such coordination work as well as any

and all utility, telephone, Cable TV, and Internet service providers company charges and/or fees. Refer to Section 26 00 01 - Electrical Utilities.

1.8 TEMPORARY SERVICES

- a. It shall be the responsibility of the Contractor to provide a complete system for temporary electrical power service and distribution. The Electrical Contractor shall provide the necessary wiring, connections, service switches, poles, wiring protective devices, lighting fixtures, lamps, outlet devices, disconnect switches, etc., as required for temporary lighting. In addition, a similar system shall be provided for the distribution of single and three phase power of voltage levels and adequate ampacity as required to facilitate the construction of the project. These services shall be provided, and installed in accordance with requirements of the National Electrical Code (NEC), the Occupational Safety and Health Administration (OSHA), and the National Electrical Safety Code (NESC).
- b. The General Contractor shall pay the cost of all electrical energy consumed on the job site throughout the entire construction period.
- c. Remove all temporary wiring upon completion of the work.

1.9 BUILDING CONSTRUCTION

- a. It shall be the responsibility of the Contractor to consult the Architectural and Engineering Drawings and Details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.
- b. The electrical drawings are diagrammatic in character and cannot show every connection in detail or every line or conduit in its exact location. These details are subject to the requirements of local ordinances and also structural and Architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate with all other trades in order to avoid interference between the various phases of work.
- c. The approximate location of electrical items is indicated on the electrical drawings. These drawings are not intended to give complete and exact details in regard to location of outlets, apparatus, etc. Exact locations are to be determined by actual measurements at the job site and will in all cases be subject to the approval of the Architect. The Architect reserves the right to make any reasonable changes in the location indicated without additional cost.

1.10 CONTRACTOR QUALIFICATIONS

- a. An acceptable contractor for the work under this division shall be a specialist in this field and have the personal experience, training, skill and the organization to provide a practical working system. If required, he shall be able to furnish acceptable evidence of having contracted for and installed not less than three systems of comparable size and type to this one, that have served their owners satisfactorily for not less than three years.
- b. The foreman or superintendent for this work shall have had experience in installing not less than three such systems and shall be approved by the Architect before the work is begun. Adequate and competent supervision shall be provided to ensure first class workmanship and installation.
- c. Work shall be executed and all materials installed in accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen, presenting a neat appearance when completed.
- d. The Contractor shall be responsible for all construction techniques required for all electrical systems specified and shown on the drawings.

1.11 OBSERVATION OF THE WORK

- a. Architect's authorized representative and/or owner's observer shall have the right to observe the work at any time. The contractor shall have a representative present when his work is being observed, and he shall give assistance, as may be required, to the architect's representative. Recommendations made by observer shall be promptly carried out, and all unsatisfactory material and/or workmanship shall be replaced to the satisfaction of the Architect.

1.12 SHOP DRAWINGS AND PRODUCT DATA

- a. Submit shop drawings and product data as specified herein - General Requirements. Submittal data shall indicate the manufacturer's name, published performance, ratings and/or capacity data, detailed equipment drawings for fabricated items, wiring diagrams, installation instructions and other pertinent data. All submittals shall bear the specification section number they are related to or the specific sheet where products are shown on the contract drawings which are not referenced by the specifications. Where literature is submitted covering a group or series of similar items, the applicable items must be clearly indicated. Submittals shall be clearly marked highlighting all proposed equipment and devices to be used in this project. Submittals that do not comply with all requirements will be returned without review. **THE CONTRACTOR CANNOT PROVIDE SUBMITTALS AND SHOP DRAWINGS BY COPYING SEALED ENGINEERING PLANS IN WHOLE OR IN PART. THE CONTRACTOR MUST PRODUCE THEIR OWN SHOP DRAWINGS, NO EXCEPTIONS.** Shop drawings shall note all deviations from contract documents.
- b. Submittal review is only for general conformance with design concept of project and general compliance with the contract documents. The Contractor is responsible for conforming and correlating equipment dimensions at job site; for information which pertains to fabrication processes or construction techniques; and for coordination of work of all trades. Review of submittals shall not relieve the Contractor of responsibility for deviation from requirements of contract documents or errors of omissions in submittals.
- c. Contractor's Check. Submittal of shop drawings, product data and samples will be accepted only when they are submitted by the Contractor. Each submittal shall indicate by signed stamp that the submittals have been checked and that they are in accordance with contract documents and that dimensions and relationship with work of other trades have been checked. Submittals that have not been checked and signed by the Contractor will be returned for checking before being reviewed.
- d. Engineer's review of submittals constitutes an acknowledgment only and in no way relieves the contractor of full responsibility for providing all systems in accordance with the intent of the contract documents. Any material provided by this contractor without approved shop drawings constitutes the contractor's agreement to comply with the engineer's intent whether specified, shown or implied.
- e. Organize data in a 3-ring binder indexed by specification section. Submittal data not organized in a 3-inch ring binder indexed by specification sections and clearly highlighting the products the contractor proposes to use in the project will be rejected without preview. Show any revisions to equipment layouts required by use of selected equipment.
- f. Submittals are required for, but not limited to, the following items:
 - 1. Shop Drawings.
 - (a) Submit 1/4 inch scale drawings for all electrical and generator rooms for review prior to any rough-in.
 - (b) Panelboards (branch circuit and distribution).

- (c) Provide manufacturer's prepared integrated shop drawings indicating the manufacturer's recommended occupancy sensor type and recommended locations to all occupancy sensors, daylight sensors, etc., for all areas with occupancy sensors.
- (d) Surge protection devices (SPD's).
- (e) Emergency generators.
- (f) Automatic transfer switches.
- (g) Switchboards, all over current protective devices, metering systems, etc.
- (h) Provide manufacturer prepare shop integrated shop drawings indicating the location of all fire alarm system devices, including Candela ratings for all visual and audio visual devices. Locations of Fire Alarm System (FACP) control panels, NAC, fan shutdown relays, etc.
- (i) Pull boxes.
- (j) Lightning protection system.
- (k) Uninterruptible power supply systems (UPS).
- (l) Emergency generator dual purpose docking stations.
- (m) Transformers.
- (n) Outdoor sports lighting systems.
- (o) Point to point lighting calculations for all light fixture types. Provide point to point lighting calculations for normal power and emergency designated light fixtures.
- (p) Provide manufacturer prepare shop drawings indicating the location of all clock systems devices and components.

2. Product Data.

- (a) Battery packs.
- (b) Battery Chargers.
- (c) Boxes (junction and pull boxes).
- (d) Transformers.
- (e) Surge protection devices (SPD's).
- (f) Switchboards.
- (g) Enclosed safety switches (disconnect switches).
- (h) Fuses and circuit breakers.
- (i) Grounding materials and equipment.

- (j) Insulated conductors, conductors termination materials, and conductors pulling compound.
 - (k) Lighting fixtures, including LED drivers.
 - (l) Lighting controls.
 - (m) Metal framing and supports.
 - (n) Motor starters.
 - (o) Electrical labeling and identification products.
 - (p) Raceways, raceway fittings and conduit bodies.
 - (q) Time switches and photocells.
 - (r) Wiring devices and wiring device cover plates.
 - (s) Electrical conductors pulling compound.
 - (t) Cold shrink cable end caps.
 - (u) Conduit penetration seals (Link-seal).
 - (v) Lugs.
 - (w) Occupancy sensors, daylight sensors, etc.
 - (x) Emergency generators.
 - (y) Automatic transfer switches.
 - (z) Panelboards.
- g. Each manufacturer is required to review the system design as related to the proper operation of his equipment, including electrical requirements, automatic controls, mechanical systems and equipment, locations and related items. Submit a letter with the submittals from the manufacturer stating that his equipment will operate satisfactorily under the design conditions, including air flows for all duct mounted smoke detectors. The manufacturer will also be required to review the final installation at the site and submit a second letter stating that the installation conforms to the design criteria and that the equipment will operate satisfactorily as installed, including air flows for all duct mounted smoke detectors. Furnish certification for the following systems:
- 1. Surge protection devices (SPD's).
 - 2. Occupancy sensors.
 - 3. Emergency generators.
 - 4. Automatic transfer switches.
 - 5. Fire alarm system.
 - 6. Clock system.

7. Lighting protection system.
- h. Provide the following with each submittal:
1. Catalog cuts with manufacturer's name clearly indicated. Applicable portions shall be circled and non-applicable portions shall be crossed out.
 2. Line-by-line specification review by equipment manufacturer and contractor with any exceptions explicitly defined. Submittals received without line-by-line specification review by the contractor and by the equipment manufacturer and contractor will be rejected without review.
- i. Equipment Layout Drawing: Provide 1/4-inch scale minimum drawings indicating electrical equipment locations prior to any rough-in. Dimensions for housekeeping pads should be indicated on these drawings. Indicate routing of conduit 1 ½ inches and larger on these drawings.

1.13 SUBSTITUTIONS AND PRODUCT OPTIONS

- a. Within 30 days after contract date, submit to Architect a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor.
- b. Contractor's Options.
1. For products specified only by reference standard, select any product meeting that standard.
 2. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the specifications.
 3. For products specified by naming one or more products or manufacturers and "or equal," Contractor must submit a request for substitutions for any product or manufacturer not specifically named.
- c. Manufacturers' names and catalog numbers specified under sections of Division 26 are used to establish standards of design, performance, quality and serviceability and not to limit competition, nor to discriminate against an "approved equal" product of another manufacturer. Equipment of equal design to that specified, will be acceptable upon approval by the Engineer. The Architect/Engineer will consider written requests for substitution of specified products, if reviewed fourteen days prior to bid date. After bid date, request for substitution will be considered only in cases of product unavailability or other conditions beyond control of the contractor. It shall be the contractor's responsibility to:
1. Personally investigate the proposed substitute product to determine that it has all the same accessories and is equal or superior in all respects to that specified.
 2. Provide the same guarantee for the substitution that he would for that specified.
 3. Coordinate the installation of the equipment which he proposes to substitute with all trades and includes the costs for any changes required for the work to be complete in all respects. The contractor will prepare shop drawings where required by the Architect/Engineer or where dimensions vary.
 4. Provide itemized cost breakdown including material and labor for the proposed product substitutions. Submit complete design and performance data. Refer to Section 26 00 00, Paragraph 1.6.A for additional requirements.

5. Include and provide point to point lighting calculations for all light fixtures included in any light fixture substitution requests.

1.14 PROJECT RECORD DOCUMENTS

- a. Throughout progress of the work of this Contract, maintain an accurate record of all changes in the Contract Documents. Upon completion of the Work of this Contract, transfer the recorded changes to the Revit drawing files and specification word processing files. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff. Thoroughly coordinate all changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to properly show the change. Include all addenda items, request for information Architect's Supplemental Instructions and any other document that causes a change in the Construction Documents. Accuracy of records shall be such that future search for items shown in the Contract Documents may reasonably rely on information obtained from the approved Record Documents.
- b. The Contractor shall mark any deviations on a daily basis. The Architect will visit the site and will require to see the "As-Built" documentation periodically. If the Contractor does not keep an accurate set of as-built drawings, the pay request may be altered or delayed at the request of the Architect. Mark the drawings with a colored pencil. Record installed feeder conduits. Dimension the location and elevation of the conduits, electrical equipment locations, all pull boxes, bus duct routing, etc.
- c. Record Documents shall consist of the following:
 1. Job Set: Promptly following award of Contract, secure from the Architect, at no charge to the Architect, one complete set of all electrical documents comprising the Contract.
 2. Final Record Documents: Obtain the AutoCad drawings files and the specification word processing files at the Contractor's expense.
 - (a) The Contractor shall transfer all change data shown on the job set of to the corresponding electronic files, coordinating the changes as required, and clearly indicating at each affected detail and other drawing the full description of all changes made during construction and the actual location of items. Call attention to each entry by drawing a "cloud" around the area or areas affected.
 3. Submit the completed total set of Record Documents to the Engineer as described above. Participate in review meeting or meetings as required by the Engineer, make all required changes in the Record Documents, and promptly deliver the final Record Documents to the Architect. Upon completion of Work, the Contractor shall certify the "Record Drawings" for correctness by signing the following certification:

CERTIFIED CORRECT (3/8" high letters)

(Name of the Contractor)

By

Date

(Name of the Sub-Contractor)

By

Date

- d. Deliver record drawings to the Architect in the number and manner specified in Division 1 - General Requirements.

1.15 OPERATION AND MAINTENANCE INSTRUCTIONS

- a. Prepare and submit sets of product data, shop drawings, wiring diagrams, instructions and parts lists for operating and maintaining the electrical equipment and systems installed. Include in the instructions a description of normal adjustments and a list of items to be lubricated. Specify the type and frequency of lubrication required. Provide special servicing tools as required for this equipment. Also include all approved submitted data, all warranties on equipment, contractor's warranty. Deliver manuals and tools to the Architect as a condition of final acceptance. Refer to Division 01 for other requirements. The Owner's manual shall include:
 - 1. Manufacturer's installation instruction brochures.
 - 2. Manufacturer's local representative and/or distributor's name and address.
 - 3. Manufacturer's operating and maintenance brochures.
 - 4. Manufacturer's internal wiring diagram.
 - 5. Contractor's installation wiring diagram.
 - 6. Control system installation drawings.
 - 7. Replacement part number listings and/or descriptions.
 - 8. Framed operating instructions when required.
 - 9. Manufacturer's warranties and guarantees.
- b. This manual shall include all of the listed data bound into a permanent hard-back, three ring binder(s) identified on the cover as "Operating and Maintenance Manual" with additional cover display of the names and location of Building, the Owner, the Architect, the Engineers, the General Contractor, and the Contractors installing equipment represented in the brochure.
- c. Contents of the manual shall be grouped in sections according to the various sections of Division 26, and shall be listed in a Table of Contents. Sections shall be organized as follows:
 - 1. Each "tab" in the brochure shall identify the grouping of all literature required for a single class of equipment; i.e., "transformers", "lighting fixtures", "switchgear", etc., for all types of equipment on the job.
 - 2. Contents under each "tab" shall refer to a single class of equipment, and shall be arranged in the following sequence: First, the manufacturer's installation brochure; second, the manufacturer's operating and maintenance brochure; third, the manufacturer's installation wiring diagram; fourth, the Contractor's field wiring diagram; if different, and fifth, the manufacturer's brochure listing replacement part numbers and description.
 - 3. Provide final tab "Warranties and Guarantees" behind which all such items will be located.

- d. Upon completion of the work and at a time designated by the Architect, instruct the Owner's operating personnel in operation and maintenance of electrical equipment and systems. Before proceeding with instruction, prepare a typed outline in triplicate listing the subjects that will be covered. Submit the outline for review by the Architect. At the conclusion of the instruction, obtain the signatures of the people instructed on each copy of the outline to signify that they have a proper understanding of the operation and maintenance of the system. Submit the signed outlines to the Architect as a condition of final acceptance. Provide a minimum of 8 hours of general instruction in addition to any time specified in other sections of Division 26.
- e. Upon completion of the work, instruct the Owner's operating personnel in operation and maintenance of electrical equipment and systems furnished and installed under Division 26. The specified training shall be given at a time and location designated and provided by the Owner for personnel selected by the Owner, in addition to any necessary on-site orientation and training. A training program shall be submitted with materials, instructor qualifications and a proposed schedule, a minimum of 45 days prior to the proposed training for each electrical system in the project. The Owner reserves the right of approval of each training course. A minimum of 12 (other quantity if appropriate) bound copies of training materials shall be provided at the time of training, with additional copies submitted at the time of Substantial Completion included with the O & M Manuals. At the conclusion of instruction, obtain the signatures of the people instructed on one copy of the program to signify that they have a proper understanding of the operation and maintenance of the system. Submit the signed program to the Architect/Engineer as a condition of final acceptance. Provide a minimum of 8 hours of general instruction in addition to any time specified in other sections of Division 26. All training sections shall be videotape recorded. Video recordings shall be provided to the Owner.

2.0 PRODUCTS

2.1 CONSTRUCTION MATERIALS

- a. PER SENATE BILL 1289 PASSED IN 2017, ALL STATE ENTITIES ARE REQUIRED TO PROVIDE ALL IRON AND STEEL PRODUCTS MANUFACTURED IN THE UNITED STATES.
- b. All materials shall be new and shall conform to the National Electrical Code and National Fire Protection Association requirements and shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the U.L. label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized, adequately equipped independent testing agency, indicating that the items have been treated in accordance with required procedures, and that the materials and equipment comply with all contract requirements.

2.2 STANDARD PRODUCTS

- a. All materials and equipment shall be standard catalog products of domestic manufacturers regularly engaged in the manufacture of products conforming to these specifications. Materials and equipment shall have been in satisfactory use at least three years prior to bid opening. Where custom or special items are required, these shall be fully described by drawings and/or material list which detail the item proposed for use on this project.

2.3 MANUFACTURERS' INSTRUCTIONS

- a. The Contractor is fully responsible for furnishing the proper electrical equipment and/or material and for seeing that it is installed as intended, and in accordance with the manufacturer's written instructions. If needed for proper installation, operation, or start up, the Contractor shall request advice and supervisory assistance from the representative of the specific manufacturer. The manufacturers' published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning all materials and equipment. The Contractor shall promptly notify the Architect in writing

of any conflict between the requirements of the contract documents and the manufacturer's directions and shall obtain the Architect's instructions before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer's directions or instructions from the Architect, he shall bear all costs arising in connection with correcting the deficiencies.

2.4 RUST PREVENTION

- a. All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus shall be given a rust inhibiting treatment and standard finish by the manufacturer. All parts such as boxes, bodies, fittings, guards, and miscellaneous parts shall be protected in accordance with the ASTM A123 or A153, except where other equivalent protective treatment is specifically approved in writing or specifically allowed for in other sections of this specification.

2.5 CAPACITIES AND SPACE LIMITATIONS

- a. Capacities shall be not less than those indicated but shall be such that no component or system becomes inoperative or is damaged because of start-up or other overload conditions. Where approved equipment requires electrical power other than that indicated in the contract documents for the specified equipment, the Contractor shall be responsible to adjust protective devices, starter sizes, conductors, conduits, etc., to accommodate this approved device electrically at no additional cost to the owner.
- b. The Contractor shall be responsible to verify that the equipment he proposes to provide will physically fit within the space indicated on the contract documents and that the required code clearances and maintenance access are maintained. Any space conflicts shall be noted in the submittals. Provide scale drawings to the Architect indicating proposed solutions to any space conflict for the Architects review and approval.

2.6 NAMEPLATES

- a. Each piece of equipment shall have a nameplate from the manufacturer with the following information: name, address, catalog number, voltage, phase, full load amperes or horsepower, and/or other pertinent information on a plate securely attached to the equipment. All data on nameplates shall be legible at the time of final inspection.

3.0 EXECUTION

3.1 DELIVERY STORAGE AND HANDLING

- a. The Contractor shall not receive any equipment at the job site until the equipment is ready to be installed or until there is suitable space provided to properly protect equipment from rust, weather, humidity, dust, and physical damage.
- b. All equipment shall be protected in accordance with the manufacturer's recommendations. The Contractor shall replace all damaged or defective equipment with new equipment.
- c. All equipment injured or damaged in transit from factory, during delivery to premises, while in storage on premises, while being erected and installed, and while being tested, until time of final acceptance, shall be replaced by this Contractor.

3.2 PROTECTION OF EQUIPMENT

- a. During construction, protect switchgear, transformers, motors, control equipment, and other items from insulation moisture absorption and metallic component corrosion by appropriate use of strip heaters, lamps or other suitable means. Apply protection immediately on receiving the products and maintain continually.

- b. Keep products clean by elevating above ground or floor and by using suitable coverings.
- c. Take such precautions as are necessary to protect apparatus and materials from damage. Failure to protect materials is sufficient cause for rejection of the apparatus or material in question.
- d. Protect factory finish from damage during construction operations and until acceptance of the project. Satisfactorily restore any finishes that become marred or damaged.

3.3 INSTALLATION

- a. Cooperation with trades of adjacent, related or affected materials or operations, and of trades performing continuations of this work under subsequent contracts, is considered a part of this work. The Contractor is responsible to coordinate with other trades in order to effect timely and accurate placing of work and to bring together, in proper and correct sequence, the work of such trades. Provide coordination drawings showing exact size and location of sleeves, openings or inserts for electrical equipment in slabs, walls, partitions and chases.
- b. Provide 4-inch thick concrete housekeeping pads for indoor floor-mounted equipment, except where direct floor mounting is required. Pour pads on roughened floor slabs, sized so that outer edges extend a minimum of 3-inches beyond equipment. Trowel pads smooth and chamfer edges to a 1-inch bevel. Secure equipment to pads as recommended by the manufacturer. Equipment concrete pads shall be designed by a structural engineer licensed in the State of Texas.
- c. All equipment shall be installed plumb and level.
- d. Permanently seal outdoor equipment at the base using concrete grout. Seal or screen openings into equipment to prevent entrance of animals, birds and insects. Use galvanized steel or copper mesh with openings not larger than 1/16-inch for screened openings. Seal small cracks and openings from the inside with silicon sealing compound.
- e. Conceal electrical work in walls, floors, chases, under floors, underground and above ceilings except:
 - 1. Where shown or specified to be exposed. Exposed is understood to mean open to view.
 - 2. Where exposure is necessary to the proper function.
 - 3. Where size of materials and equipment preclude concealment.
- f. All equipment shall be installed in a manner to permit access to parts requiring service. All electrical equipment shall be installed in such a manner as to allow removal for service without disassembly of other equipment. All required National Electrical Code clearances must be complied with.
- g. All electrical equipment shall have clearances as required by the latest version of the National Electrical Code.

3.4 HOISTING, SCAFFOLDING, AND TRANSPORTATION

- a. The Contractor shall provide all hoisting, scaffolding and ladders as required to set the equipment in place in the building.
- b. The Contractor shall provide necessary transportation to facilitate the delivery of all materials, equipment, tools, and labor to project.

3.5 CLEANING

- a. The Contractor shall, at all times, keep the premises free from accumulations of waste material or rubbish caused by him, his employees, or his work. This debris shall be removed, not only from the building, but also from the site and from any street or alley adjacent to the site.
- b. At completion of the project, the Contractor shall remove all of his tools, scaffolding, and surplus materials.

3.6 CONDUIT SLEEVES AND PENETRATION SEALS

- a. For conduits passing through outside walls, the conduit to wall penetration closures shall be "Link-Seal" as manufactured by Thunderline Corporation or Crouse Hinds. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and wall opening. Seals located underground shall be manufactured from stainless steel. Links shall be loosely assembled with bolts to form a continuous rubber belt around the conduit with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the conduit and wall opening. The seal shall be constructed so as to provide electrical insulation between the conduit and wall, thus reducing chances of cathodic reaction between these two members.

3.7 ACCESS DOORS

- a. Furnish and install access doors in all inaccessible wall or ceiling locations as required for access to conduit bodies, junction and pull boxes, outlet boxes, and other electrical equipment requiring maintenance, adjustment or operation. Access door locations shall be coordinated with the architect. Doors or panels required in acoustical ceilings are provided for under Division 08. However doors required in plaster, gypboard, masonry, or other solid wall or ceiling are included under this paragraph. Access doors are not indicated on the drawings. The contractor will be responsible for proper coordination in locating access doors for ease of operation and maintenance of concealed equipment.
- b. Non-fire-rated access doors.
 - 1. Furnish INRYCO/MILCOR approved equal with 16-gage frames, 14-gage panels, and 22-gage casing head. Provide continuous concealed hinges and flush screwdriver cam lock. Use Style K access doors for plastered surfaces, Style M for masonry or gypboard surfaces, and Style AP for acoustical plaster ceilings, with 18-gage panel and all galvanized construction.
- c. Fire-rated access doors (1-1/2 hour label doors).
 - 1. Furnish INRYCO/MILCOR or approved equal UL-listed 1-1/2 HR Label "B". Access doors with 16-gage steel frames, and 20-gage insulated sandwich type door panel. Provide door with an automatic closing and latching mechanism. Fire-rated access doors are required.

3.8 ELECTRICAL CONNECTIONS TO MOTORS, EQUIPMENT AND CONTROL SYSTEMS

- a. Contractor shall coordinate with Division 23, Division 22 and other divisions as required to verify all electrical requirements of those divisions. This is to include, but not be limited to, verification of power, voltage, phase and other characteristics as being compatible with that called for on the electrical drawings and Division 26, Division 27 and Division 28 specifications, as well as that called for in Division 23 drawings and specifications or other divisions requiring electrical connections. This shall be done prior to placing orders for equipment or material, and prior to any rough-in, etc.

- b. Motors are specified in Divisions 22 and 23. Electrical work includes the electrical connection of all motors, except those which are wired as a part of equipment. Connection of motors specified in Divisions 22 and 23 but not reflected on electrical drawings shall be included in Division 26 scope of work.
- c. The contractor shall refer to and coordinate with Divisions 22 and 23 and other divisions included in the construction documents and provide all power connections for all equipment requiring power connections.

3.9 CUTTING AND PATCHING

- a. Where it becomes necessary to cut through any wall, floor, or ceiling to install any work under this Section of the Contract, or to repair any defects that may appear up to the expiration of the guarantee period, such cutting shall be done under the supervision of the Architect by this Contractor. This Contractor shall not be permitted to cut or modify any structural members without the written permission of the Architect.
- b. Patching of all openings cut by this Contractor, or repairing of any damage to the work of other trades caused by cutting or by the failure of any part of the work installed under this Contract, shall be performed by the appropriate trade but shall be paid for by this Contractor.
- c. Any openings cut through exterior walls or roofs shall be provided with suitable covers, while they are left open, to protect the property or materials involved. Any openings cut through walls below grade shall be properly protected to prevent entrance of water or other damaging elements. All openings shall be waterproofed upon completion of the work as specified by the architect. Any openings through fire rated walls or floors shall be sealed to meet the minimum fire rating of wall or floor penetrated.

3.10 VIBRATION ISOLATION

- a. The Contractor shall furnish and install vibration isolation means for all equipment and materials furnished under this contract to prevent the transmission of perceptible vibration, structure borne or air borne noise to occupied areas. Items requiring vibration isolation shall include:
 - 1. All transformers shall be mounted on one inch (1") thick cork rib pads and/or rubber or steel spring isolator units properly sized, spaced, and loaded, which in turn shall rest on a 4" minimum concrete base.
 - 2. Where transformers are to be suspended from the structure above, each hanger shall be equipped with double deflecting steel spring and rubber in shear anti-vibration hangers. The rubber in shear mounting for each hanger shall provide a static deflection at least equivalent to the static deflection for a 1/4" rubber pad. Anti-vibration mountings shall be equipped with adequate leveling mechanisms which do not interfere with proper hanger operation.
 - 3. Electrical Conduit: Raceway systems shall be isolated from all dry type transformers and rotating or reciprocating machinery. Provide 12" of liquidtight flexible metal conduit per 1" of conduit diameter. The minimum length of liquid-tight flexible conduit used for isolation shall be 24".

3.11 CORE DRILLING

- a. All penetrations through concrete floors and walls shall be coordinated and approved by the Structural Engineer. The Contractor shall scan the area of the proposed penetration prior to performing any work to ensure that there are no existing conduit systems, concrete reinforcing steel etc., that could

be damaged by core drilling the concrete slab. The scan shall be performed using ground penetrating radar technology.

3.12 CONDITIONS OF EQUIPMENT AT FINAL ACCEPTANCE

- a. At time of acceptance, the Contractor shall have inspected all installed systems to assure the following has been completed:
 - 1. Fixtures are operating, lenses and reflectors are free of dust, debris, and fingerprints.
 - 2. Panelboards have all conductors neatly formed, laced and made-up tight. Enclosures shall be vacuum cleaned, surfaces clean of stray paint, dust, grease and fingerprints. All circuit directories to be neatly typed and in place.
 - 3. Wall plates and exposed switch and receptacle parts to be clean, free of paint, plaster, etc.
 - 4. Safety and disconnect switches and motor starters to be vacuum cleaned of debris, dust and all surfaces free of stray paint, grease and fingerprints.
 - 5. Switchgear, transformers and system devices shall be cleaned internally and externally and have all surfaces restored to initial surface conditions.
 - 6. Touch-up all scratched surfaces using paint matching the existing equipment paint. Where paint cannot be matched, the entire surface shall be repainted in a color and manner approved by the Architect.
 - 7. All electrical equipment shall have proper labeling as specified under Section 26 05 53.
 - 8. All wiring devices labeled with corresponding panelboard I.D. and circuit numbers.
 - 9. All electrical switchgear and panelboards shall be provided with arc flash warning labels.

3.13 GUARANTEE

- a. The Contractor shall guarantee all materials and workmanship for a period of twelve (12) months after the final acceptance of work.

End of Section 26 00 00

SECTION 26 00 02**FIRESTOPPING****1.0 GENERAL****1.1 SUMMARY**

- a This section specifies the furnishing and installation of necessary materials to seal electrical penetrations through fire rated walls and floors.
- b Coordinate locations of all fire ratings, and all fire rated walls, floors, partitions, etc. with architectural drawings.
- c Apply firestops at all locations as required by national, state, municipal and local governing laws and codes. All conduits, cables, bus ducts, cable trays, etc. passing through fire rated floors and/or walls shall have the void area between the material passing through floor and/or wall sealed with an approved fire-stop material to maintain the fire rating of the floor and/or wall.

1.2 REFERENCE STANDARDS

- a ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
- b ASTM E 119: Methods of Fire Tests of Building Construction and Materials.
- c ASTM E 814: Standard Test Method for Fire Tests of Through Penetration Firestops.
- d UL 263: Fire Tests of Building Construction Materials.
- e UL 723: Surface Burning Characteristics of Building Materials
- f UL 1479: Fire Tests of Through-Penetration Firestops
- g UL Products Certified for Canada.
- h Factory Mutual Approval Guide Comply with all service installation standards of the serving utility companies.

1.3 APPLICABLE PROVISIONS

- a Refer to Section 26 00 00 - Electrical General Provisions.
- b Division 7 - Thermal and Moisture Protection.

1.4 SUBMITTALS

- a Submit manufacturer's product literature for each type of firestop material to be used. Literature shall include documentation of UL classifications or approved third party testing.
- b Submit drawings of through penetrations which include the system to be utilized for the firestopping application.
- c Submit Copies of manufacturer's product data, Material Safety Data Sheets (MSDS), specifications, recommendations, standard details and installation instructions for all firestop assemblies.

- d Upon completion, installer shall provide written certification that materials were installed in accordance with the manufacturer's installation instructions and details.

1.5 QUALITY ASSURANCE

- a All firestopping systems material and design shall comply with the following:
 - 1. Shall conform to both Flame (F) and Temperature (T) ratings as required by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.
 - 2. Firestopping materials and systems must be capable of closing or filling through openings created by the burning or melting of combustible pipes, cable jacketing, or pipe insulation materials and deflection of sheet metal due to thermal expansion.
 - 3. Firestopping material shall be asbestos and lead free and shall not incorporated nor require the use of hazardous solvents.
 - 4. Firestopping sealants must be flexible, allowing for normal pipe movement.
 - 5. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.
 - 6. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.
 - 7. Materials shall be installed in accordance with the manufacturer's written installation instructions.

1.6 DELIVERY STORAGE AND HANDLING

- a Deliver materials to project site in manufacturer's original packaging clearly identified with manufacturer's name, product identification, lot number, and installation instructions as applicable.
- b Store and handle firestop materials in a location and manner providing protection from damage and exposure to the elements recommended by the manufacturer.
- c Material Safety Data Sheets (MSDS) will be available on the job site for all materials, including manufacturer's guidelines for use, handling and disposal.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- a Subject to compliance with the requirements, acceptable manufacturers shall be as follows:
 - 1. Re-useable Sealing Systems.
 - (a) CSD Sealing Systems.
 - (b) Hilti.
 - (c) 3M.
 - 2. Caulk

- (a) International Protective Coatings.
- (b) Johns Manville.
- (c) O-Z Gedney/Nelson.
- (d) Hilti.
- (e) 3M.

2.2 GENERAL

- a Through-penetration firestop product(s) tested to ASTM E814 listed in the UL Fire Resistance Directory in which it is classified as a fill, void or cavity material or a firestop device. This should be classified for approval with the particular type of penetrating item and the wall or floor assembly that the item is penetrating in order to maintain the integrity required.
- b All firestop products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal and fire resistance properties of the barrier being penetrated.
- c Penetrations containing loose electrical, data or communications cabling shall be protected using firestopping products that allow unrestricted cable changes without damage to seal.
- d Firestopping materials and systems must be intumescent or capable of filling through-openings created by the burning or melting of combustible pipes, pipe insulation materials or cable jacketing and the deflection of sheet metal due to thermal expansion.
- e Firestop sealants must be elastomeric or flexible to allow for normal pipe movement.
- f Firestop system shall have F and T Ratings suitable for intended service, UL tested.
- g All materials shall have a minimum one-year shelf life.
- h Materials shall not affect or derate the properties of cables in energized cable applications.
- i Firestop materials shall not contain flammable or toxic solvents and shall not produce toxic or flammable out gassing during the drying or curing process.

2.3 RE-ENTERABLE SEALING SYSTEM

- a This system shall consist of a metal casing with intumescent pads and removable cover. The system shall allow for the removal and addition of cables by removal of the cover and inserting or deleting the intumescent pads and reattaching the cover.
- b The enclosure is a two piece with a lower casing and top cover. The enclosure shall be formed of .061" thick steel. The lower casing shall have flanged edges of 2.375" and the top cover shall be reinforced with steel angle brackets.
- c A 0.25" steel angle bracket (fixation plate) is used as the main support for the firestop unit. The depth of the unit shall be 10"; the width and height dimensions shall be based on the size of the cable tray, or wall or floor opening.
- d Fill, Void or Cavity Materials shall be as follows:
 - 1. Fire Resistant Rubber Sponge (FRR-SP) - Nominal 1" thick intumescent (expands on application of heat) material supplied in sheets of 10" by 12". This material reacts

at temperatures of 500 degrees F and expands six to ten times its original size to completely seal the penetration.

2. Fire Resistant Rubber/Halogen Free Gaskets (FRR/HF). An insert material nominally 1" thick, is a stable material that does not react to temperature. The material acts as an insulator in the firestop system and is used on all four sides of the unit between the enclosure and the sponge material.
3. Fire Resistant, Water Repellent Sealant (FIWA). Fireproof sealant for both interior and exterior joints. In the event of fire, this sealant expands and forms a heat insulating char on its surface, which effectively seals minor cracks and also prevents the spread of flames, smoke, fumes, and water during a fire. The seal depth should be in the range of .5" to 1", depending on the joint configuration and backing material.
4. Forming or damming material. #8 Mineral Wool shall be required for filling the cavity in the penetration when units are installed on only one side of a wall or when a unit is installed in a floor.
5. Weather shields attach to firestop unit when firestop will be exposed to weather.

2.4 CAULK

- a Depending on the particular installation use FS900 or FST900 fire stop caulk or FS500/600 series fire-stop components. The firestop system shall consist of a water based firestop compound as the fill, void or cavity material along with appropriate damming material.
- b The firestop compound shall not contain any solvents, inorganic fibers or silicone compounds. The compound shall not be affected by moisture and must maintain the integrity of the floor or wall assembly for it's rated time period when tested in accordance with ASTM E814 (UL 1479).
- c The system shall be UL classified for up to and including three hours.

3.0 EXECUTION

3.1 APPLICATIONS

- a Individual runs of conduit and cable routing through fire rated walls or floors shall be sealed with caulk based system.
- b Multiple cables and cable tray penetrations through fire rated walls of floors shall be sealed with a re-enter able sealing system.

3.2 INSTALLATION

- a All material shall be installed in accordance with the Manufacturer's printed instructions for installation and when applicable, curing in accordance with temperature and humidity.
- b Furnish adequate ventilation as required to comply with all applicable safety requirements.
- c Examine adjoining construction and the conditions under which the work is to be completed. Do not proceed with work until any unsatisfactory conditions detrimental to the proper and timely completion of the work have been corrected. Verify adjacent materials are clean, dry and ready to receive installation. Verify that openings and items (penetrations) passing through them are ready for application of the firestop.

- d Verify that field dimensions are as shown on the drawings and as recommended by the manufacturer.
- e Do not proceed with installation of firestop materials when temperatures fall outside the manufacturer's recommended limits. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
- f Protect surrounding area to prevent contamination of adjacent surfaces by firestopping materials.
- g Remove any incompatible materials (dirt, debris, greases, oils and solvents) which may inhibit the adhesion or physical properties of the firestop products.
- h Coordinate with fire protection and other trades to assure that all pipe, conduit, cable and other items which penetrate fire rated construction have been permanently installed prior to installation of firestops. Schedule and sequence work to assure that partitions and other construction that would conceal penetrations are not erected prior to the installation of firestops.

3.3 INSPECTIONS

- a The General Contractor shall procure the services of an independent inspection service to review and provide a certified letter to the Contractor, Engineer and the State of Texas, stating all firestopping has been installed per UL listing and the manufacturer's recommendations. Independent service shall have a minimum of five (5) years experience in the inspection of firestopping materials and methods installed.

End of Section 26 00 02

SECTION 26 00 01**ELECTRICAL UTILITIES****1.0 GENERAL****1.1 SUMMARY**

- a This section specifies the furnishing and installation of necessary materials and making arrangements for the connection of electrical utilities for the project. The required utilities are electrical, telephone and cable television services.

1.2 REFERENCE STANDARDS

- a Comply with all service installation standards of the serving utility companies.

1.3 APPLICABLE PROVISIONS

- a Refer to Section 26 00 00 - Electrical General Provisions.

2.0 PRODUCTS**2.1 ELECTRICAL SERVICE**

- a The contract documents reflect the general location, voltage, ampacity, size and manner of routing for all utilities known to be required on this project. It shall be the responsibility of the Contractor to visit the site, meet with the local Electrical personnel in order to coordinate and confirm the exact requirements for all electrical, telephone and cable television utilities. The bid submitted by the Contractor shall include costs for all such coordination work as well as any and all utility and telephone company charges and/or fees.
- b Electrical service will be provided from the local utility company's system. The source characteristics shall be as noted on the electrical drawings. The service entrance raceways shall be installed underground in accordance with the serving utility's construction standards.
- c The location of the service entrance shall be coordinated with the local utility company. Provide materials and equipment required to connect the project service to the utility system.

2.2 TEMPORARY SERVICES

- a It shall be the responsibility of the Contractor to provide a complete system for temporary electrical power service and distribution. The Electrical Contractor shall provide the necessary wiring, connections, service switches, poles, wiring protective devices, lighting fixtures, lamps, outlet devices, disconnect switches, etc., as required for temporary lighting. In addition, a similar system shall be provided for the distribution of single and three phase power of voltage levels and adequate ampacity as required to facilitate the construction of the project. These services shall be installed in accordance with requirements of the National Electrical Code (NEC), the Occupational Safety and Health Administration (OSHA), and the National Electrical Safety Code (NESC).
- b The General Contractor shall pay the cost of all electrical energy consumed on the job site throughout the entire construction period.
- c Remove all temporary wiring upon completion of the work.

2.3 OUTAGES

- a Outages of services as required by the project will be permitted but only at time approved by the Owner. The Contractor shall notify the Owner in writing two weeks in advance of the requested outage in order to schedule required outages. No outages shall be taken unless written approval has first been received from the Owner. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including overtime charges, shall be included in the contract amount.

2.4 TELEPHONE SERVICE

- a Telephone service will be provided from the local utility company's system. The service entrance raceways shall be installed underground in accordance with the serving utility company's construction standards.
- b The location of the service entrance shall be coordinated with the telephone company. Provide materials and equipment required to enable the telephone company to connect service to the project.
- c Secure approval from the Owner for the final locations of telephone outlets, especially those located in floor slabs.
- d Materials.
 - 1. Raceways shall be in accordance with Section 26 05 33. All bends in the service entrance conduit shall be made with long sweep elbows. The minimum radius shall be four feet.
 - 2. Boxes shall be in accordance with Section 26 05 33.01.
 - 3. Coverplates shall be provided for each telephone outlet in accordance with Division 26.
 - 4. Provide ground conductor from the telephone backboard to service entrance ground in accordance with the serving utility company grounding requirements and construction standards.

2.5 CABLE TELEVISION AND INTERNET SERVICE

- a Cable television and Internet service requirements are the same as those specified for telephone service. Coordinate the location of the service entrance with will be provided from the local cable television service company's system. The service entrance lateral shall be installed underground in accordance with the serving utility company's construction standards.

3.0 EXECUTION

3.1 INSTALLATION

- a Install the utility services so the systems are complete. Demonstrate that the electrical system is operational.
- b Conduct coordination meetings with the serving utility companies prior to installation of the utility work.
- c Comply with all of the construction installation standards and requirements of the serving utility companies.

End of Section 26 00 01

SECTION 26 05 19**INSULATED CONDUCTORS****1.0 GENERAL****1.1 SUMMARY**

- a This section specifies the furnishing and installation of 600 volt insulated conductors, wire connectors, cable end caps, torque seals, etc.
- b All electrical conductors shall be copper, except insulated conductors 1/0 AWG and larger shall be aluminum conductors. Refer to Section 26 05 19.01 - Insulated Aluminum Conductors.

1.2 REFERENCE STANDARDS

- a ANSI/UL 83 - Thermoplastic-insulated Wires.
- b ICEA S-61-402 (NEMA WC 5) - Thermoplastic-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- c UL 486A-486B - Standard for Safety Wire Connectors.

1.3 APPLICABLE PROVISIONS

- a Refer to Section 26 00 00 - Basic Electrical Requirements.
- b Refer to Section 26 05 19.01 - Insulated Aluminum Conductors.

1.4 SUBMITTALS

- a Submit manufacturer's data on each electrical wires, cables connectors, accessories, wire pulling compound, cable end caps, torque seals, etc.

1.5 DELIVERY, STORAGE, AND HANDLING:

- a Deliver wire and cable properly packaged in factory-fabricated type containers, or wound on NEMA-specified type wire and cable reels.
- b Store wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris and traffic.
- c Handle wire and cable carefully to avoid abrasing, puncturing and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

2.0 PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS**

- a Subject to compliance with requirements, acceptable manufacturers shall be as follows:
 - 1. Copper Insulated Conductors.
 - (a) Encore Wire Corp.

- (b) Aetna Insulated Wire Corp.
- (c) Southwire Company.
- (d) American Insulated Wire Corp.

2. Wire Connectors.

- (a) Burndy.
- (b) 3M Electrical Products Division.
- (c) IlSCO.
- (d) Ideal.
- (e) Thomas & Betts.

3. Cable End Caps (Cold Shrink).

- (a) 3M Electrical Products.
- (b) Thomas & Betts.

2.2 600-VOLT INSULATED CONDUCTORS

- a All branch circuit conductors and feeder conductors shall be soft-drawn annealed copper with conductivity of not less than 98% at 20 degrees C (68 degrees F). The conduit fill shall not exceed NEC requirements.
- b Conductors No. 10 AWG and smaller shall be solid and conductors No. 8 AWG and larger shall be stranded. Minimum wire size shall be #12 AWG unless otherwise noted on the drawings.
- c All wire and cable shall be permanently marked approximately every two feet to indicate size, voltage and type temperature rating in accordance with NEC Article 310.
- d Provide factory colored insulation for conductors for No. 10 AWG and smaller. Color code larger insulated conductors with an approved field applied tape. Conductors color coding shall match the color code requirements of the City of Austin electrical code.
- e The conductor's polyvinyl chloride jacket shall be lead free.
- f Copper conductors shall be as follows:
 - 1. Type THW: For dry and wet locations; max operating temperature 75 degrees C (167 degrees F). PVC insulation, with a minimum insulation rating of 600 volts. Meet UL 83 and Federal Spec. J-C-30B.
 - 2. Type THHN/THWN: For dry and wet locations; maximum operating temperature shall be 75°C (THWN) or 90°C (THHN). UL listed as gasoline and oil resistant. PVC insulation with nylon outer jacket. Meet UL 83 and Federal Spec J-C-30B.
 - 3. Type XHHW: For wet or dry locations; maximum operating temperature 90°C. insulation shall be cross-linked polyethylene complying with UL 44 for XHHW-2.

2.3 INSULATED ELECTRICAL SPRING CONNECTORS

- a Provide color coded, electrical spring connectors with a pliable vinyl skirt. The connectors shall be temperature rated 105 degrees Celsius with 600 volt insulation. The connectors shall be U.L. listed and comply with Federal Specification W-S-160.

2.4 COMPRESSION CONNECTORS AND LUGS

- a The connectors shall be copper with tin plating. The connectors and lugs shall be designed to connect to the cable by means of dieless hydraulic compression tool.

2.5 INSULATED POWER DISTRIBUTION BLOCKS

- a The power distribution blocks shall be rated 600 volt, 90 degrees Celsius with tin plated copper connections. The blocks shall be mounted in an insulated base with a removable clear cover. The connector size and configuration shall be as recommended by the manufacturer for the conductors being spliced.

3.0 EXECUTION

3.1 INSTALLATION

- a Mechanically protect conductors for systems by installing in raceways. Do not install the conductors until raceway system is complete and properly cleaned. Do not bend any conductor either permanently or temporarily during installation to radii less than four times the outer diameter of 600-volt insulated conductors. Do not exceed manufacturer's recommended values for maximum pulling tension.
- b Use Ideal Wire Lube Yellow #77 Plus or Ideal Wire Lube Aqua-Gel II wire pulling lubricant or equal when pulling large conductors. The lubricant shall be compatible with rubber, neoprene, nylon polyvinyl chloride, high density or cross linked polyethylene, low density polyethylene, semiconducting jacket and hypalon cable types. Wiring pulling compound shall be U.L. listed and approved by wiring manufacturer.
- c Pull conductors simultaneously where more than one is being installed in same raceway.
- d Use pulling means including fish tape, cable, rope and basket weave wire/cable grips which will not damage cables or raceway.
- e Contractor may provide conductors with either THW or THHN/THWN insulation for general wiring.
- f Contractor shall provide conductors with XHHW-2 insulation for underground feeders.
- g Neatly and securely bundle all conductors in enclosures using nylon straps with a locking hub or head on one end and a taper on the other.

3.2 SPLICES AND TERMINATIONS

- a Splices shall be kept to a minimum. Splices shall be made in junction and pull boxes. Splices shall not be made in conduit fittings, switch and circuit breaker enclosures, panelboards, motor starters, motor control centers or switchboards. All connectors shall be of material recommended by conductor manufacturer(s) to prevent any corrosion or electrolysis between dissimilar metals.
- b Use compression type connectors or insulated power distribution blocks for splices of all stranded conductors 6 AWG and larger. Mechanical, split bolt, type connectors for conductor splices are not acceptable.
- c Use ring-tongue type terminators on all control wiring.

- d Use insulated electrical spring connectors for conductors 8 AWG and smaller.
- e Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A and B. All compression connector lugs including screws and bolts shall be sealed with blue colored F-900 torque seals after final torquing.
- f Furnish and install hot or cold shrink cable end caps to seal and insulate the portion of the conductor termination that is left exposed when conductors are terminated on mechanical lugs. The terminations shall be non-shielded and rated 1000 volts minimum and be sized in accordance with the manufacturer's recommendations.
- g Power and Lighting Circuits: Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and larger. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps on lighting and receptacle circuits.
- h Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- i Connections for all wire sizes in motor terminal boxes where the motor leads are furnished with crimped-on lugs shall be made by installing ring type compression terminals on the motor branch circuit ends and then bolting the proper pairs of lugs together. First one layer of No. 33 scotch tape reversed (sticky side out), then a layer of rubber tape, then two layers of No. 33 half-lapped.
- j The power feeder lug connections to mains or busses shall be made with hydraulically applied high compression-type lugs or connectors, except for panelboards 400 A and smaller.

3.3 CONDUCTOR SIZING

- a Conductors shall be provided as required by the more stringent requirements of the drawings or the specifications.
- b Provide No. 10 AWG conductor for single-phase, 120-volt, 20-ampere branch circuits for which the distance from panelboard to the first outlet is more than 100 feet. The entire branch circuit from the overcurrent device to the last outlet shall be No. 10 AWG minimum.
- c Provide No. 10 AWG conductors for single-phase 277 volt, 20 amp circuits for which the distance from panelboard to the first outlet is more than 200 feet. The entire branch circuit from the overcurrent device to the last outlet shall be No. 10 AWG minimum.

3.4 HOMERUNS

- a No more than three phase conductors, neutral and equipment ground conductor shall be installed in a single raceway for all feeders; HVAC and Plumbing equipment such as refrigeration equipment, fan motors, pumps, and compressors; elevators, and other similar types of equipment unless specifically noted on the drawings.
- b Multi-wire branch circuits and individual branch circuits shall be allowed to be combined in a single homerun. The maximum number of branch units shall be three. The contractor shall be responsible to apply the conductor ampacity derating factors and increase the raceway size as required by the NEC.
- c All individual branch circuits shall have a separate neutral and equipment grounding conductor. The neutral shall be considered a current carrying conductor.

- d Provide a separate neutral and equipment grounding conductor for branch circuits serving kitchen equipment, vending machines, copy machines, lighting, technology equipment, and where shown in the documents by the number of conductors indicated in the home run tickmarks.
- e Provide separate neutral and equipment grounding conductors for each branch circuit indicated by the tickmarks in the construction documents.
- f Use home run circuit numbers as indicated for panelboard connections.
- g Comply with ampacity adjustment factors as required by the NEC.

3.5 COLOR CODE

- a Provide color coding for the conductors of each feeder, and branch circuit. The conductor color coding shall be in accordance with the City of Saint Hedwing Electrical Code Ordinance, and the NEC.
- b All wiring shall be color coded in accordance with Section 26 05 53.

3.6 SIGNAL, COMMUNICATIONS, AND/OR SIMILAR SYSTEMS

- a Special system(s) conductors (i.e., telephone, intercom, P.A., fire alarm system(s), clock system, etc.) shall be installed in raceways. Refer to Division 27 and Division 28 for additional requirements.

End of Section 26 05 19

SECTION 26 05 19.02**METAL-CLAD CABLE****1.0 GENERAL****1.1 SUMMARY**

- a This section specifies the furnishing and installation of metal-clad cable MC cable shall only be use for receptacles branch circuits in walls only up to the first j-box above ceiling, and for lighting fixtures whips. All branch circuits above the ceiling to electrical panelboards shall be rigid metallic raceways. Lighting fixtures whips shall not exceed 6'-0" in length.

1.2 REFERENCE STANDARDS

- a Federal Specification - A-A59544.
- b NEC 330 - Metal-Clad Cable.
- c IEEE 12 02.
- d UL Standard 1569 - Metal Clad Cables.
- e UL Standard 03 - Thermoplastic - Insulated Wires and Cables.
- f UL Standard 4 - Armored Cable.
- g NEMA WC 70/ICEA S-95-658 - Non-shielded power cable 2,000 volts or less.

1.3 APPLICABLE PROVISIONS

- a Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

- a Submit manufacturer's data on metal-clad cable, cable connectors and accessories.

1.5 DELIVERY, STORAGE, AND HANDLING:

- a Deliver cable properly packaged in factory-fabricated type containers, or wound on NEMA-specified type wire and cable reels.
- b Store cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris and traffic.
- c Handle cable carefully to avoid abrasing, puncturing and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

2.0 PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS**

- a Subject to compliance with requirements, acceptable manufacturers shall be as follows:

- 1. Metal-Clad Cable.

- (a) AFC Cable Systems.
- (b) Brand Rex Co.
- (c) BICC Cables Corporation.
- (d) General Cable Corporation, Carol Electronics.
- (e) The Okonite Co.
- (f) Southwire Co.
- (g) Rome Cable Corporation.
- (h) Encore Wire.

2. Cable Connectors.

- (a) Bridgeport.
- (b) Thomas&Betts.
- (c) Arlington.

2.2 METAL-CLAD CABLE

a Conductors.

- 1. All conductors shall be soft-drawn annealed copper with conductivity of not less than 98% at 20 degrees C (68 degrees F).
- 2. An insulated copper grounding conductor shall be provided in all cables. Provide additional isolated ground conductors for isolated ground circuits.
- 3. Provide separate neutrals for individual branch circuits as required in Section 26 05 19.01.
- 4. All cable shall be permanently marked in accordance with NEC Article 310.11.
- 5. All conductors shall have factory color coded insulation. The color code shall be as specified in Section 26 05 19.01.

b Metallic Sheath.

- 1. The outer sheath shall be constructed from interlocked galvanized strip steel.
- 2. All cable shall be permanently marked in accordance with NEC Article 310.11.

c Construction.

- 1. The cables shall consist of copper conductors surrounded by a separator tape and enclosed by metallic sheath. A marker tape shall be provided between the binder tape and the metallic sheath.

2.3 METAL-CLAD CABLE FITTINGS

- a All fittings shall be UL listed and identified for use with metal-clad cable.
- b All fittings shall be constructed from malleable iron or steel. Fittings shall be swap on type.

3.0 EXECUTION

3.1 INSTALLATION

- a The use of MC cable is only allowed for lighting fixture whips. The maximum allowed length is six feet (6'-0"). All other wiring methods shall comply with Sections 26 05 33. Do not bend any cable either permanently or temporarily during installation to radii less than recommended by the cable manufacturer and NEC requirements.
- b Specialized cutting tools shall be used to cut the cable to the lengths required. Care shall be taken to insure that the conductor insulation is not damaged during cutting operations. Any cable with damaged conductor insulation shall be replaced.
- c The cable shall be secured to the building structure in accordance with NEC requirements with the supporting means specified in Section 26 05 29.
- d Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A and B.

3.2 COLOR CODE

- a Provide color coding for the conductors of each branch circuit. The conductor color coding shall be in accordance with Section 26 05 19, paragraph 3.5.

End of Section 26 05 19.02

SECTION 26 05 26**GROUNDING****1.0 GENERAL****1.1 WORK INCLUDED**

- a Power system grounding.
- b Electrical equipment and raceway grounding and bonding.
- c This section specifies the furnishing and installation of grounding and bonding equipment for electrical systems.
- d Extent of electrical grounding and bonding work is as specified herein. Provide a completely grounded system sized in accordance with Article 250 of the NEC. Each piece of electrical apparatus shall be solidly grounded with separate insulated green ground wire.
- e All grounding conductors terminating in ground bus bar shall be labeled, i.e., water main ground, building steel ground, building counterpoise ground loop, etc.

1.2 RELATED WORK

- a Division 26.
- b Division 27.

1.3 REFERENCES

- a NFPA 70 – National Electrical Code, latest edition
- b ANSI/UL 467 – Electrical Grounding and Bonding Equipment
- c ANSI/IEEE STD 142 – Recommended Practice for Grounding of Industrial and Commercial Power Systems
- d IEEE 81 – Guide for Measuring Earth Receptivity, Ground Impedance and earth Surface Potential of a ground System
- e IEEE 1100 – Recommended Practice for Powering and Grounding Sensitive Electronic Equipment
- f ANSI/TIA/EIA 607 – Commercial Building Grounding and Bonding Requirements for Telecommunications.
- g ANSI/IEEE Std. 142 – Recommended Practice for grounding industrial and commercial power systems.

1.4 SYSTEM DESCRIPTION

- a Ground the electrical service system neutral at service entrance equipment to grounding electrodes. Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during normal operations. Concrete encased electrodes shall be

connected as the most effective grounding electrodes. Provide a completely grounded system in accordance with Article 250 of the NEC. Provide a concrete encased grounding electrode in accordance with the NEC Article 250.52(A)(3).

- b Ground each separately-derived system neutral to separate ground buses that are installed in nearest electrical rooms. Transformer, emergency generator, automatic transfer switches, power conditioners, inverters, or other power supplies are separately derived systems. Standby or emergency generators are separately derived systems if the neutral is bonded to the generator frame and if there is no direct connection of the generator neutral conductor to the service neutral conductor.
- c Provide each telephone room, IDF and MDF room, and electrical room with ground bus. Connect ground busses to the building's main electrical ground bus with a #4/0 AWG ground conductor from each room ground bus to the main electrical room ground bus. Interconnecting ground busses in a daisy chain manner is prohibited and not allowed.
- d Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, cable trays, auxiliary gutters, meter fittings, boxes, cable armor, cable sheath, ground bus in electrical rooms and telephone rooms, IDF and MDF rooms, metal frame of the building or structure encased grounding electrode, ground loop, lightning down lead conductor, grounding conductor in raceways and cables, receptacle ground connectors, and metal underground water pipe.
- e Bonding jumpers shall be installed around non-metal fittings or insulating joints to ensure electrical continuity. Bonding shall be provided where necessary to ensure electrical continuity and the capacity to conduct safely any fault current likely to be imposed.
- f Supplementary Grounding Electrode. Install ground rod in suitable recessed well; fill with gravel after connection is made.

1.5 SUBMITTALS

- a Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements, and Division 01 for submittal requirement.

1.6 ACCEPTABLE MANUFACTURERS

- a Heary Bros. Lightning Protection
- b East Coast Lightning Equipment
- c Thompson Lightning Protection
- d ERICO
- e Bonded Lightning Protection

1.7 QUALITY ASSURANCE

- a Provide documentation for all ground test, refer to Section 26 08 00 - Electrical Testing.

2.0 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- a Grounding system components shall be as required to comply with the design and construction of the system indicated. Components shall be as indicated in manufacturer's submittal data.

- b Ground conductors shall be stranded tinned, annealed copper cable of the sizes indicated on drawings. Bond grounding conductors at both ends of metallic conduit.
- c Grounding clips shall be Steel City Type G, or equal.
- d Ground Rods shall be copper-encased steel, 7/8" diameter, minimum length 10 feet.
- e Use chemical ground rods in areas with rocky soil.

- EXECUTION

3.1 INSTALLATION

- a Install ground system in accordance with the applicable requirements of the National Electrical Code and the National Electrical Contractors Association's "Standard of Installation".
- b Install grounding conductors continuous, without splice or connection, between equipment and grounding electrodes. Install test wells at each building corner.
- c In feeder and branch circuits, provide a separate, insulated equipment grounding conductor. Terminate each end on a grounding lug, bus, or bushing.
- d Connect grounding electrode conductors to metal water pipe where metal pipe is available and accessible using suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter.
- e Install fusion welded ground connectors where they are concealed or inaccessible.
- f Ground each outlet by the use of an approved grounding clip attached to the junction box in such a position to be readily inspected on removal of the cover plate; or by the use of an approved grounding yoke type receptacle.
- g No strap grounding clamps shall be used; connections requiring bolting shall be made up with monel metal bolts, washers and nuts. Connections shall be made only after surfaces have been cleaned, or ground to expose virgin metal.
- h Conductor connections shall be made by means of solderless connectors such as serrated bolted clamps or split bolt and nut type connectors.
- i The neutral of each transformer shall be bonded to system ground at one point only. This point shall be ahead of the first secondary protective device.
- j Connect grounding conductors to ground rods at the upper end of the rod with the end of the rod and the connection points below finished grade. Below grade connection shall be exothermic-welded type connectors as manufactured by Cadweld, Thermoweld. In manhole, install ground rods with 4 to 6 inches above the floor with connections of grounding conductors fully visible and accessible.
- k Provide grounding and bonding at Austin Energy transformer vault in accordance with Austin Energy's requirements.

3.2 GROUNDING ELECTRODE

- a Provide a grounding electrode system for the service entrance equipment at the building. Provide a bonding conductor between the service equipment ground and neutral bus. The ground electrode systems shall consist of the following:

1. The grounded service conductor at the service entrance switchgear.
2. The building structural steel shall be grounded by means of a bonding jumper or conductor connected to the ground electrode system.
3. The metal underground water pipe (if available) shall be bonded to the ground electrode system. Provide bonding jumpers around insulated pipe joints as required.
4. A concrete encased electrode shall be provided. The electrode shall be installed per Article 250 of the NEC.
5. Other electrodes shall be connected to the system as called for on the drawings grounding riser diagram.

3.3 SYSTEM GROUND

- a The system neutral and ground shall be bonded to the grounding electrode conductor in the service entrance switchgear in accordance with NEC 250. The system neutral and ground shall not be bonded at any other point in the distribution system except for separately derived systems.
- b Ground all separately derived systems in accordance with NEC 250.
- c The system grounding electrode conductor shall be in accordance with NEC 250, unless larger sizes are indicated.
- d Bond the service entrance conduits together and connect to the main bonding jumper. Main and equipment bonding jumpers shall be sized in accordance with NEC 250.

3.4 EQUIPMENT GROUND

- a Provide a ground bus in all electrical rooms, telephone, and MDF rooms. Mount bus 24 inches above finished floor and 1-inch from wall around perimeter of room. Connect bus by a grounding connector with a cross-sectional area equivalent to the ground bus to an acceptable grounding electrode as described in Article 250. Connect all noncurrent-carrying metallic parts of electrical equipment in the room to the bus.
- b Raceway Systems and Equipment Enclosures.
 1. Ground cabinets, junction boxes, outlet boxes, motors, controllers, raceways, fittings, switchgear, transformer enclosures, other equipment and metallic enclosures. Ground equipment and enclosures to the continuous-grounded, metallic raceway system in addition to any other specific grounding shown.
 2. Provide bonding jumpers and ground wire throughout to ensure electrical continuity of the grounding system. Bonding jumpers shall be sized in accordance with NEC 250.
 3. Provide an equipment grounding conductor in each branch circuit and each feeder.
- c Grounding conductors shall be sized in accordance with NEC 250 unless larger sizes are indicated.
- d Bonding equipment jumpers shall be sized in accordance with NEC 250 unless larger sizes are indicated.

3.5 GROUNDING BUSHINGS

- a Feeder conduits terminating in switchboards, distribution panels, motor control centers and panelboards shall be provided with grounding bushings. Bushings shall be connected to the ground bus in the equipment. Connect the equipment grounding conductor to the grounding bushing and the equipment ground bus in the associated switchgear.

3.6 MOTORS

- a Ground each motor by means of a separate grounding conductor in the conduit connection to the motor. Grounding conductors shall be sized in accordance with NEC Table 250-122 and shall be securely and permanently attached to the motor body and to the ground bus in the panelboard, switchboard or motor control center.

3.7 TRANSFORMER GROUNDING

- a Ground all transformers a separately derived systems in accordance with NEC 250-30. The grounding connections shall be made in the transformer enclosure. Install a separate insulated equipment grounding conductor in the flexible conduit connection to the transformer. The equipment grounding conductor shall be bonded to the main bonding jumper in the transformer housing.

3.8 RECEPTACLES

- a All receptacles shall be bonded to their device box. This connection shall be made by means of a bonding jumper between the device and the box. Where the receptacle mounting yokes are designed and listed for the purpose of grounding the bonding jumper may be omitted.
- b All isolated ground receptacles shall have an isolated ground conductor installed complete from receptacle to the isolated ground bus in the associated panelboard.

3.9 FIELD QUALITY CONTROL

- a Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- b Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 5 ohms. Provide additional ground rod as required until resistance reading is 5 ohms or less.

End of Section 26 05 26

SECTION 26 05 29**METAL FRAMING AND SUPPORTS****1.0 GENERAL****1.1 SUMMARY**

- a This Section specifies the furnishing and installation of metal framing, including channels, necessary hangers, fittings, clamps, anchor bolts and rods, hardware, supports, electrical accessories and brackets, for properly installing all electrical equipment and materials.
- b All support systems shall be adequate for weight of equipment and conduit, including wiring which they carry. Support systems shall be sized to support an additional 25 percent for future loads.

1.2 REFERENCE STANDARDS

- a NEMA ML 1 - Metal Framing.
- b NFPA 70 - National Electrical Code.

1.3 APPLICABLE PROVISIONS

- a Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

- a Submit product data for all materials including, but not limited to: pipe straps, beam clamps, metal framing, rod hangers, trapeze hangers, u-bolts.

2.0 PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS**

- a Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

- 1. Metal Framing.
 - (a) American Electric.
 - (b) Allied Tube and Conduit.
 - (c) B-Line Systems Inc.
 - (d) Kindorf, Electrical Products Division.
 - (e) Unistrut.
- 2. Insert Anchors.
 - (a) Ackerman-Johnson Fasteners.
 - (b) American Electric.
 - (c) Hilti Inc.

(d) Star Expansion Co.

3. Supports.

(a) Caddy.

(b) Crouse-Hinds.

(c) Appleton.

(d) Steel City.

2.2 CHANNEL SYSTEMS

- a Fabricate channels from pre-galvanized strip steel in accordance with ASTM A-446, Grade A requirements. The minimum channel size shall be 1-5/8 inches wide by 7/8 inch deep. Provide larger channels as required to suit the particular installation requirements.
- b Fabricate clamping nuts steel bar stock. Channel clamping nuts shall meet the requirements of ASTM A-575, Grade M 1015 and shall be case hardened to 25 HRC. Hex head nuts and bolts shall meet the requirements of ASTM A-563 and ASTM A-307.
- c All nuts and bolts shall meet the requirements of the Unified Screw Threads standard ANSI B1.1, course series UNC, Class 2.
- d All fasteners shall have an electro-galvanized finish.
- e Channel system fittings shall be fabricated from bar or strip steel in accordance with the requirements of ASTM A-36. All fittings shall have an electro-galvanized finish.
- f Channel system clamps shall be fabricated from steel in accordance with the requirements of ASTM A-569. All clamps shall have an electro-galvanized finish. Provide clamps that eliminate metal to metal contact between the clamp and the conduit.
- g Channel system mounting brackets shall be fabricated from hot rolled steel. All fittings shall have an electro-galvanized finish.
- h Channel system beam clamps shall be fabricated from cold formed steel or cast from malleable iron. All beam clamps shall have an electro-galvanized finish.

2.3 ROD HANGERS

- a Rod hangers shall be selected for weight supported but shall not be smaller than No. 8.
- b Rod hangers and adjustable "J" pipe hangers equal to Kindorf Type C-149 for conduits. Conduits two inches (2") and smaller may be fastened with pipe hangers equal to Kindorf Type 6H.

2.4 MISCELLANEOUS FASTENERS

- a Galvanized U-bolts or Kindorf C-210 riser pipe clamps on channel iron bearing plates at intervals of at least one clamp per joint shall be provided for support of vertical runs of conduits of more than twelve feet (12').

3.0 EXECUTION

3.1 INSTALLATION

- a Securely fasten and support conduits and raceways of all types and all electrical boxes, devices, and equipment from the main building structure. Conduit system shall not be supported by ceiling hanger wires. Support conduits within three feet (3'-0") of each end, of each bend and each termination. Support conduit runs at ten feet (10'-0") intervals along the run to maintain true raceway alignment without sag or deformation. The use of caddy-clips for conduit supports from suspended ceiling systems is not acceptable. Caddy clips must be supported from their own independent hanger wires anchored to building structure.
- b On exposed raceways and cable run without conduit, provide supports at a minimum of six feet (6') on centers and on each side of each bend. Vertical conduits shall be supported at not more than 10' on center in addition to the above.
- c Maintain horizontal and vertical alignment of raceways to not adversely effect the building structure in strength or appearance. Cable and strap shall not be used.
- d Install exposed wall mounted conduits after wall surface is installed. Secure the conduits with anchors that provide adequate space to allow wall to be painted after conduit is installed.
- e Support cabinets and boxes to the floor and to the structure above independent of all raceways entering the boxes. Structural walls or columns may be used to support these cabinets or boxes.
- f Secure panelboard cabinets and boxes to the building structure independent of all raceways entering the cabinets and boxes.
- g Angle iron or framing channel supports or other load bearing approved support means shall be used to support all panelboards, cabinets, junction and pull boxes.
- h Fasten cabinets, boxes, panelboards, disconnects, motor controls and similar devices indicated other than at walls on channel iron racks mounted to floor and structure above. Three-fourths inch (3/4") thick plywood backboards painted to match the equipment finish may be used as a part of the rack.
- i All boxes shall be rigidly and securely fastened to the structural surface to which they attach. All boxes must be supported from a structural portion of the building independent of the raceway system.
 - 1. Surface mounted boxes shall be fastened by means of wood screws to wood, expansion bolts on concrete, toggle bolts on hollow masonry units and machine screws on metal construction.
 - 2. Exposed boxes shall be supported by means of all-thread rods 1/4" diameter minimum. The all-thread rods shall be secured to the structure.
 - 3. Boxes concealed in walls shall be secured to the wall stud with a minimum of two fasteners. Use wood screws in wood and machine screws in metal. Boxes that attach to metal studs shall be fastened to a second wall stud by means of a backing brace or rod.
 - 4. Boxes recessed in suspended ceilings shall be supported in the same manner as described for exposed boxes or by means of approved bar hangers that attach firmly to the ceiling grid.
 - 5. Boxes embedded in concrete or masonry boxes shall have integral metal ears that embed into the concrete or masonry grout.
 - 6. The methods of support outlined herein are not intended to cover every condition. If conditions other than these occur, the contractor shall propose a method to the engineer for approval prior to installation.

- j Place support and leveling channels for free standing type switchgear, transformers, and motor control equipment.
- k Rust inhibit all supports by galvanizing or other approved means. Supports shall be job rust inhibited at all cuts, breaks, welds, or other points where rust inhibitor coating is broken.

3.2 ANCHOR BOLTS

- a Use 3/8-inch diameter by 3 inches long expansion bolts to attach framing to concrete. Space bolts a maximum of 24 inches on center, with not less than two bolts per piece of framing.

3.3 TOUCH-UP

- a Touch up all scratches or cuts on steel components with an approved zinc chromate or a 90% zinc paint. Use a PVC compound on PVC-coated components.

End of Section 26 05 29

SECTION 26 05 33**RACEWAYS****1.0 GENERAL****1.1 SUMMARY**

- a. This section specifies the furnishing and installation of raceway systems, and raceway fittings.

1.2 REFERENCE STANDARDS

- a. ANSI/ANSI C80.1 - Specification for Zinc-Coated Rigid Steel Conduit.
- b. ANSI/ANSI C80.3 - Specification for Zinc-Coated Electrical Metallic Tubing.
- c. ANSI/ANSI C80.4 - Specification for Fittings for Rigid Metal Conduit and Electrical Metallic Tubing.
- d. ANSI/ANSI C80.5 - Specification for Rigid Aluminum Conduit.
- e. ANSI/UL 1 - Safety Standard for Flexible Metal Conduit.
- f. ANSI/UL 651 - Safety Standard for Rigid Nonmetallic Conduit.
- g. ANSI/UL 797 - Electrical Metallic Tubing.
- h. ANSI/UL 870 - Safety Standard for Wireways, Auxiliary Gutters and Associated Fittings.
- i. NEMA 2.10-2003 - Selection and Installation Guidelines for Fittings for use With Non-Flexible Metallic Conduit or Tubing (Rigid Metal Conduit, Intermediate Metal Conduit and Electrical Metallic Tubing).
- j. NEMA RN 1 - PVC Externally Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing.
- k. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80) and Fittings.
- l. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
- m. UL 6 - Rigid Metal Electrical Conduit.
- n. UL 360 - Liquid-tight Flexible Steel Conduit.
- o. UL 467 - Electrical Grounding and Bonding Equipment.
- p. UL 1242 - Intermediate Metal Conduit.

1.3 APPLICABLE PROVISIONS

- a. Refer to Section 26 00 00 - Electrical General Provisions.

1.4 HANDLING AND STORAGE

- a. Handling shall be done to assure that raceways are not crushed or damaged in any way which would restrict cross sectional area or cause oxidation.

1.5 SUBMITTALS

- a. Submit manufacturer's technical product data, including specifications and installation instructions, for each type of raceway system required.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- a. Subject to compliance with requirements, provide raceway of one of the following manufacturers:
 - (1) Rigid Steel Conduit, Rigid Steel PVC coated, Intermediate Metal Conduit and Electrical Metallic Tubing:
 - (a) Allied Tube & Conduit Corp.
 - (b) LTV Steel Tubular Products.
 - (c) Republic Conduit.
 - (d) Western Tube and Conduit Corporation.
 - (e) Wheatland Tube Co.
 - (2) Flexible Metal Conduit, Liquidtight Flexible Metal Conduit:
 - (a) Alflec Corp.
 - (b) AFC Cable Systems.
 - (c) Electri-Flex Co.
 - (3) (PVC) Rigid Nonmetallic Utilities Duct and Conduit:
 - (a) Carlon.
 - (b) Southern Pipe, Inc.
 - (c) Cantex Inc.
 - (4) Conduit Fittings and Bodies:
 - (a) Appleton.
 - (b) O.Z. Gedney.
 - (c) American Electric.
 - (d) Crouse-Hinds.
 - (e) Thomas & Betts Corporation.

2.2 CONDUIT AND FITTINGS

- a. Rigid Steel Conduit.

- (1) Hot-dipped galvanized rigid steel conduit per ASTM Standard A-153 galvanized after fabrication. All threads shall be galvanized after cutting. A uniform zinc coating shall applied to the inner and outer walls.
- (2) Fittings shall be threaded, insulated throat, malleable iron, either cadmium plated or hot-dipped galvanized.
- (3) Conduit shall be in manufactured accordance with UL Standard 6, ANSI C80.1 and Federal Specification WW-C-581E.

b. PVC Coated Rigid Steel Conduit

- (1) PVC coated rigid steel conduit shall be externally coated with 40 mil PVC coating and internal phenolic coating over a galvanized surface.
- (2) Conduit shall be in manufactured accordance with UL Standard 6, ANSI C80.1 and Federal Specification WW-C-581E.

c. Intermediate Metal Conduit.

- (1) Conduit shall be the same as rigid metal conduit except thinner wall.
- (2) Fittings shall be threaded, insulated throat, malleable iron, either cadmium plated or hot-dipped galvanized.
- (3) Conduit shall be manufactured in accordance with UL Standard 1242 and ANSI C80.6.

d. Electrical Metallic Tubing (EMT).

- (1) Shall be made of strip steel. The exterior shall be hot dipped galvanized with a zinc coating applied over the galvanized coating. The interior shall be coated with a silicone epoxy-ester lubricant.
- (2) Fittings shall be steel compression type. Fittings for circuits containing conductors 4 AWG and larger shall be the insulated throat type.
- (3) Conduit shall be manufactured in accordance with UL 797, ANSI C80.3 and Federal Spec. WWC-563.

e. Flexible Metal Conduit

- (1) Be made of spirally wound continuously interlocked zinc coated strip steel.
- (2) Fittings shall be malleable iron, squeeze type zinc plated or hot dipped galvanized. Fittings for circuits containing conductors 4 AWG and larger shall be the insulated throat type.
- (3) Conduit shall be manufactured in accordance with UL Standard 1 and Federal Spec. WW-C-566. Fittings shall be manufactured in accordance with UL Standard 467.

f. Liquid-Tight Flexible Metal Conduit.

- (1) Be made of spirally wound continuously interlocked zinc coated strip steel with a concentric PVC outer jacket. Conduits 1 1/4" in diameter and smaller shall have a continuous copper ground conductor built into the core. The PVC jacket shall be

water and oil resistant, UV stabilized and be suited for installation in ambient temperatures of -20 to +60 degrees Celsius.

- (2) Fittings shall be compression type, malleable iron, with insulated throat, either cadmium plated or hot-dipped galvanized.
- (3) Conduit shall be manufactured in accordance with UL Standard 1 and Federal Spec. WW-C-566. Fittings shall be manufactured in accordance with UL Standard 467.

g. Rigid Nonmetallic Conduit.

- (1) Conduit shall be schedule 40 PVC, UV stabilized, rated for 90 degree C. conductors.
- (2) Fittings shall be solvent welded socket type.
- (3) Conduit shall be manufactured in accordance with NEMA TC-2, Federal Specification WC1094A and UL Standard 651.

2.3 CONDUIT EXPANSION COUPLINGS

a. Provide Thomas & Betts XJG-TB rigid or intermediate metal conduit expansion couplings or the equivalent.

- (1) The fitting body shall be constructed from malleable or ductile iron. The conduit body shall be PVC coated fittings when installed in runs of PVC coated conduit.
- (2) The fitting shall have an internal bonding jumper constructed of a tinned copper braid sized to comply with U.L. fault current requirements and NEC 250.98 bonding requirements.
- (3) The fitting shall be capable of compensating for a minimum of 4 or 8 inches thermal expansion and contraction. The amount of movement shall be calculated in accordance with the NEC. The fitting shall be rain tight.

2.4 WIREWAYS

- a. Provide lay-in wireways with hinged cover, knockouts, connectors and fittings. All screws installed towards the inside shall be protected to prevent possible wire insulation damage. Wireways shall be NEMA 1 when located in dry areas and NEMA 3R when located in wet areas. Wireways shall be constructed from minimum 16 gage sheet metal for sizes 4" x 4" and smaller and 14 gage sheet steel for sizes larger than 4" x 4". NEMA 3R wireway shall have knockouts in the bottom only. Provide with wire retainers not less than 12" on center.
- b. The finish shall be ANSI-49 gray epoxy and shall consist of not less than two coats of enamel over a rust-inhibiting prime coat.
- c. The wireway shall be manufactured in accordance with UL Standard 870 and all components shall be UL listed.

3.0 EXECUTION

3.1 CONDUIT AND FITTINGS

- a. The minimum conduit size for branch circuits shall be ½" conduit. Minimum conduit size for data and telecommunication raceways shall be 1-inch. Minimum conduit size for fire alarm system shall be ½" conduit.

b. Types According to Use. Use rigid metal conduit throughout the project except as specified below.

- (1) Rigid steel or IMC conduit shall be used where cast in concrete walls or floor slabs which have weatherproof membranes, where cast in masonry walls, in damp or wet locations, where exposed outdoors, or indoor where exposed to physical damage.
- (2) Electrical metallic tubing may be used for branch circuitry above accessible ceilings and work concealed in dry walls. Electrical metallic tubing is allowed in concrete slabs subject to NEC requirements. Electric metallic tubing shall not be used in contact with earth or in areas that are subject to permanent moisture and physical damage.
- (3) Intermediate metal conduit may be used in lieu of rigid metal conduit for feeders in interior dry locations.
- (4) Schedule 40 PVC may be used for buried branch circuits as permitted by the NEC and local codes except where rigid is herein called for. All boxes, fittings, couplings, transition fittings, adhesives and installation procedures recommended by the manufacturer shall be strictly followed. All stub-ups shall transition to PVC coated rigid steel conduit at the elbow.
- (5) PVC conduit may be installed in the fill beneath the structural floor slab for conduit sizes larger than 1 1/4" diameter for slab on grade applications. All stub-ups shall transition to PVC coated rigid steel conduit at the elbow.
- (6) PVC conduit is allowed in concrete slab in conduit size of 1-inch diameter maximum, and slab on grade.
- (7) Feeders installed underground may be schedule 40 PVC as permitted by the National Electrical Code (N.E.C.).
- (8) Flexible and liquid-tight flexible metal conduit shall be used for final connections to utilization rotating, and vibration equipment. Maximum length shall be four foot (48 inches). Liquid-tight shall be used for all exterior locations and any interior location subject to moisture.
- (9) Metallic conduits shall be wrapped with corrosion protective tape when installed below grade or in concrete.

c. Transitions.

- (1) Continue the heavier, more protective type conduit application not less than 4 inches into the area where lighter, less protective type conduit is permitted.

d. Place sleeves in the forms of walls and floor slabs for the free passage of conduits. Set sleeves in place a sufficient time ahead of concrete placement so as not to delay the work. Apply caulking for sleeves through floors and through exterior walls. Install plugs or caps on all conduits prior to concrete placement. Provide sleeves and penetrations in accordance with Section 26 00 00.

e. Installation Requirements.

- (1) Metallic conduits shall be continuous between enclosures such as outlets, junction and pull boxes, panels, cabinets, motor control centers, etc. The conduit shall be secured to enclosures so that the raceway system is electrically continuous throughout. Where threaded conduits enter enclosures provide locknuts on the inside and outside of the enclosure.

- (2) Where threaded conduits are terminated in enclosures, provide insulated bushings for conductor protection. In equipment having a ground bus, such as in switchgear, motor control centers and panelboards, provide an insulated grounding bushing and extend the grounding conductor to the ground bus. In no case shall flexible conduit systems be used for exiting electrical panelboards.
- (3) Rigid nonmetallic conduit shall be adequately solvent welded at the joints to form a tight, waterproof connection.
- (4) All raceways shall be installed perpendicular and parallel to the building lines in a neat and orderly manner.
- (5) All raceways are to be concealed in all finished areas unless otherwise specifically indicated on the Drawings. When exposed the exact routing shall be confirmed in the field with the Architect/Engineer prior to rough in. Provide chrome-plated floor and ceiling plates around conduits exposed to view and passing through walls, floors, partitions, or ceilings in finished areas. Select plates to properly fit the conduit when securely locked in place.
- (6) Install raceway systems with all junction boxes and pullboxes as necessary and as required by the N.E.C.
- (7) Emergency system raceways and fire pump system raceways shall comply with the fire rating requirements of the N.E.C. Article 700, and N.E.C. Article 695.

f. Installation Methods.

- (1) All raceway systems shall be complete before installing conductors.
- (2) All raceways shall have openings temporarily plugged to exclude foreign objects. The interior of all raceways shall be cleaned before pulling installing conductors.
- (3) All joints shall be cut square and be reamed smooth. All field threaded conduits shall be coated with an approved zinc chromate or with a 90 percent zinc paint.
- (4) All turns shall be made with standard ells or conduit bent in accordance with the NEC. Conduit bodies may be used in lieu of conduit ells where ease of installation and appearance warrants their use. For exterior and exposed applications, conduit bodies may be used only where specifically approved by the Architect. Furnish access doors for conduit bodies located above inaccessible ceilings. Refer to architectural drawings for required access doors' fire ratings. All field bends shall be made using equipment designed for the particular conduit material and size. Bends shall be free from dents or flattening. There shall be no more than the equivalent of three ninety degree bends in any raceway between terminals and cabinets, or between outlets and junction boxes or pull boxes.
- (5) Securely fasten and support conduit to metal framing using hot-dipped galvanized, malleable iron pipe straps or other approved means. Refer to Section 26 05 29. Galvanized tie wires for securing conduits, is not acceptable. The use of cad-clips for conduit supports from suspended ceiling systems is not acceptable.
- (6) Provide a No. 30 nylon pull cord in all empty conduits. Identify both ends of the line by means of labels or tags reading "Pulling Line".
- (7) Terminate concealed conduit for future use with a coupling at structural surfaces. Install an approved conduit plug flush with the surface.

- (8) All openings around electrical penetrations at fire rated walls, partitions, floors or ceilings shall be sealed to maintain the fire resistance rating of the penetration. Refer to Section 26 00 02.
- (9) All conduit in hazardous areas shall conform to NEC requirements for these areas and where feeding from or to a hazardous area to another room "seal offs" shall be used.
- (10) All feeders and branch circuit raceways shall be terminated in panelboard enclosures. The use of panelboard skirt is prohibited and not allowed under this contract.

3.2 THERMAL EXPANSION AND CONTRACTION

- a. Provide expansion fittings where required to compensate for thermal expansion and contraction in runs of metallic conduit systems as required by the National Electrical Code and the Contract Documents. The full coefficient of thermal expansion and contraction shall be taken into account for in all outdoor locations and all interior locations that are not heated and air conditioned to maintain a fairly constant temperature (+/- 10 degrees F). An expansion fitting shall be provided in any conduit run that is calculated to have 0.20 inches or greater of expansion or contraction. The calculations shall be done in accordance with NEC 300.
- b. Seal the interior of all raceways installed underground that will be subjected to water. All underground raceways shall be sealed in accordance with N.E.C. Article 300.

3.3 SEALING RACEWAYS

- a. Seal the interior of all raceways that will be subjected to moisture, gas, and different temperatures such as penetration through walls between air conditioned and non-air conditioned spaces, as required by the N.E.C. Article 300. The sealing bushings shall be compatible with the conductor insulation material and be U.L. listed.

3.4 WIREWAYS

- a. Install wireways, where shown, according to NEC Article 376. Field apply a 90 percent zinc paint coating over cuts or scratches before any other finish is applied.

3.5 INSTALLATION OF UNDERGROUND RACEWAYS

- a. The ground shall be excavated in open trenches to the proper width and depth for the installation of the underground conduits. Minimum conduit burial depth shall be 24" below finished grade to top of the conduit for 600 volt systems.
- b. Where the bottom of the trench is excavated below the necessary elevation, it shall be brought to proper grade by the use of sand or three-eighth inch gravel.
- c. No extra will be allowed because of the nature of the ground in which the trench or other excavations are made. All necessary sheathing to prevent cave-ins and barricades shall be provided in accordance with OSHA requirements.
- d. Where unstable ground is encountered in the bottom of the trench, it shall be excavated to a depth of at least 12 inches below the line of the duct or slab, and replaced with coarse gravel to the proper height.
- e. Where the excavation for its entire depth is in water or wet sand, pump and trench so as to drain it effectively.

- f. Backfill trenches with the excavated material unless otherwise specified. It shall be thoroughly compacted to insure a satisfactory job. In surfaced areas, compactions shall be 95% of surrounding undisturbed soil. Sodded areas shall be compacted to 95% up to topsoil. Topsoil shall be lightly compacted then soil mounded to allow for settling.
- g. Where conduits pass under existing sidewalks, roads or curbs cut and remove same in order to install the conduit or ducts. All sidewalks, roads or curbs shall be replaced with material equal to those now in place.
- h. Provide a burial utility tape with magnetic tracer, over all underground electrical installations that are exterior to the building. This shall include all feeders, branch circuits and communications conduits.
 - (1) Warning tape over electrical installation under 600 volts shall be red with black lettering stating "BURIED ELECTRICAL LINE".
 - (2) Warning tape over electrical installations over 600 volts shall be red with black lettering stating "BURIED HIGH VOLTAGE LINE".
 - (3) Warning tape over communications installations shall be orange with black lettering stating "BURIED TELEPHONE LINE".

Tape shall be installed one foot to six inches below finished grade, 3" wide as manufactured by T & B Westline or equal. Tape shall include magnetic tracer.
- a. All raceways installed underground shall be sealed in accordance with the requirements of the National Electrical Code Article 300. Provide conduit sealing bushings to prevent entrance of moisture into the underground raceway systems. Acceptable sealing bushing manufacturer is O-Z. Gedney or approved equal.

End of Section 26 05 33

SECTION 26 05 33.01**ELECTRICAL BOXES****1.0 GENERAL****1.1 SUMMARY**

- a This section specifies the furnishing and installation of all outlet boxes, floor boxes, junction boxes and pull boxes.

1.2 REFERENCE STANDARDS

- a ANSI/NEMA Publication No. OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers and Box Supports, and Cast Aluminum Covers.
- b ANSI/UL 514 - Electrical Outlet Boxes and Fittings.

1.3 APPLICABLE PROVISIONS

- a Refer to Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

- a Submit manufacturer's product data on electrical boxes.

1.5 DELIVERY STORAGE AND HANDLING

- a Deliver boxes properly packaged in accordance with Section 26 00 00.

2.0 PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS**

- a Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

1. Appleton.
2. American Electric.
3. Cooper Crouse-Hinds.
4. Hubbell Electrical Products.
5. Hoffman Engineering Company.
6. O.Z. Gedney.
7. Raco Inc.
8. Thomas & Betts

2.2 OUTLET BOXES

- a Provide galvanized steel boxes of sufficient size to accommodate wiring devices to be installed at outlet. Provide an extension ring for the device to be installed. Square or rectangular boxes may be supplied. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding. Unless otherwise noted, provide 1 - ½ 2-1/8-inch deep by 4-inch box.
- b Provide corrosion-resistant cast-metal FS or FD rain tight outlet wiring boxes with threaded hubs for surface mounting in areas having exposed rigid metal conduit systems and all outdoor locations. Provide galvanized boxes for surface mounting in areas having exposed EMT.
- c Boxes for Lighting Fixtures. Provide galvanized steel octagonal boxes with fixture stud supports and attachments as required to properly support ceiling and bracket-type lighting fixtures. Unless otherwise noted, provide 1 - ½ 2-1/8-inch deep by 4-inch box.
- d Masonry Boxes. Provide galvanized steel, 3-1/2-inch deep, masonry boxes for all devices installed in masonry walls.

2.3 JUNCTION AND PULLBOXES

- a Junction and Pull Boxes: Provide galvanized code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers. Junction and pull boxes shall be 16 gauge for sizes up to 12" x 12" x 12" and 10 gauges for all sizes 12" x 12" x 12" and larger. Pull boxes in sizes 12" x 12" x 12" and larger shall be provided with hinged covers.
- b Provide NEMA 1 boxes in interior dry locations.
- c Provide NEMA 3R boxes in all exterior locations and interior locations subject to moisture.

3.0 EXECUTION

3.1 COORDINATION

- a In order that all outlets may come in proper relation to paneling, decorated areas, etc., this Contractor shall familiarize himself with the details of these spaces and shall carefully lay out all outlets so that the equipment or piping of other trades passing under, over, across or in close proximity to same, will not cause the device or fixtures at or in these outlets to be inaccessible for use or maintenance. This Contractor must consult with the other Contractors on the project and procure all details of the various locations so as to make the outlet boxes come in proper relation to the work of all other trades. The Architect/Engineer reserves the right to relocate any outlet within reason from its original location shown on the plans prior to the application of the walls at no cost.

3.2 OUTLET BOXES

- a Unless otherwise indicated, mount all outlet boxes flush within 1/4-inch of the finished wall or ceiling line. Provide galvanized steel extension rings where required to extend the box forward in conformance to NEC requirements. Attach ring with at least two machine screws. Provide plaster covers for all boxes in plastered walls and ceilings.
- b Boxes for suspended lighting fixtures shall not be attached to or supported from suspended ceilings, unless specifically approved by ceiling installer/manufacture. Do not support boxes from ceiling grids.
- c Do not connect outlet boxes back to back unless specific approval is obtained. Where such a connection is necessary to complete a particular installation, fill the voids around the wire between the boxes with sound insulating material.

- d Provide only the conduit openings necessary to accommodate the conduits at the individual location. Provide knockout closures to cap all unused openings.
- e Provide weatherproof outlets and outlets in areas subject to moisture with gaskets between the box and the cover plate.
- f All boxes shall be provided with covers.
- g All outlet boxes installed in fire rated walls shall be fire rated with approved fire stopping material around the outlet boxes.
- h **Mounting Height.** Mounting height of a wall-mounted outlet box means the height from finished floor to horizontal center line of the cover plate. Where outlets are indicated adjacent to each other, mount these outlets in a symmetrical pattern with all tops at the same elevation. Where outlets are indicated adjacent, but with different mounting heights, line up outlets to form a symmetrical vertical pattern on the wall. None of the mounting heights listed in this section are to be construed as waiving of the regulations of any authority having lawful jurisdiction. Verify all device mounting heights with the Architect prior to rough-in. Device mounting heights shall be as follows:
 - 1. Receptacles, Telephone, and Data Outlets +18" AFF
 - 2. Wall Switches +48" AFF
 - 3. Manual Motor Starters +54" AFF
 - 4. Disconnect Switches +54" AFF
 - 5. Fire alarm system visual and audio/visual devices shall be mounted at eighty inches (80") above the highest floor level within the space or six inches (6") below ceiling, whichever is lower.
 - 6. Special system devices such as lighting motion sensors shall be mounted as recommended by the manufacturer's written instructions.

3.3 JUNCTION AND PULL BOXES

- a Install boxes as required to facilitate cable installation in raceway systems. Junction and pull boxes shall be sized to accommodate conductor system splices and associated insulation. Generally provide boxes in conduit runs of more than 100-feet or as required in Section 26 05 33. Locate boxes strategically and make them of such shape to permit easy pulling of wire or cables. The use of extension rings to increase the junction boxes interior space capacity is not acceptable.
- b Provide boxes so that covers are readily accessible and easily removable after completion of the installation. furnish and install suitable access doors for boxes located above inaccessible ceilings. Select a practical size for each box and cover. All boxes shall cover plates. Refer to architectural drawings for required access doors' fire ratings.
- c All pull boxes, junction boxes or any other electrical enclosure installed underground shall be U.L. listed and labeled for use in wet locations. Any connections and splices in an underground installation shall be approved for wet location applications.
- d All junction and pull boxes shall be labeled with corresponding panelboard(s) I.D., and panelboard circuit number.

3.4 FIRE ALARM SYSTEM BOXES

- a All junction boxes associated with the fire alarm system shall be painted red with a white stripe. Each box cover plate shall be labeled by zones, refer to Section 26 00 00 or 26 05 53 for acceptable label type.

3.5 EMERGENCY SYSTEM BOXES

- a All junction boxes associated with emergency power systems shall be painted red. Each box shall be labeled with corresponding panelboard I.D. and panelboard circuit number.

3.6 FLOOR BOXES

- a Verify locations of all in-floor electrical connections, all floor boxes, and all poke-thru floor boxes with architect prior to rough-in and installation.

End of Section 26 05 33.01

SECTION 26 05 53**ELECTRICAL IDENTIFICATION****1.0 GENERAL****1.1 SUMMARY**

- a This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to; buried electrical line warnings, identification labeling for raceways, cables, and conductors, operational instruction signs, warning and caution signs, equipment labels and signs.
- b Label all wiring devices, junction, pull boxes, and disconnect switches with corresponding panelboard I.D. and circuit number.

1.2 REFERENCE STANDARDS

- a NFPA 70 - National Electrical Code
- b ANSI - American National Standards Institute
- c OSHA - Occupational Safety and Hazard Association

1.3 APPLICABLE PROVISIONS

- a Section 26 00 00 - Electrical General Provisions

1.4 SUBMITTALS

- a Submit manufacturer's product data for all electrical identification materials.

2.0 PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS**

- a Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Ideal Industries, Inc.
 - 2. LEM Products, Inc.
 - 3. Panduit Corp.
 - 4. Seton Name Plate Co.
 - 5. Standard Signs, Inc.
 - 6. Thomas & Betts Corp.
 - 7. T & B Westline.
 - 8. W.H. Brady, Co.

2.2 ADHESIVE TAPE

- a Colored Adhesive Marking Tape for Wires, and Cables shall be self-adhesive vinyl tape not less than 7 mils thick by 3/4 inch wide. Color shall be as required by the color code table. The tape shall be Scotch #35 or equal.

2.3 UNDERGROUND LINE MARKING TAPE

- a Underground line marking tape shall be WBT 4 mil polyethylene, 3" wide, with lettering as specified. All underground line marking tape shall be foil backed detectable buried utility tape as manufactured by Thomas & Betts or approved equal.

2.4 PLASTIC LAMINATE SIGNS

- a Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8-inch thick for larger sizes.
- b Engraved legend in white letters on black face and punched for mechanical fasteners.

2.5 INTERIOR BAKED ENAMEL WARNING SIGNS

- a Provide printed aluminum signs, punched for fasteners, with colors, legend, and size appropriate to the location.

2.6 EXTERIOR SIGNS

- a Exterior Metal-Backed Butyrate Warning and Caution Signs: Weather-resistant, non-fading, printed cellulose acetate butyrate signs with 20-gage, galvanized steel backing, with colors, legend, and size appropriate to the location. Provide 1/4-inch grommets in corners for mounting.

2.7 CABLE TIES

- a Cable Ties shall be self-locking nylon cable ties, 3/16-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 40 degree F to 225 degree F. T & B Ty-wrap or equal.

3.0 EXECUTION**3.1 INSTALLATION**

- a Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.
- b Where identification is to be applied to surfaces that require a finish, install identification after completion of finish work.

3.2 SWITCHGEAR

- a In general, the following information is to be provided for the types of electrical equipment as listed. Verify the nameplate legend with the A/E.
 - 1. 5 KV and 15 KV Switchgear. For each switch or circuit identify the load served.
 - 2. Switchboards, Motor Controls Centers and Distribution Panelboards. Identify the piece of equipment, and the voltage characteristics, i.e., 480/277V, 3PH, 4W. Identify the load served for each overcurrent protective device.

3. Transformers. Identify the equipment.
4. Panelboards.
 - (a) Identify the panelboard designation and voltage characteristics.
 - (b) Prepare a neatly typed circuit directory behind clear heat-resistant plastic for each panelboard. Identify circuits by equipment served and by room numbers. The room names and numbers shall be verified with the Architect. Indicate spares and spaces with light, erasable pencil marking. Identify the panelboard with an engraved plastic laminate sign.

3.3 MISCELLANEOUS ELECTRICAL EQUIPMENT

- a Identify all power receptacles with panelboard I.D. and circuit number. The information shall be contained on the face plate. The device cover plate shall be labeled with the "Brother P-Touch" or equal. The label material shall be white self adhesive vinyl cloth that is oil, water and humidity resistant. The minimum size of the label material shall .5" wide by .5" high. Provide other sizes of label material as required for the particular applications so that the printing is clearly legible.

3.4 JUNCTION AND PULLBOXES

- a Junction and pull boxes shall be labeled with a labeling machine engraver and include the following:
 1. Panel which the circuits contained in the box originate. (Panelboard I.D. and circuit numbers)
 2. Circuits contained in the box.
 3. Voltage of the circuits contained in the box.

3.5 UNDERGROUND ELECTRICAL LINE IDENTIFICATION

- a Provide a burial utility tape, over all underground electrical installations that are exterior to the building. This shall include all feeders, branch circuits and communications conduits.
 1. Warning tape over electrical installation under 600 volts shall be red with black lettering stating "BURIED ELECTRICAL LINE".
 2. Warning tape over electrical installations over 600 volts shall be red with black lettering stating "BURIED HIGH VOLTAGE LINE".
 3. Warning tape over communications installations shall be orange with black lettering stating "BURIED TELEPHONE LINE".
- b Tape shall be installed one foot to six inches below finished grade.

3.6 CONDUCTOR COLOR CODE

- a Provide color coding for the conductors of each feeder, and branch circuit. The conductor color coding shall be in accordance with the City of Saint Hedwig electrical code ordinance and the NEC. Verify the conductor color code with the City of Saint Hedwig Inspection Department prior to releasing the conductor materials for purchasing.

CONDUCTOR COLOR CODE		
SYSTEM VOLTAGE	208/120 Volt, 3 Phase, 4 Wire	480/277 Volt, 3 Phase, 4 Wire
PHASE A	Black	Purple
PHASE B	Red	Brown
PHASE C	Blue	Yellow
NEUTRAL	White	Gray
GROUND	Green	Green

b Furnish and install conductors with color factory-applied the entire length of the conductors except as follows:

1. Furnish and install conductors with factory applied color the entire length of the conductor, for all conductors that are 10 AWG and smaller.
2. For conductors larger than 10 AWG, apply colored pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 3/4-inch-wide tape in colors as specified. Do not cover cable identification markings by taping. Tape locations may be adjusted slightly to prevent such covering.

3.7 WARNING SIGNS

a Apply warning, caution, and instruction signs and stencils as follows:

1. Install "Danger: High Voltage" signs on entry doors to electrical rooms and on outdoor medium voltage switchgear.
2. Provide instruction signs where required to explain functions of emergency systems, remote lighting controls, etc.

3.8 NAMEPLATES.

a Apply equipment identification labels of engraved plastic- laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2-inch high lettering on 1-inch high label (1-1/2-inch high where two lines are required), white lettering in black field. Text shall match terminology and numbering of the Contract Documents and shop drawings. Verify the exact terminology with the A/E.

Lettering Height

- | | |
|------|---|
| 1/2" | Panelboards, electrical cabinets, and enclosures. |
| 1/2" | Access doors and panels for concealed electrical items. |
| 1/2" | Electrical switchboards. |
| 1/2" | Electrical substations. |
| 1/2" | Motor control centers. |
| 1/4" | Motor starters. |
| 1/2" | Pushbutton motor control stations. |
| 1/2" | Power transfer equipment. |

- 1/4" Contactors.
- 1/5" Switch remote from equipment controlled.
- 1/2" Transformers.
- 1/4" Disconnect switches.
- 1/2" Emergency generating units.
- 1/2" Fire alarm control panels and all transponders.
- 1/2" Security monitoring master station or control panel.
- 1/2" Junction and pull boxes.
- 1/2" UPS systems.
- 1/2" Automatic transfer switches. Install nameplates labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment. Nameplate shall be secured to equipment by means of self tapping machine screws.

End of Section 26 05 53

SECTION 26 08 00**ELECTRICAL TESTING****1.0 GENERAL****1.1 SUMMARY**

- a. This section specifies testing of the electrical systems.
- b. All testing shall be performed by a recognized independent testing laboratory. The testing laboratory shall provide all material, equipment, labor and technical supervision to perform such tests and inspections.
- c. It is the intent of these tests to assure that all electrical equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design specifications and manufacturer's recommendations.
- d. Set overcurrent protective devices adjustable trip settings in accordance with Section 26 00 73.
- e. The following test are included in this section. This does not preclude other system test and testing requirements in other specification sections and testing and demonstration required by the Authorities Having Jurisdiction.
 - 1. Ground resistance test.
 - 2. 600V cable insulation (Megger) test.
 - 3. Panelboard, switchboards, switchgear, switchboard instruments by switchgear manufacturer.
 - 4. Motor controllers and motor control centers.
 - 5. Dry type transformers.
 - 6. System voltage test.
 - 7. Special systems.
 - 8. Miscellaneous systems.
 - 9. Infrared thermal inspections.
 - 10. Contact resistance (ductor) test, during construction and acceptance phase.

1.2 APPLICABLE PROVISIONS

- a. Section 26 00 00 - General Electrical Provisions.

1.3 SUBMITTALS

- a. Submit all testing reports.

1.4 QUALIFICATIONS OF TESTING AGENCY

- a. The testing agency shall meet federal OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907. Membership in the National Electrical Testing Association constitutes proof of meeting such criteria.

1.5 ACCEPTABLE TESTING AGENCIES

- a. E.T.I.
- b. Shermco Industries.
- c. Or approved NETA certified contractor.

1.6 TEST INSTRUMENT CALIBRATION

- a. The testing laboratory shall have a calibration program which maintains all applicable test instrumentation within rated accuracy.
- b. Instruments shall be calibrated in accordance with the following frequency schedule
 - 1. Field instruments - 6 months maximum.
 - 2. Laboratory instruments - 12 month.
 - 3. Leased specialty equipment - 12 months.
 - 4. Dated calibration labels shall be visible on all test equipment.

1.7 SETTINGS OF OVER CURRENT DEVICES

- a. The testing laboratory shall be responsible for implementing all settings and adjustments on protective devices in accordance with values shown in the coordination study.
- b. Enter "address" codes for power monitoring devices or similar instrumentation where shown. Test monitoring instrumentation for accuracy in combination with associated PT's and CT's.

1.8 TEST REPORTS

- a. The test reports shall include the following:
 - 1. Description of equipment tested.
 - 2. Description of test.
 - 3. List of test equipment used in calibration and calibration date.
 - 4. Test results.
 - 5. Conclusions and recommendations.
 - 6. Appendix, including appropriate test forms.
- b. The test report shall be bound and its contents certified.
- c. Submit five copies of the completed report to the Architect no later than fifteen working days after completion of test.

1.9 TEST FAILURE

- a. Any system material or workmanship which is found defective on the basis of acceptance tests shall be reported directly to the Architect and the contractor shall replace the defective material or equipment and have test repeated until test proves satisfactory without additional cost to the Owner.

1.10 NOTIFICATION OF TESTING

- a. Notify the engineer and the Owner two weeks (10) working days before any scheduled testing. The engineer and the Owner observe the testing at their option.

2.0 PRODUCTS - NOT USED**3.0 EXECUTION****3.1 SYSTEM VOLTAGE TESTS**

- a. Measure and record system voltages under maximum load conditions available during construction. Incoming service voltage, as well as transformer secondary voltages shall be checked and adjusted to be equal to the voltage rating, or not exceeding 2-1/2% above the voltage rating. Line-to-line voltages should be adjusted between 460 and 480 volts, or 208 and 213 volts. A record of each final test along with time of day, date, and conditions of loading should be recorded for each test location. Submit test results in the Operation and Maintenance Manuals.
- b. With the system energized, make line-to-line voltage and line current measurements at all three phase motors ½ HP and larger under full load conditions. Should measured values deviate +/- 5% from the nameplate ratings, the condition shall be corrected. Notify the Architect immediately should deviations occur. Submit test results in the Operation and Maintenance Manuals.

3.2 GROUND RESISTANCE TEST

- a. Building ground electrode resistance testing shall be accomplished with a ground resistance direct-reading single test meter utilizing the Fall-of-Potential Method. There cannot have been any rain, or any other methods of watering the soil in the previous 48 hours prior to performing the ground resistance test.
- b. Test results shall be in writing, and shall show temperature, humidity, and condition of the soil at the time of the tests. In the case where the ground resistance exceeds 5 ohms, provide additional grounding electrodes to reduce the resistance to ground to 5 ohms.
- c. Tests shall include measurement of ground resistance at the following equipment and structures:
 - 1. Main Electrical Room Ground Bar.
 - 2. Signal reference grids (ground rod grid and on-slab metallic plane).

3.3 600 VOLT CABLE INSULATION TEST

- a. Measure and record insulation resistance of all feeders using a 1000 volt megger for one minute. Make tests with circuits isolated from source and load.
- b. After the branch circuit conductors have been installed, but before they have been connected to the associated wiring devices, test all conductors for short circuits, open circuits. These tests shall be performed by reading resistance in ohms with a multi-meter. Records of these test are not required.

- c. Test for load division between all conductors in parallel feeders. The difference in current carried between the individual feeders comprising the parallel feeder shall not exceed 10% of feeder current. Records shall indicate amperage, voltage, and feeder identification. Any feeder not in compliance shall be modified to correct the load division to within 10% and shall be retested. Submit test results in the Operation and Maintenance Manuals.

3.4 PANELBOARDS, SWITCHBOARDS AND SWITCHGEAR

- a. Test the torque of all bolted cable to bus connections and all bus to bus connections and paint red dot using Torque seal as manufactured by Organic Products (tel # 214-438-7321) on each bolt to confirm the torque test. Check for A-B-C phase rotation.
- b. Perform a dielectric test all buses.
- c. Perform the following test and observations of all circuit breakers in all electrical panelboards, and switchboards.
 - 1. Circuit breakers to be operated several times to ensure smooth operation.
 - 2. Inspect the circuit breaker molded case for cracks.
 - 3. Rated current to be passed through each phase and millivolt readings to be taken across contacts.
 - 4. Time-current characteristic tests to be performed by passing 300% rated current through each phase and monitoring trip time.
 - 5. Instantaneous pick-up current to be determined by finding the current level at which breaker trips out in less than 2 cycles.
 - 6. Insulation resistance tests to be performed at 1000 volts D.C.
 - 7. Contacts, shunts, etc. to be visually inspected for alignment.
 - 8. Inverse time, instantaneous pick-up and millivolt drop across contacts, including resistance values as well as deficiencies causing breaker to function outside published limits to be recorded. Times are compared with manufacturer's or NEMA published values.
 - 9. Test and calibrate all microprocessor-based metering equipment.
 - 10. Measure contact resistance for all unswitched contacts with a low resistance ohmmeter.
 - 11. Test and confirm proper operation of all safety interlocks and indicator light schemes.
 - 12. Test all grounding and bonding.
- d. Perform infrared thermal inspection of all bussing, bus connection and cable terminations.
- e. Develop test parameters and perform tests for the purpose of evaluating performance of all integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
- f. Verify the correct operation of all interlock safety devices for fail-safe functions in addition to design function.

- g. Verify the correct operation of all sensing devices, alarms, and indicating devices (light schemes).

3.5 MOTOR CONTROLLERS

- a. Measure and record the insulation resistance of all motor windings to ground with a megohm meter before applying line voltage to the motors. If these values are less than 1 megohm, the Contractor furnishing the motor shall be notified and shall correct the deficiency.
- b. Check operation of combination motor starters. Test shall include short circuit and overload protective devices as well as contactor operation and interlock. Primary injection shall be used to test the overload protection.
- c. Torque test feeder terminations and paint red dot using torque seal on each lug to confirm the torque test. Check for A-B-C phase rotation.
- d. Perform infrared thermal inspection of all bussing, bus connection and cable terminations.

3.6 DRY TYPE TRANSFORMERS

- a. Clean all debris from transformer enclosure. Clean coils and termination points.
- b. Verify the secondary voltage and adjust taps as required to bring the secondary voltage to within +/- 1% of nameplate voltage.
- c. Confirm neutral and equipment ground. Measure and record impedance to ground.
- d. Inspect enclosure for damage.
- e. Confirm air clearance around transformer per manufacturer's listed requirement.
- f. Torque test feeder terminations and paint a red dot using torque seal on each lug to confirm the torque test. Check for A-B-C phase rotation.
- g. Test sound level of transformer to confirm it is within the manufacturer's rated level.
- h. Perform infrared thermal inspection of all cable terminations.

3.7 SPECIAL SYSTEMS

- a. Systems such as fire alarm, intercom, nurse call, public address, security and special access systems shall be tested by the system supplier. Following the test, provide an affidavit that the system has been tested by him, and that the system is complete and operational as specified.

3.8 MISCELLANEOUS SYSTEMS

- a. The Contractor shall test all receptacles for power polarity and ground to assure that all receptacles are operating properly, correctly wired and suitably grounded. Provide an affidavit to the effect that this work has been accomplished.
- b. Do not subject Ground Fault Interrupter (GFCI) type breakers or receptacles to megger tests.

3.9 INFRARED THERMAL INSPECTIONS

- a. Perform a thermal inspection of all equipment while under a construction load.

- b. Perform an in depth thermal evaluation of all equipment and/or objects specified six months after move-in date, and a second in depth thermal evaluation one year after move-in date.
- c. The infrared thermographer shall exercise reasonable care in the performance of work to prevent hazard to self or others, and/or prevent unscheduled interruption of utility services.
- d. Quality Control:
 - 1. The infrared thermographer shall have sufficient knowledge of the system, object or process being inspected to understand the observed patterns of radiation. All infrared thermographers shall be a certified Level 2 Thermographer: A Certified Level 2 Thermographer shall have successfully met and passed the experience, training, and testing requirements for a Level 2 Thermographer set forth by the American Society for Nondestructive Testing (ASNT) and pursuant SNT-TC-1A, 1992. Training and certification will be recognized only if administered by one of the following:
 - (a) An accredited third party independent training organization such as The Academy of Infrared Thermography, The Infraspection Institute, John Snell and Associates, etc.
 - (b) An ASNT Certified Level 3 Thermographer as prescribed in SNT-TC-1A, 1992.
- e. The infrared thermographer will use radiometric thermal imaging equipment that incorporates the use of Focal Plane Array (FPA) technology having a temperature sensitivity of 0.15°C , obtain accurate thermal data to $.2^{\circ}\text{C}$, and provide high resolution color thermal images that make the hot spots and affected component easily discernible to maintenance personnel without the need for other real time photographs or images. Thermal imaging equipment will be cooled by a closed loop electronic cooler and not require the use of liquid nitrogen. Thermal imaging equipment will have a minimum spatial resolution of 1.4 mrad. Thermal imaging equipment will have a minimum thermal sensitivity of 2°C . When providing quantitative infrared thermal data, the thermographer will assure that the infrared measuring equipment meets the manufacturer's standard equipment specifications for accuracy by performing a field test of the equipment. All temperature measuring equipment will be calibrated at intervals recommended by the manufacturer and at least every three years.
- f. Submit two complete copies of the results in bound format. Provide digital files of all of the thermal images on a CD. The report shall include the following at a minimum:
 - 1. The printed image of each item inspected. Each image shall be identified by the unit's name as indicated on the Drawings or as marked in the field for existing equipment.
 - 2. Date and time of inspection.
 - 3. Name of person or persons performing the inspection.
 - 4. A brief written statement about each image. If the image indicated that there may be a potential problem, provide recommendations on how to correct the problem.

3.10 DEMONSTRATION TESTING

- a. Demonstration Test of Completed Systems. Demonstrate the features and operation of the following systems:
 - 1. Special systems.

- (a) Security systems.
 - (b) Fire alarm systems.
 - (c) Intercommunication equipment.
 - (d) Paging and public address systems.
 - (e) Clock System.
 - 2. Electrical service entrance equipment:
 - (a) Fuses, fuse holders and switches.
 - (b) Meter sockets and meters.
 - (c) Switching.
 - (d) Operation of circuit breakers.
 - (e) Ground fault protection devices.
 - 3. Electrical system and control and equipment:
 - (a) Power distribution equipment.
 - (b) Motor control devices.
 - (c) Contactors.
 - (d) Switchboards.
 - (e) Panelboards.
 - 4. Lighting systems:
 - (a) Lighting controls.
 - (b) Interior and exterior light fixtures.
 - (c) Emergency lighting systems.
 - (d) Light fixtures, with emergency power pack.
 - 5. Emergency power systems:
 - (a) Emergency generators.
 - (b) Automatic transfer switches.
 - (c) Uninterruptible power supply systems (UPSS).
 - (d) All safety interlocks and indicator light schemes.
- b. Each system shall be demonstrated once only, after completion of satisfactory testing and acceptance.

- c. The demonstration shall be held upon completion and acceptance of all systems at a date to be agreed upon in writing by the Architect.
- d. The demonstration shall be held by the appropriate Contractors in the presence of the Architect or his representative and the manufacturer's representative.
- e. Demonstrate the functions and location of each system, and indicate its relationship to the riser diagrams and drawings.
- f. Demonstrate by "start-stop operation" how to work the controls, how to reset protective devices, how to replace fuses, and what to do in case of emergency.
- g. Check rotation of all equipment and correct if necessary.

End of Section 26 08 00

SECTION 26 24 16**PANELBOARDS****1.0 GENERAL****1.1 WORK INCLUDED**

- a. Distribution panelboards.
- b. Branch circuit panelboards.
- c. All distribution panelboards shall be furnished and installed with oversized wiring gutters on each side of the enclosure.
- d. All panelboard typewritten circuit directories shall be submitted to the Owner for their review and approval. The contractor shall edit typewritten directories as required by the Owner review and shall provide new typewritten directories.
- e. All branch circuit and distribution panelboards shall be provided UL listed microprocessor-based Multi-Point Metering System.

1.2 REFERENCES

- a. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
- b. NAME KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- c. NEMA PB 1 - Panelboards.
- d. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- e. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment.
- f. NEMA AB 3 – Molded Case Breakers and Their Application
- g. ANSI/UL 67 – Electric Panelboards
- h. ANSI/UL 50 – Cabinets and Boxes
- i. ANSI/UL 508 – Industrial Control Equipment

1.3 SUBMITTALS

- a. Provide submittals in accordance with and in additional to Section 26 00 00, Basic Electrical Requirements.
- b. Submit for each panelboard the following data: breaker layout drawings with dimensions indicated and nameplate designation, component list, conduit entry/exit locations, cable, terminal sizes, circuit breaker arrangement and equipment ratings including, but not limited to, voltage, main bus ampacity, integrated short circuit ampere rating, and temperature rating of circuit breaker terminations.
- c. Submit manufacturers product data sheets.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- a. Deliver distribution panelboards in factory-fabricated water-resistant wrapping.
- b. Handle panelboards carefully to avoid damage to material component, enclosure and finish.
- c. Store in a clean, dry space and protected from the weather.

1.5 QUALIFICATIONS

- a. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- b. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- c. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.6 REGULATORY REQUIREMENTS

- a. Panelboard overcurrent protective devices shall be selectively coordinated with all supply side overcurrent protective devices as required for this project by the National Electrical Code/NFPA 70 Articles 645.27, 700.27, 701.27 and 708.54.
- b. The panelboards shall be UL labeled.

2.0 PRODUCTS**3.0 ACCEPTABLE MANUFACTURERS**

- a. Eaton.
- b. Square D Company.
- c. Siemens.

2.2 PANELBOARD CONSTRUCTION

- a. General: Provide flush or surface mounted, or surface mounted deadfront circuit breaker type distribution or branch circuit panelboards with electrical ratings and configurations, as indicated on the drawings and schedules. Load center type of panelboards are not acceptable. All panelboards shall be 225 amp mains minimum.
- b. Enclosure:
 - 1. Interiors shall be completely factory assembled. They shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors. Enclosure shall be 20" wide made from galvanized steel. Enclosures shall be provided with blank ends.
 - 2. Trims for branch circuit panelboards shall be supplied with a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall have a semi flush cylinder lock and catch assembly. Door-in-door trim shall be provided. Both hinged trim and trim door shall utilize three point latching. No tools shall be required to install or remove trim. Trim shall be equipped with a

door-actuated trim locking tab. Equip locking tab with provision for a screw such that removal of trim requires a tool, at the owner's option. Installation shall be tamper resistant with no exposed hardware on the panelboard trim.

3. Distribution panelboard trims shall cover all live parts. Switching device handles shall be accessible.
4. Surface trims shall be same height and width as box. Flush trims shall overlap the box by 3/4 of an inch on all sides.
5. A directory card with a clear plastic cover shall be supplied and mounted on the inside of each door.
6. All locks shall be keyed alike.
7. Construct cabinet in accordance with UL 50. Use not less than 16-gauge galvanized sheet steel, with all cut edge galvanized. Provide a minimum 4-inch gutter wiring space on each side. Provide large gutter where required to accommodate the size and quantity of conductors to be terminated in the panel, and where required by code.
8. Exterior and interior steel surfaces shall be cleaned and finished with gray enamel over rust inhibiting phosphatized coating. Color shall be ANSI 61 gray.
9. Rating: Minimum integrated short-circuit rating, voltage and current rating as shown on drawings.
10. Labeling: The Contractor shall furnish and install engraved, laminated plastic nameplates on the trim per Section 26 05 53, Electrical Identification.

c. Bus:

1. Main bus bars shall be tin-plated copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.
2. A system ground bus shall be included in all panels.
3. Full-size (100%-rated) insulated stand-off neutral bars shall be included for panelboards. Bus bar taps for panels with single-pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection. 200%-rated neutrals shall be supplied for panels served by "K" rated dry type transformers and all feeders shown on drawings with oversized neutral conductors.
4. Neutral and ground buses for branch circuit panelboards with 84 positions shall be provided with neutral and ground buses to terminate 84 neutral and 84 ground conductors.
5. Where isolated ground buses are specified or indicated, provide copper grounding bus bars mounted in the panelboard on insulated standoffs to ensure isolation from equipment ground potential. Isolated ground buses shall be drilled and tapped as appropriate for connection of the individual isolated grounding conductors.
6. All lugs for phase, neutral, and ground buses shall be tin-plated copper.

7. Panelboard shall be rated SE where required for service Entrance duty.

2.3 DISTRIBUTION PANELBOARDS – CIRCUIT BREAKER TYPE

- a. Distribution panelboards equipped with bolt-on devices shall have interrupting ratings as indicated on the drawings. Panelboards shall be fully rated. Panelboards shall be Eaton type Pow-R-Line 3a or Pow-R-Line 4B. Panelboards shall have molded case circuit breakers.
- b. Provide main circuit breakers UL listed for application at 100% of their continuous ampere rating in their intended enclosure.
- c. Main breakers, if furnished, shall be equipped with microprocessor based trip units that have integral Arc Flash Reduction trip feature. The use of zone selective interlocking to emulate this function does not meet the intent of this specification and will not be allowed.
- d. Distribution circuit breakers shall be fixed mounted type and equipped with either microprocessor based trip units.
- e. Provide shunt trips, bell alarms, and auxiliary switches as shown on the contract drawings.

2.4 SWITCHING AND OVERCURRENT PROTECTIVE DEVICES

- a. Provide molded case circuit breakers with manufacturer's standard construction, bolt on type, heavy duty, quick-make, quick-break, single and multi pole with integral inverse time delay thermal and instantaneous magnetic trip in each pole. Circuit breakers shall be constructed using glass reinforced polyester insulating material providing superior dielectric strength.
- b. Circuit breakers shall have an over center, trip-free, toggle operating mechanism that will provide a quick-make, quick-break contact action.
- c. Provide handle padlock attachments on circuit breakers. Device shall be capable of accepting a single padlock. All circuit breakers shall be capable of being individually padlocked in the off position.
- d. The circuit breakers shall be connected to the bus by means of solidly bolted connection. In multi-pole breakers, the phase connections on the bussing shall be made simultaneously without additional connectors or jumpers. Multi-pole breakers shall be two or three pole as specified. Handle ties are permitted when multiple single pole breakers are used to serve a multi-wired modular furniture system. The circuit breaker shall have common tripping for all poles.
- e. All circuit breakers shall be provided with visible ON and OFF indications.
- f. Provide GFI circuit breakers as indicated on drawing or per NEC requirement.
- g. Breaker voltage and trip rating shall be per drawings. Breaker faceplate shall indicate UL certificate standards with applicable voltage systems and corresponding short current rating as per drawings.
- h. Molded Case Circuit Breakers:
 - 1. All circuit breakers shall be thermal magnetic type with common handle for all multiple pole circuit breakers. Circuit breakers shall be minimum 100-ampere frame. Ratings through 100-ampere trip shall take up the same pole spacing. Circuit breakers shall be UL listed as type SWD for lighting circuits.
 - 2. Circuit breaker handle locks (ON position) shall be provided for all circuits that supply exit signs, emergency lights, energy management, and control system (EMCS) panels and fire alarm panels.

3. All circuit breakers 225 amp frame and above 225 amp frame shall be provided with microprocessor based trip units with "LSI" functions.
4. All circuit breakers 1000 amp frame and 1200 amp frame shall be provided with microprocessor based trip units with "LSIG" functions. Additionally circuit breakers with 1200 amp frame shall be provided with Arch Reduction Maintenance Systems ("ARMS").

2.5 PANELBOARD SUBMETERING

- a. All branch circuit and distribution panelboards shall be provided with a UL listed microprocessor-based Multi-Point Metering System (MPM), Eaton type PX Multipoint Meter or approved equal having the specified features.
- b. MPM shall have 60 channels for current sensor input. Meter shall auto-detect sensor rating and have standard tamper detection.
- c. MPM shall calculate power and energy consumption in accordance with ANSI C12.20 (0.5%) metering specification and store metered data in nonvolatile memory.
- d. MPM shall store the following per phase and system total for each metering point
 1. Voltage, Current, and Frequency (system total only)
 2. Watts, VAR, VA, and power factor
 3. Watt hours including forward and reverse
- e. MPM shall store energy profile information for each metering point in non-volatile memory. The demand profile time period shall be adjustable from 1, 5, 15, 30 and 60 minutes for fixed method and 1, 5, and 15 minutes for sliding method. The MPM shall have the ability to sync with external input to the on board demand input. The MPM shall be able to save a minimum of 1 year of load profile data for all 60 meter points on a 15 minutes basis.
- f. MPM shall be provided with multiple communications ports and protocols, including the following capability:
 1. RS-485 remote display port
 2. RS-485 Modbus RTU
 3. USB Local Configuration Port
 4. HTML web pages
 5. File transfer protocol (ftp)
 6. RJ-45 10/100Base-T Ethernet network port
 7. Modbus TCP
 8. BACnet/IP
 9. SMTP(Simple Mail Transfer Protocol) for email support
 10. SNMP(Simple Network Management Protocol) MIB support

11. Ethernet TCP/IP
12. NTP(Network Time Protocol) support

2.6 SURGE PROTECTIVE DEVICES

- a. All emergency systems branch circuits and distribution panelboards shall be provided with surge suppression devices (SPSD).
- b. SPD shall comply with ANSI/UL 1449 4th Edition or later listing by Underwriters Laboratories (UL).
- c. SPD shall be factory installed integral to the panelboard by the original equipment manufacturer, and shall be a product of the same manufacturer as the panelboard and breakers.
- d. The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable single-mode modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
- e. Electrical Requirements:
 1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
 2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
 3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards. End of life mode to be open circuit. Unit with end of life short-circuit mode are not acceptable.
 4. Unit shall operate without the need for an external overcurrent protection device (OCPD), and be listed by UL as such. Unit must not require external OCPD or replaceable internal OCPD for the UL Listing.
 5. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	●	●	●	●
Delta	N/A	●	●	N/A
Single Split Phase	●	●	●	●
High Leg Delta	●	●	●	●

6. Nominal Discharge Current (In) – All SPDs applied to the distribution system shall have a 20kA In rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an In less than 20kA shall be rejected.
7. ANSI/UL 1449 4th Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 4th Edition VPR for the device shall not exceed the following:

Modes	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	700	1200	1500
L-L	1200	2000	3000

3.0 EXECUTION

3.1 INSTALLATION

- a. Install panelboards in accordance with manufacturer's written instructions and the applicable requirements of the NEC, NEMA, ANSI and the National Electrical Contractors Association's "Standard of Installation".
- b. Anchor enclosed firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secured. Direct attachment to dry wall is not permitted. Freestanding panelboards shall be installed on a concrete housekeeping pad with anchors per manufacturer's recommendation.
- c. Mounting height:
 1. Distribution Panelboards: The highest operating handle is no greater than 79 inches above finished floor.
 2. Branch Circuit Panelboards: The highest operating handle is no greater than 79 inches above finished floor.
 3. Where panelboards occur in groups, the tops shall be aligned if it can be done without exceeding items 1 and 2 above.
- d. Install panelboards plumb. Adjust trim to cover all openings. Seal all conduit openings and cap all used knockout holes.
- e. Provide blank plates for unused open spaces in panelboards. Keep the front door closed after work to protect from damage, dirt, and debris at all times.
- f. Install identification nameplates in accordance with Section 26 05 53, Electrical Identification.
- g. Provide a minimum of two (2) 1-1/2" spare empty conduits from each branch circuit panelboard to above nearest accessible ceiling. Label pull wires "Spare Conduits".

3.2 FIELD QUALITY CONTROL

- a. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers and lugs.
- b. Provide testing in accordance with Section 26 08 00 – Electrical Testing.

3.3 PANELBOARD SCHEDULE

- a. The Contractor shall provide engraved, laminated plastic nameplates for circuit identification as indicated on the Drawings for distribution panelboards. All panelboard schedules shall be computer generated.
- b. The Contractor shall fill the index directory inside the front door of branch circuit panelboards identifying each circuit as shown on Panel Schedule drawings. Where changes are made, the schedule shall reflect the changes. At the end of the job, these schedules shall reflect as-built record conditions.
- c. Provide electronic copies of all panelboard schedules as part of the close-out documents.
- d. All panelboard schedules shall include the following information.
 1. Panelboard ID No.
 2. Room number where panelboard is located. Coordinate room number designations with final approved room number schedule.
 3. Serve from: Transformer or distribution panel ID number serving panelboard.
 4. Date published.
 5. Circuit number: each circuit number identified.
 6. Description: room number(s) which the circuit feeds and equipment name, i.e., printer, VAV box, security camera, if applicable, or device type, i.e., receptacle, IG recept., floor box and furniture, SPD's, or spare if the circuit is not used.

End of Section 26 24 16

SECTION 26 27 26**WIRING DEVICES****1.0 GENERAL****a. SUMMARY**

1. This section specifies the furnishing and installation of wiring devices, and device cover plates.
2. Install the occupancy sensors, power packs and control wiring in accordance with the recommendations of the manufacturer.
3. All wiring devices and wiring device cover plates shall be decorator style type.

b. REFERENCE STANDARDS

1. ANSI/UL 20 - General-Use Snap Switches.
2. ANSI/UL498 - Electrical Attachment Plugs and Receptacles.
3. UL 943 - Ground Fault Circuit Interrupters.
4. NEMA WD 1 - General-Purpose Wiring Devices.

c. APPLICABLE PROVISIONS

1. Refer to Section 26 00 00 - Electrical General Provisions.

d. SUBMITTALS

1. Submit manufacturer's product data on wiring devices.

e. DELIVERY STORAGE AND HANDLING

1. Deliver wiring devices properly packaged in accordance with Section 26 00 00.

2.0 PRODUCTS**a. ACCEPTABLE MANUFACTURERS**

1. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:

- (1) Wiring Devices

- (a) Arrow Hart, Division Crouse-Hinds.
- (b) Hubbell Inc., Wiring Device Division
- (c) Pass & Seymour/Legrand

- (2) Dimmers

(a) Lutron Electronic Co., Inc.

(b) Wattstopper

b. SWITCHES

1. Provide Decorator type, square face AC Rocker switch. Hubbell DS120 or approved equal, 120-277 volt, 20 amperes, commercial specification grade. Switches shall be single pole, double pole, three way, four way, as scheduled on the drawings and shall be the self grounding type.

c. DIMMER SWITCHES

1. Provide decorator style solid-state AC dimmer controls for incandescent fixtures; wattage as required to control the load indicated, 120-volts, 60 Hz, with continuously adjustable slide dimmer and preset on/off switch. Provide with electromagnetic filters to eliminate noise, RF and TV interference.

d. LOW VOLTAGE DIMMER

1. Provide Wattstopper RH4FBL3 series dimmers or equal. The low voltage dimmers shall provide dimming intensity level and on/off control of low voltage incandescent, incandescent light fixtures using magnetic step-down transformers and low voltage lamps, and neon and cold cathode lamps using magnetic step-down transformers. The control shall be a vertical linear slide, full to minimum range. The switch shall be a mechanical air-gap switch, initiated at bottom of slider travel on single pole dimmers, push/push type mechanism on three-way and preset dimmers.
2. The dimmers operate on 120V two-wire circuits only. Neutrals from multiple dimmers may not be shared in 120/208V applications. The dimmer response shall follow the square law dimming curve. Voltage compensation shall be by means of a firing angle adjustment. The dimmer shall include an output filter network to minimize interference.
3. The dimmer shall mount in a standard single-gang device box. Follow the manufacturers recommendations for derating if multiple dimmers are ganged together. Wire connections shall be made by means of pigtails on the dimmer

e. DUPLEX RECEPTACLES

1. Provide Decorator type, square face, commercial grade receptacles, 2- pole, 3-wire, grounding, 20-amperes, 125-volts. The NEMA configuration shall be 5-20R unless otherwise indicated. Receptacles shall be Hubbell DR20 or approved equal.
2. USB Charging Convenience Receptacles, provide Hubbell USB20AC5 or approved equal. Provide with (1) USB Type-A and (1) USB Type-C ports. Charging device shall comply with UL 1310 and compatible with USB 1.1/2.0/3.0 devices, including Apple products.
3. Plugload Controlled Convenience Receptacles, provide Hubbell DR20C series, 20A, 125V, with permanent power symbol and "Controlled" embossed on face. Provide with either both faces on one duplex Controlled or One Controlled Face/One non-controlled/ Split Circuit Type. Refer and install per plans.

f. GROUND FAULT CIRCUIT INTERRUPTERS

1. Provide feed through type self test ground-fault circuit interrupters, with heavy-duty duplex receptacles with ground fault indicator light, capable of protecting connected downstream

receptacles on single circuit, and of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20-amperes, 120-volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 milliamperes ground-fault trip level; with NEMA configuration 5-20R Hubbell GFRST20. Include indicator light that shows when GFCI has malfunctioned and no longer provides GFCI protection.

2. Provide feed through type self test ground-fault circuit interrupters, with heavy-duty duplex receptacles with ground fault indicator light, capable of protecting connected downstream receptacles on single circuit, and of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20-amperes, 120-volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 milliamperes ground-fault trip level; with NEMA configuration 5-20R. The receptacles shall be Hubbell GFR8200 commercial specification grade or equal.
3. The device shall trip if the line or load connections are miswired.

g. ARC FAULT CONVENIENCE RECEPTACLES

1. Arc Fault Convenience Receptacles, 125 V, 15A and 20A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - (1) Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems; AFR25TRW, AFR20TRW, or a comparable product by one of the following:
 - (a) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
 - (b) Leviton Manufacturing Co., Inc.
 - (c) Pass & Seymour/Legrand (Pass & Seymour).

h. TAMPER-RESISTANT CONVENIENCE RECEPTACLES

1. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
 - (1) Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Wiring Device - Kellems; DR20TR or a comparable product by one of the following:
 - (a) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; TRBR20.
 - (b) Leviton Manufacturing Co., Inc.; TBR20.
 - (c) Pass & Seymour/Legrand (Pass & Seymour); TR63.
 - (2) Description: Labeled shall comply with NFPA 70, "Health Care Facilities" Article, Tamper-Resistant Convenience Receptacles, 125 V, 20 A. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

i. WEATHER RESISTANT AND TAMPER RESISTANT CONVENIENCE RECEPTACLES

1. Weather Resistant and Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

- (1) Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Wiring Device - Kellems; DR20WRTR or a comparable product by one of the following:
 - (a) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; TWR20.
 - (b) Leviton Manufacturing Co., Inc.; TWR20.
 - (c) Pass & Seymour/Legrand (Pass & Seymour); NO EQUAL.
- (2) Description: Labeled shall comply with NFPA 70, "Health Care Facilities" Article, Tamper-Resistant Convenience Receptacles, 125 V, 20 A. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

j. TAMPER RESISTANT CONVENIENCE RECEPTACLES

1. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:
 - (1) Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems; GFRST20 or a comparable product by one of the following:
 - (a) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; TRVGF20.
 - (b) Leviton Manufacturing Co., Inc.; T7899.
 - (c) Pass & Seymour/Legrand (Pass & Seymour); 2095TR.

k. FAN SPEED CONTROLS

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbell Incorporated; Wiring Device-Kellems; RDVFSQF or a comparable product by one of the following:
 - (1) Leviton Manufacturing Co., Inc.
 - (2) Pass & Seymour/Legrand (Pass & Seymour).
2. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters.
3. Comply with UL 1917.

l. DEVICE COVER PLATES

1. Device cover plates in finished spaces shall be impact resistant nylon thermoplastic. Device plate shall be provided with positive bow to assure that all four edges of the plate are flush against the wall. All cover plates shall be provided with captive screws.
2. Device cover plates in weatherproof locations shall meet UL 514 for continuous use in a wet location. The cover plates shall be Hubbell Extra Duty #RW 58350 or Taymac #20510, deep cover, vertical mount.
3. Emergency Powered Devices and cover plates shall be red. The emergency panel and circuit shall be indicated by means of a nameplate on the front of each cover plate.

m. **DEVICE COLOR**

1. The wiring devices and cover plates shall be white unless otherwise directed by the project architect. Coordinate all wiring devices and wiring device finish colors with Architect prior to their procurement.
2. Switch wiring devices and their cover plates shall be gray in color and shall be marked per N.E.C. Article 406.3(E).

3.0 EXECUTION

a. **GENERAL**

1. Where items of equipment are provided under other sections of this specification or by the Owner, provide a compatible receptacle for the cap or plug and cord of the equipment.
2. Multiple gang cover plates shall be used for all multiple device locations.
3. Where cover plates do not completely conceal the rough openings for the devices, it shall be the responsibility of the Contractor to paint, patch, etc. around the opening to the satisfaction of the Architect/Engineer.
4. Tighten connectors and terminals securely, including screws and bolts.
5. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.
6. Install cover plates after painting work is completed, tight to surfaces over which they are installed.

b. **WALL SWITCHES**

1. Install switch on the strike side of the door as finally hung.
2. Install wall switches in a uniform position so the same direction of operation will open and close the circuits throughout the job, generally up or to the left for the ON position.
3. Where more than one device occurs in an outlet box, resulting in a 300 volt or higher potential between them, provide a barrier between the devices.

c. **DIMMERS**

1. Provide all equipment, labor and other services for proper installation of the dimmers.
2. Provide a separate neutral wire to prevent dimmer interaction and neutral harmonic current rise.
3. Provide multi-gang coverplates for installations of dimmers and switches ganged as specified. The coverplate shall attach without exposed fasteners. The Contractor shall be responsible for derating the dimmer if side sections are removed. All derating shall be done in accordance with the manufacturer's recommendations.

d. **RECEPTACLES**

1. Mount receptacles vertically centered at the height specified.

e. DEVICE COVERPLATES

1. Provide device cover plates for each device of the type required for service and device involved.
2. Label plates in accordance with Section 26 05 53 - Electrical Identification.

End of Section 26 27 26

SECTION 26 27 26.15**MULTI-SERVICE METAL CONCRETE FLOOR BOXES****1.0 GENERAL****1.1 CONDITIONS AND REQUIREMENTS**

- a. The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.
- b. Basis-of-Design Product: The design for recessed activation Multi-Service Metal Concrete Floor Boxes is based on SystemOne ETERNAL™ Series Recessed Activation Series Floor Boxes manufactured by Hubbell Wiring Systems Or approved equal.

1.2 SECTION INCLUDES

- a. Multi-Service Metal Concrete Floor Boxes

1.3 RELATED SECTIONS

- a. Section 07 84 00 - Firestopping.
- b. Division 26 - Electrical: Electrical systems and components.

1.4 SUBMITTALS

- a. Submit under provisions of Section 26 00 00, Paragraph 1.12, and Division 01.
- b. Product Data: Submit for All components including power and technology wiring devices.
- c. Shop Drawings: For the following electrical system components. Include plans, elevations, sections, details, and attachments to other work.
 - (1) Multi-Service Metal Concrete Floor Boxes
- d. Samples: Submit one (1) sample with required color and finish for each type Multi-Service Metal Concrete Floor Box.

1.1 QUALITY ASSURANCE

- a. Manufacturers: Firms regularly engaged in manufacture of Multi-Service Metal Concrete Floor Boxes and fittings of the types and sizes required, whose products have been in satisfactory use in similar service for not less than 10 years. Provide poke-thru devices produced by a manufacturer listed in this section.
- b. Source Limitations: Obtain each type of Multi-Service Metal Concrete Floor Box through one (1) source from a single manufacturer.
- c. Multi-Service Metal Concrete Floor Boxes and Components: Comply with requirements of applicable local codes, NEC, UL, and NEMA Standards pertaining to poke-thru devices and components. Listed and labeled in accordance with NFPA 70, Article 100.
- d. Accessibility Compliance: Design device flange to meet ADA Accessibility Guidelines as to changes in floor and ground surface levels. Flanges shall be beveled so the slope is no greater than 1:2.

1.2 DELIVERY, STORAGE AND HANDLING

- a. Multi-Service Metal Concrete Floor Boxes and components in factory labeled packages.
- b. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
- c. Protect from damage due to weather, excessive temperature, and construction operations.

2.0 PRODUCTS

2.1 MANUFACTURERS

- a. Basis-of-Design Product: The design for recessed activation Multi-Service Metal Concrete Floor Boxes is based on SystemOne ETERNAL™ Series Recessed Activation Series Floor Boxes manufactured by Hubbell Wiring Systems Or approved equal.
- b. Substitutions will be considered under provisions of Section 26 00 00, and Division 01.

2.2 RECESSED OUTLET FLOOR BOXES

- a. Recessed Outlet Floor Boxes Slab at Grade: SystemOne ETERNAL™ Recessed Activation Series having 3.75 inch deep wiring chamber per gang. With green epoxy coating, U.L. Listed for slab-on-grade installations. Capable of supplying Power, Data, Voice and AV services, manufactured by Hubbell Wiring Systems or approved equal.
 - b. Two gang: #CFB2G30CRE or CFB2G30RCRE (provisions for round cover), capable of up to 2" entry per gang. Flush flange, Surface flange and Furniture Feed cover availability. Covers with provisions for cable egress, when in use, shall not exceed/extend past 0.15" rise.
 - c. Four Gang: #CFB4G30CRE or CFB4G30RCRE (provisions for round cover), capable of up to 2" entry per gang. Flush flange, Surface flange and Furniture Feed cover availability. Covers with provisions for cable egress, when in use, shall not exceed/extend past the 0.15" rise.
 - d. Six Gang: #CFB6G30CRE or CFB6G30RCRE (provisions for round cover), capable of up to 2" entry per gang. Flush flange, Surface flange availability. Covers with provisions for cable egress, when in use, shall not exceed/extend past 0.15" rise.
- (1) Cover Style: Standard carpet, Standard tile, Standard finished concrete, Furniture feed carpet, Furniture feed tile, or Furniture feed finished concrete. Coordinate cover style requirements with Architect prior to procurement.
 - (2) Cover Finishes:
 - (a) Rectangular Covers: Aluminum painted, Brass painted, Black painted, Nickel painted, or Bronze painted. Coordinate cover finishes requirements with Architect prior to procurement.
 - (b) Round Covers: Brass plated, Aluminum plated, Satin Nickel plated, Bronze plated, Black painted, or Gray painted. Coordinate cover style requirements with Architect prior to procurement.
 - (3) Listing and Labeling: Shall comply with UL 514C. Metal Floor Boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- (4) Communication Modules Mounting Accessories: Provide activation unit with three locations to mount communication connectors. Mount connectors using a mounting bracket capable of accepting up to 12 Ortonics® TracJack™ Category 6 insert modules or TechChoice™ Category 6 discrete keystone connectors. Also provide unit with two (2) Category 6 discrete keystone connectors and two (2) industry standard keystones and accommodate a mechanism to permit protection of communication cabling. Coordinate communications and technology devices with Division 27 prior to procurement.

3.0 EXECUTION

3.1 EXAMINATION

- a. Examine conditions under which Multi-Service Metal Concrete Floor Boxes, accessories, and fittings are to be installed. Notify the Architect/Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- a. Strictly comply with manufacturer's installation instructions and recommendations and approved shop drawings. Coordinate installation with adjacent work to ensure proper clearances and to prevent electrical hazards.
 - (1) Mechanical Security: Raceway systems shall be mechanically continuous and connected to all electrical outlets, boxes, device mounting brackets, and cabinets, in accordance with manufacturer's installation sheets.
 - (2) Electrical Security: Metal raceway shall be electrically continuous and bonded in accordance with the National Electric Code for proper grounding.
 - (3) Raceway Support: Raceway shall be supported at intervals not exceeding 5 feet or in accordance with manufacturer's installation sheets.
 - (4) Accessories: Provide accessories as required for a complete installation, including insulated bushings and inserts where required by manufacturer.
 - (5) Unused Openings: Close unused raceway openings using manufacturer's recommended accessories.
 - (6) All Multi-Service Metal Concrete Floor Boxes locations shall be coordinated with architect prior to rough-in. Locations of furniture feed covers shall be coordinated with architect and modular furniture approved shop drawings prior to rough-in.
 - (7) All receptacles shall be labeled with corresponding electrical panelboard I.D., and corresponding circuit number.
- b. Install unit to permit all wiring to be completed at floor level.

3.3 CLEANING AND PROTECTION

- a. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer.

- b. Protect Multi-Service Metal Concrete Floor Boxes until acceptance.

End Of Section 26 27 26.15

SECTION 26 28 13**OVERCURRENT PROTECTIVE DEVICES****1.0 GENERAL****a. SUMMARY**

1. This section specifies the furnishing and installation of low voltage fuses rated 600 volts and below, 6000 amperes and below and automatic circuit breakers.
2. Refer to Section 26 00 73. Fault and Coordination Study and Arc Flash Hazard Analysis.

b. REFERENCE STANDARDS

1. ANSI/ANSI C97.1 - Standard for Low Voltage Cartridge Fuses 600 Volts and Less.
2. ANSI/UL 198.2 - High-Interrupting-Capacity Current-Limiting Fuses.
3. NEMA FU 1 - Low Voltage Cartridge Fuses.
4. NEMA AB 1 - Molded Case Circuit Breakers.
5. NEMA AB 2 - Procedures for Verifying the Performance of Molded Case Circuit Breakers.
6. UL 198.3 - High-Interrupting-Capacity Class K Fuses.
7. UL 198.4 - Class R Fuses.

c. APPLICABLE PROVISIONS

1. Refer to Section 26 00 00 - Electrical General Provisions.

d. SUBMITTALS

1. Submit shop drawings and product data for fuses and circuit breakers.
2. Include time current curves, dimensions, voltage, short circuit ampere interrupting rating, continuous current rating and number of poles.

e. OPERATION AND MAINTENANCE DATA

1. Provide operation and maintenance data in accordance with Section 26 00 00.

2.0 PRODUCTS**a. ACCEPTABLE MANUFACTURERS**

1. Subject to compliance with the requirements, acceptable manufacturers shall be as follows:
 - (1) Fuses.
 - (a) Bussman - Cooper Industries.
 - (b) Ferraz Shawmut.

(2) Circuit Breakers.

- (a) Easton.
- (b) Square D.
- (c) Siemens.

b. FUSES

1. Provide fuses with a voltage rating suitable for the normal voltage of the system in which they are to be applied.
2. Class RK1 Time-Delay Fuses: Fuses rated from 1/10 to 600 amperes shall be UL Class RK1, dual element time-delay type. The fuses shall have separate overload and short circuit elements. The fuses shall have a spring assisted thermal element with a melting point of 284 °F. The two elements shall be physically separated in different chambers. The fuse shall be capable of maintaining an overload of 500% of its rated current for a minimum of 10 seconds. The fuses shall have a U.L. listed interrupting rating of 200,000 amperes rms/sym.
3. Class RK5 Time-Delay Fuses: Fuses rated from 1/10 to 600 amperes shall be UL class RK5, dual element time-delay type. The fuses shall have separate overload and short circuit elements. The fuses shall have a spring assisted thermal element with a melting point of 284 °F. The two elements shall be physically separated in different chambers. The fuse shall be capable of maintaining an overload of 500% of its rated current for a minimum of 10 seconds. The fuses shall have a U.L. listed interrupting rating of 200,000 amperes rms/sym.
4. Class L Time-Delay Fuses: Fuses rated from 601 to 6000 amperes shall be UL Class L, time-delay type. The fuses shall have "O" ring seals between the end bells and the glass melamine fuse barrel. The fuse links shall be 99.9% pure fine silver. All terminals shall be silver plated. The fuses shall be capable of maintaining an overload of 500% of its rated current for a minimum of 4 seconds. The fuses shall have a UL listed interrupting rating of 200,000 amperes rms symmetrical.

c. MOLDED CASE CIRCUIT BREAKERS

1. Provide molded-case thermal magnetic circuit breakers. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole. Two and three pole breakers shall be common trip. Construct with over center, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40 degrees C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated for 65° or 75°C wire for breaker sizes less than 100 amperes and 75°C for breaker sizes 100 amperes and greater. The circuit breakers shall have a minimum 10,000 AIC at 120/208 volts and 14,000 AIC at 277/480 volt. Provide breakers with an AIC rating equal to or greater than the minimum rating noted on the panelboard schedules.

d. ARC FAULT CIRCUIT INTERRUPTING CIRCUIT BREAKERS

1. Provide arc fault circuit interrupting circuit breakers (AFCI) for all receptacles where required by N.E.C. The AFCI device shall clear a 5 ampere arc in no more than one second and clear a 30 ampere arc in no more than 0.11 seconds.
2. The device requires that the branch circuit neutral conductor not be shared for proper operation of the device. Provide a separate neutral conductor for each branch circuit serving the receptacles in the bedroom/sleeping areas of the facility.

e. GROUND FAULT CIRCUIT BREAKERS FOR HEAT MAINTENANCE CABLE SYSTEMS, AND HEAT TRACE SYSTEMS

1. Provide ground fault type circuit breakers serving heat maintenance cable system and heat trace systems. The ground fault circuit protector shall have a sensitivity of 30 mA (thirty milliamps). The circuit breakers shall be Cutler-Hammer Quicklag type: QBGFEP or approved equal.

3.0 EXECUTION

a. INSTALLATION

1. Install overcurrent protective devices for all wiring and equipment as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.

b. FUSES

1. Check all fuse clip fasteners for alignment and tightness in accordance with the manufacturers recommendations.
2. Install fuses so label is in an upright, readable position.
3. Fuses for HVAC equipment shall be provided in accordance with equipment manufacturer's recommendations.
4. All fused disconnects shall have a label placed on the inside of the door that indicates fuse size and type. The manufacturers standard label shall suffice.
5. 1/10 to 600 ampere fuses for individual motor circuits shall be Class RK5/RK1 sized at 1.25 times the full load amperes of the motor for 1.15 service factor motors and 1.15 times the full load amperes for 1.0 service factor motors.
6. 601 to 6000 ampere Class L fuses for individual motor circuits shall be sized at 1.5 times the motor full load amperes.

c. CIRCUIT BREAKERS

1. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cabling.
2. Set field-adjustable circuit breakers for trip settings as recommended by the short circuit and coordination study.
3. Inspect circuit-breakers operating mechanisms for malfunctioning and, where necessary, adjust or replace units for free mechanical movement.
4. The elevator circuit breakers shall be installed in accordance with NEC and ANSI 17.1. Provide all conduit and wiring to interlock the shunt trip coil of the circuit breaker with fire alarm system and elevator controller as required by ANSI 17.1.

d. SPARE FUSES

1. As spares, provide the greater amount of either three fuses or 10 percent of each size and type installed. Deliver the spare fuses to the Owner at the time of final acceptance of the project. Neatly encase the spare fuses in suitable containers or cabinets.
2. Provide spare fuse cabinet, labeled "SPARE FUSE CABINET", and sized to accommodate the required spare fuses. Mount cabinet adjacent to main switchboard, unless otherwise noted. Attach list of all fuses provided on the project to inside cabinet door.

End of Section 26 28 13

SECTION 26 28 16
ENCLOSED SWITCHES

1.0 GENERAL

1.1 SUMMARY

- a This Section specifies the furnishing and installation of enclosed switches.
- b Provide enclosed switches as the disconnecting means for equipment.

1.2 REFERENCE STANDARDS

- a NFPA 70 - National Electrical Code.
- b UL 98 - Safety Standard for Enclosed Switches.
- c NEMA KS 1 - Enclosed Switches.
- d NFPA 70E - Electrical Safety in the Workplace.

1.3 APPLICABLE PROVISIONS

- a Section 26 00 00 - Electrical General Provisions.

1.4 SUBMITTALS

- a Product Data: Submit manufacturer's product data on enclosed switches. Submittals shall include the following:
 - 1. Voltage, Phase, Horsepower/Ampere Rating
 - 2. NEMA Enclosure Type
 - 3. Dimensions

3.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- a Subject to compliance with the requirements, acceptable manufacturers shall be as follows.
 - 1. Eaton
 - 2. Square D.
 - 3. Siemens.

2.2 CHARACTERISTICS

- a Provide switches with voltage rating of 240 volts or 600 volts a-c, as required to match the distribution system voltage.
- b Provide heavy duty switches conforming to NEMA KS 1 standard for Type HD switches.

- c Provide switches with quick-make, quick-break contacts.
- d Unless otherwise indicated, provide 3-pole, visible blade switches.

2.3 CONSTRUCTION

- a Switches shall be furnished in NEMA 1 general purpose enclosures in interior dry locations and NEMA 3R enclosures in exterior locations and indoor areas subject to moisture. Covers on NEMA 1 enclosures shall be attached with pin type hinges. NEMA 3R covers shall be securable in the open position. Enclosures shall be manufactured from galvanized steel. Enclosures shall have a gray baked enamel finish, electrodeposited on cleaned, phosphatized steel.
- b The operating handle shall be suitable for padlocking in the OFF position with as many as three padlocks of 5/16-inch diameter shank. The switch cover shall be interlocked with the operating mechanism to prevent opening the cover when the switch is in the ON position and to prevent turning the switch ON when the door is open.
- c The lugs shall be front accessible, UL listed for 65 or 75 degree C, aluminum or copper wires.
- d Provide incoming line terminals with an insulated shield so that live parts are not exposed when the door is open.
- e Provide switches with isolated, fully rated neutral block in circuits with a neutral conductors.
- f Provide each switch with a ground lug for termination of the circuit grounding conductors.
- g Provide fused switches with rejection-type fuse holders which are suitable for use with fuses specified.
- h Provide factory nameplate, front cover mounted, indicating the switch type, catalog number and voltage, amperage and horsepower ratings.

3.0 EXECUTION

3.1 INSTALLATION

- a Provide switches for all equipment as required to comply with NEC requirements for equipment disconnecting means.
- b Mount the switches so that the operating handle is approximately 54 inches above finished floor. Where switches are group mounted, align the tops of all of the switches.

3.2 DISCONNECT SWITCHES MARKING

- a All disconnect switches shall be labeled as required by Section 26 05 53 - Electrical Identification.

3.3 GROUNDING

- a Connect the equipment ground conductor to the grounding lug in the enclosed switches.

End of Section 26 28 16

**SECTION 31 3116
TERMITE CONTROL****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Chemical soil treatment.
- B. Site-applied termiticide for wood, steel, and concrete.

1.02 REFERENCE STANDARDS

- A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 2019.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
- C. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.
- D. Test Reports: Indicate regulatory agency approval reports when required.
- E. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements.
- F. Certificate of compliance from authority having jurisdiction indicating approval of toxicants.
- G. Manufacturer's Instructions: Indicate caution requirement.
- H. Record and document moisture content of soil before application.
- I. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three (3) years of documented experience.
- J. Maintenance Data: Indicate re-treatment schedule .
- K. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing this type of work and:
 - 1. Having minimum of three (3) years documented experience.
 - 2. Approved by manufacturer of treatment materials.
 - 3. Licensed in the State in which the Project is located.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide 3 year installer's warranty against damage to building caused by termites.
 - 1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.
 - 2. Inspect annually and report in writing to Owner. Provide inspection service for 3 years from Date of Substantial Completion.

PART 2 PRODUCTS**2.01 CHEMICAL SOIL TREATMENT**

- A. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.
- B. Diluent: Recommended by toxicant manufacturer.
- C. Manufacturers:
 - 1. Bayer Environmental Science Corp: www.backedbybayer.com/pest-management.
 - 2. FMC Professional Solutions: www.fmcprosolutions.com.
 - 3. Syngenta Professional Products: www.syngentaprofessionalproducts.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SITE-APPLIED TERMITICIDE

- A. Site Applied Termiticide for Wood, Steel and Concrete: Borate mineral salt based, spray applied termiticide formulated for use on wood, steel, concrete and other building materials.
 - 1. Active Ingredient: 40% minimum disodium octaborate tetrahydrate (DOT).
 - 2. Carrier and Penetrant: Proprietary glycol solution.
 - 3. Products:
 - a. Nisus Corporation; Bora-Care: www.nisuscorp.com/#sle.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Verify final grading is complete.

3.02 APPLICATION - CHEMICAL TREATMENT

- A. Comply with requirements of U.S. EPA and applicable state and local codes.
- B. Spray apply toxicant in accordance with manufacturer's instructions.
- C. Apply toxicant at following locations:
 - 1. Under Slabs-on-Grade.
 - 2. At Both Sides of Foundation Surface.
 - 3. Soil Within 10 feet of Building Perimeter For a Depth of 2 feet.
- D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.
- E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.
- F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- G. Re-treat disturbed treated soil with same toxicant as original treatment.
- H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 INSTALLATION - SITE-APPLIED TERMITICIDE

- A. Comply with manufacturer's written instructions.

3.04 PROTECTION

- A. Do not permit soil grading over treated work.

END OF SECTION

**SECTION 32 0190
LANDSCAPE MAINTENANCE**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Furnish all labor, material, equipment and services required to maintain landscape in a healthy growing condition and in a neat and attractive appearance throughout the maintenance period.

1.02 RELATED REQUIREMENTS

- A. Division 32 Section Landscape Irrigation
- B. Division 32 Section Landscape Work

1.03 QUALITY ASSURANCE

- A. The Maintenance Contractor shall be experienced in horticulture and landscape maintenance, practices and techniques, and shall provide sufficient number of workers with adequate equipment to perform the work during the maintenance period.

1.04 MAINTENANCE PERIOD

- A. Continuously maintain the entire project area during the progress of the work and during the ninety (90) calendar-day maintenance period until final acceptance of the project by the Landscape Architect.
 - 1. Maintenance Period begins after all punchlist and corrective items have been accepted by the Landscape Architect and owner.
- B. Maintenance period shall not start until all punch list items are addressed, when all elements of construction, planting and irrigation for the entire project are in accordance with Plans and Specifications. A prime requirement is that all lawn and landscape areas shall be planted and that all lawn areas shall show an even, healthy stand of grass seedlings which shall have been mown twice. If such criteria are met to the satisfaction of the Landscape Architect, a written notification shall be issued to establish the effective beginning date of maintenance period.
- C. Any day of improper maintenance, as determined by the Landscape Architect, shall not be credited as an acceptable maintenance period day. The maintenance period shall be extended on a daily basis if the work is not in accordance to the Plans and Specifications. Project shall not be segmented into maintenance areas or phases, unless authorization of the Landscape Architect is obtained.
- D. Maintenance shall continue beyond the ninety (90) day maintenance period, as required, until final acceptance is given by the Landscape Architect.
- E. Contractor shall provide protection to the project site during the maintenance period.
- F. A phased maintenance period will not be accepted.

1.05 GUARANTEE AND REPLACEMENT

- A. Guarantee: All plant material and other materials installed under the Contract shall be guaranteed against any and all poor, inadequate or inferior materials and/or workmanship or improper maintenance, as determined by the Landscape Architect, and shall be replaced by the Contractor at his expense.
Warranty periods are as follows:
 - 1. Trees, vines, and shrubs: One Year
 - 2. Groundcover and Turf: One year.
- B. Replacement: Any materials found to be dead, missing, declining or not in a satisfactory or healthy condition during the maintenance period shall be replaced immediately. The Landscape Architect shall be sole judge as to the condition of material. Material to be replaced within the guarantee period shall be replaced by the Contractor within five (5) days of written notification by the Landscape Architect or owner. All replacement materials and installations shall comply with the Plans and Specifications. Any plant missing due to suspected theft shall be replaced by the Contractor. If the Contractor suspects that theft may be a problem, the Contractor shall provide written documentation to the owner that security on this site needs to be intensified.
- C. The Contractor may relieve himself of theft responsibility if after the security notice, with no result, a written notice to the owner shall be given that plant material will not be replaced for theft or vandalism due to lack of site security being maintained. This procedure may take place only during the Landscape Maintenance Period.

1.06 OBSERVATION SCHEDULE

- A. Normal progress observations shall be requested by the Contractor from the Landscape Architect as per observations listed in specifications Division 32 Section "Landscape Work."

1.07 FINAL ACCEPTANCE OF THE PROJECT

- A. Upon completion of all project work, including maintenance period, the Landscape Architect will, upon proper written request, make an observation to determine final project acceptability. Provide minimum a 14 business day notice for final observation.
- B. Where observed work does not comply with the Plans and Specifications, replace rejected work and continue specified maintenance period until reinspected by the Landscape Architect and determined to be acceptable. All replacement materials and installations shall be in accordance with the Plans and Specifications. Remove rejected work and materials immediately from project. Prior to the date of final observation, Contractor shall provide the Landscape Architect with all Record Drawings and close out documents in accordance with the Plans and Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials used shall either conform to Specifications in other sections or shall otherwise be acceptable to the Landscape Architect. The Landscape Architect shall be given a monthly record of all herbicides, insecticides and disease control chemicals used and irrigation scheduled. The amendments listed herein are for Bidding purposes only. The final amendment types and rates shall be determined by the Agronomic Soils Test.
- B. Turf maintenance fertilizer: shall be "Best Turf Supreme 16-6-8":
 - 1. 16% nitrogen
 - 2. 6% phosphoric acid
 - 3. 8% potash
- C. Slow Release maintenance fertilizer: shall be "Best Superturf 25-5-5 with Polyon" and shall consist of the following percents by weight:
 - 1. 25% nitrogen
 - 2. 5% phosphoric acid
 - 3. 5% potash

PART 3 - EXECUTION

3.01 GENERAL MAINTENANCE

- A. General: Proper maintenance, including watering, weeding, mowing, edging, fertilization, rolling of turf, replacement and infill of mulch replacement of jute mesh, infill of settled areas, repairing and protection shall be required until entire project is finally accepted, but in any event for a period of not less than the specified maintenance period after planting.
- B. Watering: Thoroughly water to insure vigorous and healthy growth until work is accepted. Water in a manner to prevent erosion due to application of excessive quantities of water. When hand watering use a water wand to break the water force. Supplemental hand water as required to maintain and encourage the proper growth of new and existing plant material.
- C. Weeding:
 - 1. Keep plant basins, turf areas and areas between plants free of weeds. Control weeds with pre-emergent herbicides. If weeds develop, use legally approved herbicides and hand remove. Avoid frequent soil cultivation that destroys shallow roots. Weeding also shall be included in all paved areas including public or private sidewalks.
 - 2. Hand weed as required in addition to the application of weed control herbicides and pre-emergent to maintain all areas free of weeds including turf species other than the specified species. Periodic or predetermined weeding schedules may not be adequate and should be supplemented.
 - 3. Apply a final application of pre-emergent herbicide at the end of the maintenance period, just prior to final acceptance.
- D. Tree basins in turf areas: Remove turf from around each tree to create a 4'- 0" diameter basin depending on tree size.
- E. Pruning
 - 1. Trees: Prune trees to select and develop permanent scaffold branches; to eliminate narrow V-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns;

- to maintain a natural appearance and to balance crown with roots. All trees shall be maintained and pruned in accordance with the accepted practices of the American Society of Consulting Arborists (ASCA). Prune only as directed by the Registered Consulting Arborists and Landscape Architect.
2. Shrubs: Same objectives as for trees. Shrubs shall not be clipped into balled or boxed forms unless such is required by the landscape plans. All pruning cuts shall be made to lateral branches, buds or flush with the trunk. Stubbing and heading shall not be permitted.
 3. Only skilled workers shall perform pruning work in accordance with standard horticultural pruning practices. Remove from the project all pruned branches and material. Remove and replace any plant material excessively pruned or malformed resulting from improper pruning practices at no additional costs to the owner.
 4. Improperly pruned plant material as determined by the Landscape Architect is to be replaced at no cost to the owner.
- F. Staking and Guys: Stakes and guys shall remain in place through the guarantee period and shall be inspected and adjusted to prevent rubbing that causes bark wounds. Remove nursery stake from all trees that are staked with lodgepole stakes per specifications. Provide supplemental staking or guying as required during high wind events to prevent damage to trees. Any damaged tree caused by high winds must be replaced by the contractor at no cost to the owner.
- G. Insect, Animal, Rodent and Disease Control: Maintain proper control with legally approved materials as required as part of the Contract.
- H. Protection: The Contractor shall maintain protection of the planted areas. Damaged areas shall be repaired or replaced at the Contractor's expense.
- I. Trash: Remove trash weekly in all planted areas, pedestrian walkways and parking areas. Maintain all areas free of trash, clippings, and debris at all times.
- J. Replacement: As per Guarantee and Replacement Specifications of this Section.
- K. Fertilization: Fertilize all planting areas, during and just prior to end of maintenance period with the slow release maintenance fertilizer as indicated in the agronomic soils report.
- L. Watering: Planting areas shall be watered at such frequency as weather conditions require to replenish soil moisture below root zone and to establish healthy plant material.
1. Contractor is responsible for water audits and payment of any local penalties by local water districts at no additional cost to the Owner.

3.02 LAWN AND TURF MAINTENANCE

- A. Mowing and Edging
1. Initial mowing of turf will commence when the grass has reached a height of two and one-half (2-1/2) inches. The height of cut will be two (2) inches. After initial establishment maintain Bermuda and creeping grasses at 1½" and fescues or rye grass at 2". Mowing will be at least every 4-6 days for the second through fifth cuttings, and at least once per week after that for fescue. Bermuda grass is to be mowed minimum twice a week. Bent grass is to be mowed daily. Turf must be well established and free of bare spots and weeds to the satisfaction of the Landscape Architect prior to final acceptance.
 2. Excess grass clippings shall be picked up and removed from the site and premises. Let turf areas dry out enough so that mower wheels do not skid, tear or mark the lawn. Edges shall be trimmed at 90 degrees to pavement, at least weekly or as needed for neat appearance. Clippings shall be removed from paved and planting areas, etc. and disposed of from the site.
- B. Watering: Lawns shall be watered at such frequency as weather conditions require to replenish soil moisture below root zone and to establish healthy strands of grass.
1. Contractor is responsible for water audits and payment of any local penalties by local water districts at no additional cost to the Owner.
- C. Disease control: Control turf diseases throughout the maintenance period with legally approved fungicides and herbicides. Replace any damaged or infected grass.
- D. Weed Control:
1. Control broad leaf weeds with selective, legally approved herbicides throughout maintenance period.
 2. A final application of selective herbicide shall be applied at the end of the landscape maintenance period, acceptance, just prior to final acceptance.

3. Hand weed as required in addition to the application of weed control herbicides and pre-emergent to maintain all areas free of weeds including turf species other than the specified species. Periodic or predetermined weeding schedules may not be adequate and should be supplemented.
- E. Fertilization:
 1. During maintenance period an application of turf maintenance fertilizer, as specified, shall be made at thirty (30) day intervals from the date of maintenance period start at a rate of five (5) pounds per 1,000 square feet, and as required by the agronomic soils report.
 2. Final application (just prior to final acceptance) shall be made with the slow-release maintenance fertilizer as required by the agronomic soils report.
 3. Replacement: At conclusion of maintenance period a final observation of lawn and turf areas shall be made. Remove diseased areas and unhealthy strands of grass from the site; do not bury into the soil. Replant areas with material and in a manner as specified on the Plans and Specifications at no additional cost to the Owner. All grass is to be fully grown with 100% coverage with a suitable thatch layer prior to turnover and final acceptance.
- F. Arborist: Provide a written report and recommendations as required by the landscape architect if any plant material is in the sole opinion of the landscape architect, declining, stressed, infested, or otherwise not growing at the anticipated growth rate. The report is to include Agronomic Soils Test Data and recommendations and be provided at no cost to the owner.

3.03 IRRIGATION SYSTEM

- A. System Observation: The Contractor shall check all systems for proper operation. Lateral lines shall be flushed out after removing the last sprinkler head or two at each end of the lateral. All heads are to be adjusted as necessary for unimpeded head to head coverage.
- B. Valves: Contractor shall set, and verify that all pressure regulating valves to the operating pressure specified on the drawings.
- C. Controllers: Set and program automatic controllers for seasonal water requirements. Give the Owner's Representative instructions on how to turn off system in case of emergency.
- D. If the irrigation system is designed and specified to be operable from a central irrigation computer controller located off site, or a standard controller on site. The contractor shall demonstrate to Landscape Architect, Owner's Representative and future maintenance contractor that the central irrigation system is fully installed and operational from this off site control system as described and specified. Contractor shall make all adjustments as necessary to insure this operation prior to final acceptance.
- E. Contractor shall set up and coordinate training for the Maintenance Contractor (Provider) on the irrigation controller, and pump with the manufactures representative. Maintenance period shall not end, and the project will not be accepted until this training has been completed.
- F. Repairs: Repair all damages to irrigation system at the Contractor's expense. Repairs shall be made within twenty-four (24) hours or sooner to prevent damage to site improvements.

3.04 CLEANING

- A. During maintenance work, keep pavements clean and work area in an orderly condition. Haul away and remove all debris from landscape areas, and do not leave any clippings, fertilizer, amendments and / or other material from landscape planting and/or maintenance period.
- B. Powerwash all pavement and flatwork as necessary to remove all staining and tire marks on surfaces caused by maintenance or construction vehicles, prior to final acceptance.

END OF SECTION

**SECTION 32 1500
DECOMPOSED GRANITE SURFACING**

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Aggregate paving surface course (resin-stabilized decomposed granite).
- B. Edging materials

1.02 RELATED REQUIREMENTS

- A. Division 31 Section Grading
- B. Division 32 Section Landscape Work

1.03 DEFINITIONS

- A. Decomposed Granite (DG): compacted decomposed granite composite utilizing resin emulsion and specified aggregate.
- B. Resin emulsion: Liquid binding agent for Decomposed Granite (DG).

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Manufacturer's product sheets, including installation specifications.
- B. Samples for Verification: For each of the following:
 - 1. Decomposed granite or specified aggregate: 2 lb. sample of each color and texture of stone required, in labeled plastic bags.
 - 2. One foot length of edging materials and accessories, of manufacturer's standard size, to verify color selected.
 - 3. 12-inch by 12-inch filter fabric (soil separator) membrane.
- C. Test reports:
 - 1. Marshall Stability test results using pre-approved specified aggregate.
 - 2. Final compaction report.
- D. Mix Design:
 - 1. Source, color and weight of aggregate.
 - 2. Quantity of water for pre-wetting.
 - 3. Quantity of resin emulsion.
 - 4. Written certification from approved mix manufacturer that all deliveries of mix meet specifications.
 - 5. Weight tickets or weigh-master tickets for each load of mix.

1.05 QUALITY ASSURANCE

- A. Pre-installation Meeting:
 - 1. The Contractor shall coordinate, schedule and conduct a meeting to review the installation requirements with the mix supplier and Architect.
- B. Mockup:
 - 1. Contractor shall form and install a 4-foot square sample of DG duplicating a small section of actual work to be done for each type, size and color of surfacing material.
 - 2. If work is acceptable, sample may be part of the total production. If work is not satisfactory, sample shall be removed at Contractor's expense and further samples installed until approved as satisfactory by Architect.
- C. Installer Qualifications: Installer to provide evidence to indicate successful experience in providing decomposed granite or crushed 3/8" or 1/4" minus aggregate paving containing stabilizer binder additive.
 - 1. Installer shall be certified by the manufacturer or blender of the resin product.

1.06 SITE CONDITIONS

- A. Weather and site requirements:
 - 1. Aggregate base or sub-base is to be dry.
 - 2. Do not install DG mix, or apply seal coat if the possibility of rain is forecast within four days following installation.
 - 3. Resin emulsion is diluted with water: protect newly installed pavement and seal coat from water until curing is complete.

4. Install DG mix and seal coat when ambient temperature is above 60 degrees Fahrenheit and overnight temperature is above 32 degrees F.

1.07 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.
- C. Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs as required.

1.08 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Aggregate: Furnish one five pound bag for each type, color, and size of material installed.
 2. Resin emulsion: Furnish one 40 pound bag of stabilizer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.02 AGGREGATE MATERIALS

- A. Nominal maximum size of aggregate:
 1. Sieve Metric% Passing
 2. 9.5 mm 95 -100
 3. 4.5 mm 87 -100
 4. 2.36 mm 73 - 93
 5. 600 um 34 - 54
 6. 300 um 20 - 40
 7. 75 um min 11 - 23

2.03 STABILIZING AGENT

- A. Basis of Design: Design is based on "Stabilizer" manufactured by Stabilizer Solutions, Inc. 205 South 28th St., Phoenix, AZ 85034; phone (602) 225-5900, (800) 336-2468; fax (602) 225-5902; website stabilizersolutions.com; or a comparable product by one of the following:
 1. Stabilizer Solutions, Phoenix, AZ (800) 336-2468
 2. Soil Stabilization Product Company, Inc. Merced, CA (800) 523-9992
 3. SoilTac by Soil Works, Inc. CA (760) 345-0771
- B. Resin emulsion: Totally natural additive emulsion with high solids content formulated especially for use as a natural flexible pavement binder.
 1. Resin-stabilized DG shall cure to a water-insoluble, high strengths state, equal in strength to hot-mix asphalt concrete.
 2. Resin emulsion shall dry without affecting the color of the aggregate.
 3. Resin emulsion shall be added at an addition rate of 10%-12% during blending operations.
 4. Resin emulsion shall be non-hazardous, non-toxic, non-corrosive, and shall be water- soluble.
- C. Water: Fresh, clean, and potable.
- D. Seal coat: Resin emulsion.
- E. Tack coat: Resin emulsion diluted with water.

2.04 DECOMPOSED GRANITE MIX (DG MIX)

- A. DG mix as supplied by manufacturer-approved blender with not less than 10% - 12% emulsion by dry weight of the aggregate.
- B. Blend 12 to 16 lbs. (verify with manufacturer for exact blend) of Stabilizer per 1-ton of decomposed granite or crushed 3/8" or 1/4" minus aggregate screenings. It is critical that stabilizer be thoroughly and

uniformly mixed throughout decomposed granite or crushed 1/4" or 3/8" minus aggregate screenings.

- C. Installed DG mixture shall meet the following requirements when tested in accordance with the Marshall Stability Test, ASTM D 1599-89. Mix blending facility shall submit test results for review and approval. Requirements for Marshall Stability Flow: Stability Minimum (pounds) shall equal 4,000 lbs.

2.05 EDGING

- A. Aluminum edging: Per Contract Drawings

2.06 WEED BARRIER FABRIC

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Mirafi N-Series, Model 140N manufactured by Mirafi, Pendergrass, GA (706) 693 2226, www.mirafi.com.
- B. Spun or woven, non-degrading geotextile fabric that blocks 95% of weed growth and is permeable to air, water, gases and fertilizer.
 - 1. Filter Fabric: Composite fabric geotextile consisting of woven, needle-punched polypropylene geotextile substrate bonded to a non-woven polypropylene fabric, weighing not less than 4.8 oz./sq. yd. (160 g/sq. m).

2.07 SOIL STERILANT

- A. Soil Sterilant: Oxydil Ureabor, as manufactured by Best Products Division, Occidental Chemical Company, Lathrop, CA.

2.08 HERBICIDE

- A. Chemical herbicide shall be Surflan or Dacthol pre-emergent. All material shall have an integral dye so that it is evident which areas have been treated. It is the Contractor's responsibility to post warnings to indicate that the above chemicals are being applied.
 - 1. Chemical herbicide for control of actively growing weeds and grasses shall be Roundup or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine site and verify that conditions are suitable to receive work and that no defects or errors are present which would cause defective installation of product or cause latent defects in workmanship and function.
- B. Review subgrade to verify that it has been graded correctly and compacted as required for installation of the decomposed granite.
- C. Before proceeding with work, Contractor shall notify the Architect in writing of any unsuitable conditions and conflicts.

3.02 PROTECTION OF EXISTING CONDITIONS

- A. Use every possible precaution to prevent damage, including staining, to existing conditions to remain such as structures, utilities, irrigation systems, plant materials and paving on or adjacent to the site of the work.
- B. Provide barricades, fences or other barriers as necessary to protect existing conditions to remain from damage during construction.
- C. Contractor is fully responsible for all costs associated with replacement of damage caused by his work.

3.03 LAYOUT

- A. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means for aggregate paving finish grades.
- B. Staking: Provide a sufficient quantity of grade stakes as required to provide aggregate paving with smooth finish grades and positive drainage.

3.04 SUB-GRADE PREPARATION

- A. Refer to Geotechnical report for subgrade preparation prior to placement of decomposed granite. Grade subgrade with uniform slope between points where elevations are given.
- B. Subgrade shall be crowned in the middle, or have a 2% slope from one side to the other.
- C. Grade sub-grade surface to within 0.05 foot of finish grade minus aggregate paving thickness.

- D. Fill and compact any depressions and remove loose material to finish true to line and grade, presenting a smooth, compacted and unyielding surface.
- E. Remove debris, loose dirt and other extraneous materials.
- F. Ditches, drains and drain pipes shall be installed if necessary to protect of the pavement and base from cross flows of water. All water flow should be directed off of and away from the pavement and base.

3.05 AGGREGATE BASE

- A. Edging materials must be in place prior to placing aggregate base or DG. The DG compacted surface should be no less than 1/8" above the edging material to assure proper drainage
- B. Compaction tests of aggregate base are required prior to installation of DG.
 - 1. Architect shall to determine how many compaction tests are to be conducted.
 - 2. Aggregate base must not be disturbed during installation of DG.
 - 3. Any damage to base during testing must be repaired prior to placement of pavement.

3.06 INSTALLATION OF DG MIX

- A. Edging materials must be in place prior to placing DG. The DG compacted surface should be no less than 1/8" above the edging material to assure proper drainage.
- B. Install weed barrier fabric over compacted subgrade prior to installation of DG mix. Minimum thickness shall be 4".
- C. Decomposed Granite (DG) to be installed in 2-inch nominal lifts to the desired overall thickness.
- D. Placement: Place mix via a single, continuous operation.
 - 1. Use a self-propelled, mechanized spreading-and-finishing machine designed specifically for placement of resin emulsion mix.
 - 2. Machine shall be equipped with a screen or strike-off assembly capable of being accurately regulated and adjusted to a uniform depth.
 - 3. Small amounts of material may be placed and raked by hand, using asphalt rakes.
- E. Provide a structural section of a minimum of 4" compacted thickness upon completion of final compaction. Verify required thickness on drawings.
- F. DG surface shall be crowned in the middle or have a 2% cross slope, unless finish graded on the drawings.
- G. If slope of surfaces to be paved exceed 4 percent, place material in an uphill direction. Do not allow placing equipment to run over un-compacted material.
- H. Initial compaction: After mix placement, begin initial compaction as soon as mix will bear roller weight without undue displacement.
 - 1. If mix will not support compaction equipment due to excess moisture, delay initial compaction until mix achieves adequate stability to support compaction equipment.
 - 2. Use of non-heeled boots is required for anyone having to walk on resin DG during installation process.
 - 3. Perform initial breakdown compaction with self-propelled, 1-ton steel drum rollers in static mode only. Walk-behind vibratory plate compactors shall be used for edges and areas where a steel drum roller is not practical.
 - 4. On grades of 4% or steeper: Use static rollers, operate equipment at slow speeds and with the drive wheel forward to the uphill direction of work progress.
 - 5. Generally, no more than two passes are required for initial compaction.
 - 6. Warning: If the pavement begins to develop stress cracks, the pavement is being over-compacted and further compaction should be halted.
 - 7. Test paving surface for slope and smoothness after initial rolling, and correct deficiencies immediately so that finished surface will meet specified tolerances and requirements for smoothness.
- I. Final Compaction:
 - 1. Begin final compaction as soon as possible after initial compaction has been completed.
 - 2. The purpose of the final compaction is to eliminate roller marks from the initial compaction and to create an aesthetically appealing pavement surface. The Architect shall be the judge of aesthetic considerations.
 - 3. Contractor may use a 1-ton steel drum roller or small plate compactor. Do not over roll.

3.07 TOLERANCES

- A. In-Place compacted thickness:
 - 1. Compacted Sub-Grade Course: Maximum 1/2-inch plus, minus 0-inch.
 - 2. Aggregate Paving Surface Course: Maximum 3/16-inch plus, minus 0-inch.
- B. Finished surface smoothness:
 - 1. Subgrade: +/- 0.08 foot.
 - 2. Compacted Sub-Grade Course: Maximum 3/8-inch in 10-feet.
 - 3. Aggregate Paving Surface Course: Maximum 3/16-inch in 10-feet in any direction.

3.08 REPLACEMENT OF DEFECTIVE PAVEMENT

- A. Replace full depth of paving thickness in paving mixes that are contaminated, pavement that is cracked, or otherwise defective.
 - 1. Skin patching will not be permitted.
- B. Edges of Replaced Pavement:
 - 1. Cut edges of pavement to be removed so that sides are vertical and oriented perpendicular and parallel to direction of traffic.
 - 2. Spray edges with a tack coat of resin emulsion.
- C. Installation of replacement pavement:
 - 1. After applying tack coat, place pavement mix in areas where paving was removed in sufficient quantity to conform to elevation and tolerance requirements.
 - 2. Thoroughly compact DG mix so that cured patch meets all requirements set forth in this specification.
 - 3. Skin patching of an area that has been rolled will not be permitted.

3.09 FIELD QUALITY CONTROL

- A. Density tests:
 - 1. Perform tests in accordance with ASTM D 2950.
 - 2. Perform tests within 48 hours after final compaction.
 - 3. Perform at least three tests, in areas specified by Architect.
- B. Surface shall not vary more than 3/16 inch per 10 feet, except at intersections or changes of grade. Areas not meeting specified surface tolerance are to be corrected immediately after initial compaction.
- C. DG course thickness: Correct areas not meeting specifications immediately after initial compaction.

3.10 PROTECTION

- A. Protect pavement surface against equipment and traffic until pavement has cured sufficiently, a minimum of 72 hours, to support traffic without marring, rutting, tearing, distressing or damaging the pavement in any way. Utilize warning signs, barricades, and protection fencing to protect pavement from traffic.
- B. All pavement installed must be protected by covering with plastic sheeting if unforeseen inclement weather occurs prior to complete curing.
- C. Contractor is responsible for replacing damaged pavement, if damage was preventable, at his own expense.

3.11 CLEANING

- A. Keep DG mix off of adjacent surfaces, including planting areas and pavements.

END OF SECTION

SECTION 323119**AMERISTAR[®] PERIMETER SECURITY USA INC.****MONTAGE PLUS[®] - STANDARD PICKET SPACE FENCE SYSTEM - FENCE WALL RACKABLE****PART 1 - GENERAL****1.01 WORK INCLUDED**

The contractor shall provide all labor, materials and appurtenances necessary for installation of the welded ornamental steel fence system defined herein.

1.02 RELATED WORK

Division 31 - Earthwork

Section 033000 - Concrete

1.03 SYSTEM DESCRIPTION

The manufacturer shall supply a total fence system of Montage Plus standard picket space **Welded and Rackable** (ATF – All Terrain Flexibility) Ornamental Steel for standard picket space Majestic design. The system shall include all components (i.e., panels, posts, gates, and hardware) required.

1.04 QUALITY ASSURANCE

The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

- ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- ASTM D523 - Test Method for Specular Gloss
- ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
- ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
- ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.06 SUBMITTAL

The manufacturer's literature shall be submitted prior to installation.

1.07 PRODUCT HANDLING AND STORAGE

Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism, and theft.

1.08 PRODUCT WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufacturer's warranty shall be guaranteed for five (5) years from date of original purchase.

PART 2 – MATERIALS

2.01 MANUFACTURER

The fence system shall conform to Montage Plus standard picket space ***Welded and Rackable*** (ATF – All Terrain Flexibility) Ornamental Steel, for standard picket space Majestic flush bottom rail treatment, 2-Rail and 3-Rail style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.

2.02 MATERIAL

A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (310 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft² (184 g/m²), Coating Designation G-60.

B. Material for pickets shall be 3/4" square x 18 Ga. tubing. The rails shall be steel channel, 1.5" x 1.4375" x 14 Ga. Picket holes in the rail shall be spaced 4.675" o.c. for standard picket space. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

2.03 FABRICATION

A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).

C. The manufactured panels and posts shall be subjected to an inline electrode position coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be Black. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2 (Note: The requirements in Table 2 meet or exceed the coating performance criteria of ASTM F2408).

D. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Commercial weight fences under ASTM F2408.

E. Gates with an out to out leaf dimension less than and including 72 inches shall be fabricated using Montage Plus ornamental panel material and 1-3/4" sq. x 14ga. gate ends. Gate leafs greater than 72 inches shall be fabricated using ForeRunner rails, 17 gauge pickets, intermediate uprights, gussets and 1-3/4" sq. x 14ga. gate ends. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding.

PART 3 - EXECUTION

3.01 PREPARATION

All new installation shall be laid out by the contractor in accordance with the construction plans.

3.02 INSTALLATION

Fence post shall be spaced according to Table 3, plus or minus 1/4". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36" (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The "Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

3.03 FENCE INSTALLATION MAINTENANCE

When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

3.04 GATE INSTALLATION

Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations.

3.05 CLEANING

The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

TABLE 1 – MONTAGE PLUS PANELS		
Fence Posts	Panel Height	
2-1/2" x 16 Ga.	Up to & Including 6' Height	
Gate Leaf	Gate Height	
	Up to & Including 4'	Over 4' Up to & Including 6'
Up to 4'	2-1/2" x 14 Ga.	3" x 12 Ga.
4'1" to 6'	3" x 12 Ga.	3" x 12 Ga.
6'1" to 8'	3" x 12 Ga.	4" x 12 Ga.

TABLE 2 – CORROSION RESISTANCE REQUIREMENTS		
Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium 8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

TABLE 3 – MONTAGE PLUS – POST SETTINGS						
Span	For CLASSIC, GENESIS, MAJESTIC, & WARRIOR 8' Nominal (91.95" Rail)					
Post Size	2-1/2"	2-1/2"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Montage Plus Universal (BB112)	Montage Plus Line Blvd. (BB114)	Montage Plus Flat Mount (BB111)		Montage Plus Swivel (BB113)	
Post Settings ± 1/4" O.C.	95"	95"	95"	95-1/2"	95"	95-1/2"

Note: When using BB113 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel.

SECTION 32 8423**IRRIGATION SYSTEM****PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Work specified in this section: Provide all labor, materials, transportation, and services necessary to furnish and install the irrigation system as shown on the drawings and described herein.
- B. Underground irrigation system shall include, but is not limited to, pipe sleeves where required, valves and fittings, controller and wire, testing, sprinkler heads, excavating and backfilling irrigation system work, associated exterior plumbing and accessories to complete the system.

1.2 RELATED SECTIONS

- A. The requirements of the "General and Supplementary Conditions of the Contract" and Division 1 specification sections shall apply to all work of this Section with the same force and effect as though repeated in full herein.
- B. General Scope of Work and Requirements: Section 00 1000.
- C. Site Grading: See Specifications.
- D. Landscape Planting: Section 32 9300.
- E. Treatment of Existing Trees: Section 32 9345.

1.3 REFERENCES

- A. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2000.
- B. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 1996a.
- C. Texas Water Code, Chapter 34, Chapter 344 Rules for Licensed Irrigators (TCEQ).
- D. National Fire Protection Association, (NFPA); National Electrical Code.
- E. National Sanitation Foundation (NSF).
- F. City of San Antonio Code.
- G. San Antonio Water System Code.

1.4 SUBMITTALS

- A. Certifications/Material List/Shop Drawings:
 - 1. The Contractor shall submit copy of irrigator's license on company letterhead.
 - 2. The Contractor shall submit letter of certification of on-site water pressure.
 - 3. The Contractor shall furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior approval by the Landscape Architect.
 - 4. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used.
 - 5. Submit copy of the Irrigation Installation Certification Letter. Original copy to be issued to City inspector.
 - 6. Contractor Shop Drawings:
 - a. Wire Routing Plan: Contractor shall submit full size drawing showing in color the routing of wires from valves to controller. Contractor shall show where wires leave mainline to controller.
 - b. Temporary Irrigation Plan: Contractor shall submit full size drawing showing location of heads and valves, properly zoned and connections to the mainline.

7. Equipment or materials installed or furnished without prior approval of the Landscape Architect may be rejected and the Contractor required to remove such materials from the site at his own expense.
 8. Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.
 9. Manufacturer's warranties shall not relieve the Contractor's liability under the guarantee. Such warranties shall only supplement the guarantee.
- B. Record and As-Built Drawings:
1. The Contractor shall provide and keep up-to-date an "as-built" set of Oce prints which shall be corrected daily and show every change from the original drawings and specifications. The drawings shall show exact "as-built" locations, sizes and kinds of equipment installed. This set of drawings shall be kept on the site and shall be used only as a working set.
 2. These drawings shall also serve as work progress sheets and shall be the basis for measurement and payment for work completed. These drawings shall be available at all times for inspection. Should drawings not be available, no inspection will take place.
 3. The Contractor shall make neat and legible notations on the as-built progress sheets daily as the work proceeds, showing the work as actually installed.
 4. Before the date of the final inspection, the Contractor shall transfer all information from the "as-built" prints to an Oce print or electronic file. All work shall be in pen to allow proper printing of original.
 5. The Contractor shall dimension from two (2) permanent points of reference i.e. building corner, sidewalk, or road intersections, etc., the location of the following items:
 - a. Connections to potable water lines.
 - b. Location of new and existing backflow preventer.
 - c. Connections to electrical power.
 - d. Location of new controller.
 - e. Routing of pressure lines.
 - f. Irrigation control valves.
 - g. Quick-coupling valves.
 - h. Other related equipment as directed by the Landscape Architect.
 6. On or before the date of the final inspection, the Contractor shall deliver the completed as-builts on Oce print or electronic file to the Landscape Architect. Delivery of the as-builts will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the as-builts.
- C. Controller Charts:
1. On the inside door of controller, provide a reduced copy of the irrigation plan colored coded area of coverage per each zone and location of main line, manual valves and taps. Chart shall be laminated. Securely fasten chart to controller door.
- D. Operation and Maintenance Manuals:
1. Prepare and deliver to the Owner within ten calendar days prior to completion of construction, three hard cover binders with three rings containing the following information:
 - a. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local sources of equipment installed. Manuals and/or catalog and parts sheets on all material and equipment installed under this contract.
 - b. Guarantee statement.

- c. Complete operating and maintenance instructions on all major equipment.
 - d. Copy of the Irrigation Installation Certification Letter.
 - e. Water Schedule: Water schedule shall state watering times and frequencies of each irrigation zone. Water schedule shall be based on the local ET (evapotranspiration) rate.
 - 2. In addition to the above mention maintenance manuals, provide the Owner's maintenance personnel with instructions for major equipment.
- E. Equipment to be Furnished:
- 1. Supply as part of this contract the following tools:
 - a. Two (2) sets of sprinkler wrenches for adjusting, cleaning or disassembling each type of sprinkler and two (2) each of any special tools required for any other equipment.
 - b. Four (4) pop-up spray heads each type and four (4) nozzles of each type installed.
 - c. Two (2) 12" lengths of dripline.
 - d. Two (2) quick coupling keys with hose swivels, hose bibs/garden valves to match size installed.
 - e. Two (2) valve keys each for operating cast iron and brass gate valves.
 - f. Two keys for automatic controller lock.
 - 2. The above mentioned equipment shall be turned over to the Owner at the conclusion of the project. Before final inspection, verification that materials have been provided will occur.

1.5 QUALITY ASSURANCE AND REQUIREMENTS

- A. Installer's Qualifications: Minimum of 5 years experience installing irrigation systems of comparable size. Irrigation contractor shall be licensed in the State of Texas and bonded.
- 1. The Irrigation Contractor shall have in his employ a representative holding a valid irrigation license as issued by the Texas Commission on Environmental Quality, P.O. Box 13087, Austin, Texas 78711, on site at all times during the performance of this contract.
 - 2. A working foreman will be required on site at all times during construction. This foreman will remain on this project throughout the duration of the contract. In the event of his illness, or other extenuating circumstances, notify and advise the Owner's Representative immediately as to what remedial action will be taken.
- B. Permits and Fees: The Contractors shall obtain and pay for any and all permits and all inspections as required. Contractor shall also be responsible for all fees and costs involved for irrigation tap with the City main, water and related work.
- 1. Irrigation Contractor shall comply with City inspector directions with agreement from Landscape Architect without extra cost to Owner.
 - 2. Irrigation Contractor shall comply with City Inspector written directions with agreement from Landscape Architect without extra cost to Owner.
- C. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of the article used in this contract furnishes directions covering points not shown in the drawings and specifications.
- D. Ordinances and Regulations: All local, municipal and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations or requirements of the same. However, when these specifications and drawings call for or describe materials, workmanship, or

construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

1. Installer Certification Letter: City of San Antonio requires a letter from the Licensed Irrigator certifying that the irrigation system was installed in accordance with the approved irrigation plan. Original copy shall be placed with the Test & Measure report in a weatherproof bag that will be collected by the building official. Irrigation contractor is to submit a copy of his conformity letter in the submittal package.
 - E. Statement of Area of Coverage: Drawing does not provide 100% coverage of the site. See plans and these specifications for areas to be irrigated.
 - F. Explanation of Drawings:
 1. Due to the scale of drawings, it is not possible to indicated all offsets, fittings, sleeves, etc. which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigations systems, planting and architectural features.
 2. The words "Landscape Architect" as used herein shall refer to the Owner's authorized representative. The word "Contractor" shall herein refer to the Irrigation Contractor unless stated otherwise.
 3. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.
- 1.6 PRODUCT DELIVERY, STORAGE AND HANDLING
- A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.
 - B. Handling of PVC pipe and fittings: The Contractor is cautioned to exercise care in handling, loading, unloading and storing of PVC pipe and fittings.
 - C. Store and handle materials to prevent damage and deterioration. Do not store PVC pipe in direct sunlight for more than 7 days.
- 1.7 SUBSTITUTIONS
- A. If the Irrigation Contractor wishes to substitute any equipment or materials for those equipment or materials listed on the irrigation drawings and specifications, he may do so by providing the following information to the Landscape Architect for approval ten days prior to bid date:
 1. Provide a statement indicating the reason for making the substitution. Use a separate sheet of paper for each item to be substituted.
 2. Provide descriptive catalog literature, performance charts and flow charts for each item to be substituted.
 3. Provide the amount of cost savings if the substituted item is approved.
 - B. The Landscape Architect shall have the sole responsibility in accepting or rejecting any substituted item as an approved equal to those equipment and materials listed on the irrigation drawings and specifications.
- 1.8 GUARANTEE
- A. The guarantee for the sprinkler irrigation system shall be made in accordance with the attached form.
 - B. A copy of the guarantee form shall be included in the operations and maintenance manual.
 - C. The guarantee form shall be re-typed onto the Contractor's letterhead and contain the following information:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defects in material or workmanship which may develop during the period of one year from date of acceptance and also to repair or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT: _____
LOCATION: _____
SIGNED: _____
ADDRESS: _____
PHONE: _____
DATE OF ACCEPTANCE: _____

1.9 PROJECT CONDITIONS

- A. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary and at no additional cost to the Owner.
- B. The Contractor shall verify on-site pressure is not less than design pressure. Contractor shall submit letter certifying that on-site pressure exceeds design pressure by 10%. If on-site pressure does not exceed design pressure by 10%, contact Landscape Architect for resolution. If construction work is started prior to receiving certification letter, the Contractor assumes all costs for changes required to meet on-site pressure.
 - 1. If on-site pressure exceeds design pressure by more than 10%, Contractor shall install a pressure regulator.
- C. Site Utilities:
 - 1. Determine locations of underground utilities, especially site lighting, cable, telephone, and irrigation lines. Perform all work in a manner which will avoid possible damage. Do not permit heavy equipment or trucks to damage utilities. Hand excavate, as required to minimize possibility of damage to underground utilities.
 - 2. Coordinate work with the irrigation contractor to prevent damage to underground wire and other obstruction work located in landscape areas.
 - 3. Known underground and surface utility lines are indicated on the utility survey. Contractor shall verify location of all known underground and surface utilities by contacting the appropriate utility companies.
 - 4. Any damage to utilities shall be repaired by contractor.
- D. Contractor is responsible for protecting all existing trees, plants, lawns, and other features designated to remain.
- E. Contractor shall repair/replace any damage to adjacent facilities caused by irrigation system work operations at no additional cost to Owner.
- F. Provide and install a dedicated irrigation meter and backflow preventer for the irrigation system water supply.
- G. Design Pressure:
 - 1. Design Static Pressure: See Plan.
 - 2. Spray Zone: 30 PSI

3. Tree Bubbler Zone: 30 PSI
4. Drip Zone: 20 PSI

1.10 SCHEDULES

- A. The Contractor shall begin exterior landscape work upon acceptance of the Contract by the Owner. Landscape Contractor shall submit a schedule for the work to be performed to the Landscape Architect for approval.

1.11 PROTECTIONS

- A. All items required to complete this contract remain the property and responsibility of the Contractor until final acceptance. Take adequate precautions to protect all work and materials against damage. Cooperate fully with other trades to insure a satisfactory completion.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General: Use only new materials of brands and types noted on drawings, specified herein, or approved equals.
- B. PVC Pressure Mainline Pipe and Fittings:
 1. Pressure mainline piping for sizes 1" inch to 4" shall be solvent-weld PVC Schedule 40. Pipe 6" and larger shall be gasketed PVC pipe, Class 200.
 2. Pipe shall be made from an NSF approved Type I, Grade II, PVC compound conforming to ASTM resin specification D1785-68. All pipes must meet requirements as set forth in Federal Specification PS-21-70, with an appropriate standard dimension (S.D.R.) (Solvent-weld pipe).
 3. PVC solvent-weld fittings shall be Schedule 40, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.
 4. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.
 5. All PVC pipe must bear the following markings:
 - a. Manufacturer's name
 - b. Nominal pipe size
 - c. Schedule or Class
 - d. Pressure rating in P.S.I.
 - e. NSF (National Sanitation Foundation) approval
 - f. Date of extrusion
 6. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.
- C. PVC Non-Pressure Lateral Line Piping:
 1. Lateral piping for ½" pipe shall be PVC Class 315, SDR 13.5. Pipe ¾" inch and larger, shall be PVC Class 200, SDR-21. Both class pipe shall be with solvent-weld joints.
 2. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM resin specification D1784. All pipe must meet requirements set forth in Federal Specification PS-22-70 with an appropriate standard dimension ratio.
 3. Except as noted in paragraphs 1 and 2 of Section 2.1B, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure mainline pipe and fittings as set forth in Section 2.1B of these specifications.

- D. Flexible PVC Tubing: All flexible PVC tubing shall be I.P.S. heavy wall hose made from rigid PVC material. Hose shall meet or exceed schedule 80 wall thickness and shall comply with ASTM D2287 and tested in accordance with ASTM D1598. Hose shall be tested at 200 psi static pressure for 2 hours and a quick burst rating of a minimum of 400 psi. Hose shall be as manufactured by AG-Products, Winter Haven, Florida.
- E. Drip Irrigation:
1. Netafim Techline manufactured by Netafim Irrigation , Inc. distributed by Longhorn Supply, San Antonio, Texas, 210-340-3516. Contractor shall provide all necessary fittings and accessories as required by the manufacturer for the installation of the product. Drip line shall be Techline CV, 12" o.c. emitters, 0.9 gph.
 2. Valve: Netafim pre-assembled valve, filter and pressure regulator control zone kit.
 - a. Pressure Regulator: Pressure Regulator shall be Low flow for valves less than 4.5 gpm and High Flow for valves greater than 4.5.
 3. Air/Vacuum Relief Valve: Shall be per plans and details
 4. Flush Valve: Shall be per plans and details.
 5. Drip Indicator: Shall be per plans and details.
- F. Swing Joints and Nipples: Install threaded and gasketed schedule 80 PVC 3-way swing joints and nipples. The unit shall contain o-ring seals at all elbow connections.
- G. Fittings:
1. Schedule 40 PVC molded fittings meeting ASTM D224. Fittings shall be suitable for solvent weld or slip joint ring tight seal. Threaded fittings shall be Schedule 80 PVC. Fittings for plastic to metal connections shall be PVC male adapters.
- H. Manual Valves:
1. Gate valves 3.0 inches and smaller shall be USA made, 200 lb. WOG, highest grade cast bronze gate valve with screw-in bonnet, nonrising stem and solid wedge disc, threaded ends and a cast iron handwheel, manufactured by Nibco or approved equal.
 2. Isolation Valves shall be Nibco schedule 80 PVC ball valves with union connection at both ends of valve sized same main line or approved equal.
- I. Quick coupling Valves: Quick coupling valves shall have a brass one-piece body designed for working pressure of 150 PSI operable with quick coupler key. Key size and type shall be as shown on plans.
- J. Backflow Prevention Units: Backflow prevention units shall be of size and type indicated on the irrigation drawings. Install backflow prevention units in accordance with irrigation construction details and/or city code.
1. Backflow preventer shall be a double check valve assembly, bronze body, erosion resistant internal parts, with ball valve test locks and gate valves.
- K. Wye Strainer: Wilkins Strainer, Model YB, Brass, 20 mesh stainless steel screen or approved equal.
- L. Pressure Reducing Valve: Bronze water pressure regulating valve with 300 lbs. max rating with adjustment between 25- 75 lbs.
- M. Control Wiring:
1. Connections between the automatic controllers and the electric control valves shall be made with direct burial copper wire 14, AWG-U.F. 30 volt, using a

- National Electric Code Class II circuit. Install in accordance with valve manufacturer's specifications and wire chart.
2. For runs greater than 2000 feet, larger wire may be used provided it conforms to controller manufacturer's specifications for both material specification and installation.
 3. Underground splice kit shall be 3M DBY water-tight, dry splice connector or approved equal. All wire splices shall be protected by a valve box. No splices shall be installed on runs less than 500 feet.
 4. Common wire shall be white.
 5. Station control power wire shall be solid color.
 6. Tracer Wire shall be green color, 12 AWG, UF Classification, UL approved for direct burial. Wire shall be set above all mainlines in sand layer, routed to controller, labeled, and terminated with red (color code) electrical spring connector (wire nut).
 7. Where control wire leaves mainline, install in Schedule 40 PVC conduit.
- N. Automatic Controllers:
1. Automatic controllers shall be of size and type shown on the plans. Final location of automatic controllers shall be approved by the Landscape Architect.
 2. Unless otherwise noted on the plans, the 120 volt electrical power for the controller is available at the site. The final electrical hook-up shall be the responsibility of the Irrigation Contractor.
- O. Weather Sensors:
1. Rain sensor: Hunter Mini-Clik 502 model.
 2. Freeze sensor: Hunter Freeze-Clik 401 model.
 3. Wireless will be rejected.
- P. J-Boxes: J-boxes with accessible pull points for rigid conduit shall be LB box, pulling L (SLB), or J-box.
- Q. Electrical Control Valves:
1. All electric control valves shall be as called for on the plans.
- R. Valve Boxes:
1. Manual Valves: 10" inch box, Carson Industries or Ametek, with green bolt down cover. Use extensions where required.
 2. Electrical Control Valves: Standard rectangular box, Carson Industries or Ametek, with green bolt down cover or approved equal. Install extension sleeves as required.
 3. Backflow Preventer: Rectangular steel meter box with lid. Box shall be sized to fit required backflow preventer by minimum of 6" on each end.
 4. Backflow Preventer: Pump Guard Box or approved equal. Box shall have hinged lockable section. Box shall be sized to fit required backflow preventer by minimum of 6" on each end.
- S. Sprinkler Heads:
1. All sprinkler heads shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw and discharge as shown on the plans and/or specified in these special provisions.
 2. All sprinkler heads of the same type shall be of the same manufacturer.
- T. Sleeves:
1. Definition: a pipe with in another pipe for carrying water will be installed.
 2. Wire sleeve: a pipe used to carry low voltage irrigation wires for operation of electric control valves.

3. All sleeves shall be SCH 40. Size shall be equal to twice the diameter of the pipe or combination of pipes enclosed within the sleeve.

2.2 ACCESSORIES

- A. Primers, cements, solvents, and joint compounds:
 1. General: All primers, cements, solvents, and joint compounds shall be approved for use by the Uniform Plumbing Code; ASTM D 2564 for PVC pipe and fittings. Utilize appropriate type for application required.
 - a. Primer: Weld-On P70 purple primer.
 - b. PVC: IPS Weld-On 721 solvent cement.
 - c. Flexible PVC: Weld-On 795 solvent cement .
 - d. Schedule 80 PVC: Weld-On 705 solvent cement.
 2. Connections for PVC and Metal Pipe: For all threaded connections between PVC and metal pipe use Heavy Duty Rectorseal thread sealing paste with virgin Teflon No. 100 as manufactured by Rectorseal Corp. Apply in accordance with manufacturer's instructions.
- B. Drainage fill: ½" washed pea gravel.
- C. Filter Fabric: Dewitt's weed barrier or approved equal.
- D. Sand Layer: Washed sand.

PART 3 EXECUTION

3.1 INSPECTION

- A. Site Conditions:
 1. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and inform Landscape Architect of his approval prior to proceeding with work under this section.
 2. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by his operations or neglect. Check existing utilities drawings for existing utility locations.
 3. Coordinate installation of sprinkler irrigation materials including pipe, so there shall be not interference with utilities or other construction or difficulty in planting trees, shrubs and groundcovers.
 4. The Contractor shall carefully check all grades to satisfy himself that he may safely proceed before starting work on the sprinkler irrigation system.

3.2 PREPARATION

- A. Physical Layout:
 1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads.
 2. All layout shall be approved by Landscape Architect prior to installation.
 3. Remove existing paving for sleeve installation if required. Saw cut existing paving to provide uniform straight transition at new to existing paving. Replace paving to equal or better conditions.
 4. It is the responsibility of the contractor to verify and locate existing mainline, utilities, etc. for the completion of his work per plans.
- B. Water Supply:
 1. Irrigation system shall be connected to water supply points as indicated on the drawings. It is the responsibility of the contractor to verify and locate existing mainlines, utilities, etc. for the completion of his work per plans.
- C. Electrical Supply:

1. Electrical service is available at the general locations of all controllers. The Contractor shall make the final wiring of the controller consistent with the city code.
2. Connections shall be made at approximated locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

3.3 INSTALLATION

A. Trenching:

1. Prior to trenching, verify the location of all underground site utilities and protect in place.
2. Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted.
3. Provide for a minimum of eighteen (18) inches cover for all pressure supply lines.
4. Provide for a minimum cover of twelve (12) inches for all non-pressure lines.

B. Backfilling:

1. The trenches shall not be backfilled until all required inspections and/or tests are performed.
2. Trenches shall be backfilled with sand bed to 3 inches below pipe and 3 inches above pipe. The remainder of trench shall be backfilled with cleaned excavated material, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Compact trenches to match surrounding soil. Backfill will conform to adjacent grades without dips, sunken areas, jumps or other surface irregularities.
3. If settlement occurs and subsequent adjustments in grade, pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.

C. Trenching and Backfill Under Paving:

1. Trenches located under areas of paving, asphaltic concrete or concrete will be installed shall be backfilled with 3" of sand above and below pipe. The balance of the trench is to be backfilled with flowable fill 1-2 sack cement to the bottom level of finished paving.
2. Compact backfill in layers to 95% compaction, using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The Irrigation Contractor shall set in place, cap and pressure test all piping under paving.
3. General piping under existing walks is done by jacking, boring or hydraulic driving, but where any cutting or breaking of sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as a part of the contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from the Landscape Architect.

D. Sleeves:

1. Extend sleeves a minimum of one foot past edge of pavement or walls. Drive a 24" stake at the location of sleeve. Maintain stake for irrigation contractor.
2. Required sleeving will be provided by the General Contractor or Irrigation contractor as shown on plans.
3. Size of sleeves shall be equal to twice the diameter of the pipe or combination of pipes enclosed within the sleeve.
4. Provide for a minimum cover of eighteen (18) inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic paving.

5. Install sleeves at all areas where piping crosses paving or through walls and as required. All sleeves may not be shown on plans.
 6. Galvanize pipe sleeves installed under building shall be installed with clamps and hangers as necessary to support the weight of pipes and water. Freeze proof sleeves with freeze protection tape.
 7. Drainage structures shall not be used as sleeves.
- E. Assemblies:
1. Routing of sprinkler irrigation lines as indicated on the drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform with the details per plans.
 2. No multiple assemblies shall be installed in plastic lines. Provide each assembly with its own outlet.
 3. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawing or specifications pertaining to specific items required to complete work, perform such work in accordance with industry's best standard practice.
- F. Piping:
1. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent welding methods shall be as recommended by the pipe and fitting manufacturer.
 2. Remove burrs and shavings at cut ends prior to installation. Remove all scrap PVC pipe and fittings from site.
 3. Make plastic to plastic joints with solvent weld joints or slip seal joints. Use solvent recommended by manufacturer. Install pipe fittings in accordance with manufacturer's instructions.
 4. Install pipe with markings facing to the top of trench for ease of observation.
 5. Allow joints to set at least 24 hours before water/compaction pressure is applied to the piping.
 6. Do not use crosses in pipe connections.
 7. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon paste shall be used on all threaded PVC to metal joints. Hand tighten male adapters plus one turn with a strap wrench. Where threaded PVC connectors required, use threaded PVC adapters into which the pipe may be welded.
 8. Line Clearance: All lines shall have a minimum clearance of three (3) inches from each other and from lines of other trades. Parallel lines shall not be installed directly over one another, space minimum of 6" apart. Do not place more than three lines in a single trench.
- G. Drip Assembly:
1. Dripline:
 - a. Install pipe providing for expansion and contraction as recommended by Manufacturer.
 - b. Space drip line tubing four inch (4") maximum from perimeter of planting bed, edge of paving or structure; spacing of laterals shall not exceed distance noted on drawing. Number of laterals indicated on the drawing is the minimum number required; Contractor shall install number of laterals as needed to insure specified spacing between laterals is not exceeded. Comply with the manufacturer's installation guidelines.
 - c. Cut tubing square and remove burrs at cut ends.
 - d. Layout in-line tubing for shrubs and groundcovers so plants receive water within rootball zones.

- e. Layout in-line tubing for trees as indicated on Drawings. Layout in-line tubing for shrubs and groundcovers so plants receive water within rootball zones.
 - f. Install tubing 3" below soil grade. Tubing shall not be installed directly below mulch.
 - g. Staple in-line tubing to ground at 6 foot maximum intervals and within 12 inches of ends and intersections.
 - h. At Existing Trees: Layout in-line tubing on finished grade. Do not trench in RPZ (Root Protection Zone). Staple in place and place mulch as specified.
 - 2. Assembly Using Solvent Weld Joints:
 - a. Do not make solvent weld joint if ambient temperature is below 35 deg F.
 - b. Clean mating pipe and fitting with clean, dry cloth. Apply uniform coat of Weld-On PVC 721 solvent to outside of pipe and inside socket of fitting. Give joint quarter turn and make certain pipe is inserted to full depth of fitting socket.
 - c. Allow joints to set 24 hours minimum before applying pressure to pipe.
 - 3. Assembly Using Distribution Pipe Joints:
 - a. Connect distribution tubing to lateral line using barbed ell fitting.
 - b. Connect fitting to distribution tubing using straight barbed fitting with 1/2 inch threaded end.
- H. Wiring:
- 1. Provide for a minimum cover of eighteen (18) inches for all control wiring.
 - 2. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply wherever possible.
 - 3. Where more than one (1) wire is placed in a trench, the wiring shall be taped together at intervals of ten (10) feet.
 - 4. An expansion curl shall be provided within three (3) feet of each wire connection and each electric control valve. Expansion curls shall be a minimum of 3' in length at each splice connection so that in case of repair, the splice may be brought above the finish grade without disconnecting the control wires.
 - 5. Control wires shall be laid loosely in trench without stress or stretching. Provide expansion joints at 100' intervals by making 5-6 turns around a piece of 1/2" pipe.
 - 6. All splices shall be made with approved wire connector. Use one connector sealing pack per splice.
 - 7. Field splices between the automatic controller and electrical control valves will not be allowed.
 - 8. Install two (2) extra control wires from controller to the remote control valves located the greatest distances from the controller in all directions and label as spare wires. Spare wires shall be a different color than the common and valve wires. Provide a minimum 6' length of wire coiled up in valve box.
 - 9. Where wires leave mainline, install in Schedule 40 PVC conduit. Size as required.
 - 10. Where wires are installed under building, all wires shall be in galvanized steel conduit. Hang conduit with metal straps and hangers as necessary to prevent sagging.
- I. Automatic Controller: Install as per manufacturer's instructions. Remote control valves shall be connected to controller in sequence as shown on the drawings. Watertight seal all wall penetrations.
- 1. Provide rigid conduit from controller to below finished grade to accommodate valve wires. Wires to weather sensors shall also be in rigid conduit. All 90 turns shall have J-boxes installed. Clamp conduit securely to wall. Final approval will be given by Owner.
 - 2. Wiring for Automatic Controller:

- a. 120 volt power provided to the automatic controller shall be the responsibility of the General Contractor.
 - b. Wire controllers per city code. Install wires in liquid tight conduit when wire must be run above the ground. If outdoor mounting is required, all wiring to controller and to power supply will be hard-wired.
3. Contractor shall install controller map.
- J. Weather Sensors: Install weather sensors on weatherproof J-Box fitted with ½" diameter galvanized thread steel nipple to extend 12" minimum beyond fascia/gutter. Install wires to controller in ½" rigid conduit. Clamp conduit securely to wall. All 90 turns shall have J-boxes installed. Final approval of location will be given by Owner. Coordinate with other trades as required to complete work. Do not attach to gutter.
- K. Backflow Preventer: Install backflow preventer providing all clearances as required by applicable codes. Install unions before and after backflow preventer located within vault. Install concrete pad per detail. All lines above grade shall be galvanized steel Schedule 40 piping. Freeze wrap all above ground appurtenances. Leave handles exposed. Bolt box to concrete pad. Allow clearances for maintenance.
- L. Wye Strainer: Install strainer upstream of backflow preventor. Provide all clearances as required by applicable codes. Install in valve box.
- M. Pressure Reducing Valve: Install pressure reducing valve before backflow preventer in separate valve box when existing static pressure as to be verified by Contractor exceeds design static pressure by ten (10) percent.
- N. Electrical Control Valves: Install where shown on drawings and details. When grouped together, allow at least eighteen (18) inches between valves. Install each electric control valve in a separate valve box. Provide unions on both sides of valve.
- O. Manual Valves: Install manual valves per detail. Provide unions on both sides of valve.
- P. Quick Coupler Valves: Install quick coupler valves per detail.
- Q. Sprinkler Heads:
 1. Install the sprinkler heads as designated on the drawings. Sprinkler heads to be installed in this work shall be equivalent in all respects to those itemized.
 2. Spacing of heads shall not exceed the maximum indicated on the drawings or maximum recommended by manufacturer.
- R. Valve Boxes: Install valve boxes over remote control valves with unions showing. Use box extensions and brick supports to raise valve boxes to be level with finished grade.
- S. Dielectric Protection: Use dielectric fittings at connection where pipes and products of dissimilar metal are joined.
- T. Thrust Blocks: All mainline pipe 3" and larger shall have thrust blocks installed at all fittings installed on the main line. Care shall be taken by the Contractor to keep all concrete on the fittings and from joints of pipe. Control, power and valve wires must be kept free of concrete by the Contractor and placed outside of the thrust. Thrust blocks shall be poured against undisturbed ground. No precast thrust blocks will be allowed.
- U. Flushing of System:
 1. After all new sprinkler pipe lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of

sprinkler heads, the control valves shall be opened and full head of water used to flush out the system.

2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Landscape Architect.

3.4 TEMPORARY IRRIGATION

- A. Contractor shall provide and install an above ground irrigation system and equipment/materials as required to establish lawn areas not covered by the automatic irrigation system. It is the contractor's responsibility to install necessary sleeves to provide temporary irrigation. Coordinate with landscape contractor to insure proper coverage for the time required to establish the lawn. Remove temporary irrigation system when lawn is established and accepted by Landscape Architect.

3.5 TEMPORARY REPAIRS

- A. The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

3.6 FIELD QUALITY CONTROL

- A. Adjustment of the System:
 1. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible.
 2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.
 3. Lowering raised sprinkler heads by the Contractor shall be accomplished within ten (10) days after notification by Owner.
 4. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans.
 5. The Contractor shall make minor adjustments in moving or capping of heads as directed in the field by Owner or Landscape Architect as part of this work. Additional cost to Owner will not be accepted.
- B. Testing of Irrigation System:
 1. The Contractor shall schedule with the Landscape Architect a time for the testing of the system.
 2. After installation of electric control valves, test all pressure lines under hydrostatic pressure of 150 lbs per square inch, and prove watertight.
 3. All piping under paved areas shall be tested under hydrostatic pressure of 150 lbs per square inch, and proved watertight prior to repaving.
 4. Sustain pressure in lines for not less than four (4) hours. If leaks develop, replace joints and repeat test until entire system is proven watertight.
 5. All hydrostatic tests shall be made only in the presence of the Landscape Architect, or other representative of the Owner. No pipe shall be backfilled until it has been inspected, tested and approved.
 6. Furnish necessary force pump and all other test equipment.
 7. When the irrigation system is completed, perform a coverage test in the presence of the Landscape Architect, to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans, or where the system has been willfully installed as indicated on the drawing when it is obviously inadequate, without bringing this to the attention of the Landscape Architect. This test shall be accomplished before any planting operations begin.

8. Upon completion of each phase of work, the entire system shall be tested and adjusted to meet site requirements.
9. Test and demonstrate the irrigation system running from the controller.
10. Backflow device shall be tested and certified before substantial completion is issued.

3.7 MAINTENANCE

- A. The entire irrigation system shall be under full automatic operation for a period of two days prior to any planting.
- B. The Landscape Architect reserves the right to waive or shorten the operation period.

3.8 CLEAN-UP

- A. Clean-up shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be swept or washed down, and any damage sustained on the work of others shall be repaired to original conditions.

3.9 FINAL OBSERVATION PRIOR TO ACCEPTANCE

- A. The Contractor shall operate each system in its entirety for the Landscape Architect at time of final observation. Any items deemed not acceptable by the Landscape Architect shall be reworked to the complete satisfaction of the Landscape Architect.
- B. The Contractor shall show evidence to the Architect that the Owner has received all accessories, charts, record drawings, and equipment as required before final inspections can occur.

3.10 OBSERVATION SCHEDULE

- A. Contractor shall be responsible for notifying the Landscape Architect in advance for the following observation meetings:
 1. Pre-Job Conference.
 2. Pipe and sleeving under paving installation.
 3. Pressure supply line installation and testing.
 4. Automatic controller installation.
 5. Control wire installation.
 6. Lateral line and sprinkler installation.
 7. Coverage test.
 8. Final inspection.
- B. When observations have been conducted by other than the Landscape Architect, show evidence in writing of when and by whom these observations were made.
- C. No site observations will commence without as-built drawings. In event the Contractor calls for a site visit without as-builts drawings, without completing previously noted corrections, or without preparing the system for said visit, he shall be responsible for reimbursing the Landscape Architect at his current billing rates per hour portal to portal (plus transportation costs) for inconvenience. No further site visits will be scheduled until this charge has been paid and received.

END OF SECTION

SECTION 32 9119 LANDSCAPE GRADING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Weeding.
- B. Finish grading for lawns
- C. Finish grading for planting areas.

1.02 RELATED REQUIREMENTS

- A. Division 31 Section Site Clearing
- B. Division 31 Section Grading
- C. Division 32 Section Decomposed Granite Surfacing
- D. Division 32 Section: Landscape Work

1.03 DEFINITIONS

- A. Finish Grading: finish grading shall consist of adjusting and finishing soil surfaces with site or imported topsoil, raking grades to a smooth, even, uniform plane. Remove and legally dispose of all extraneous matter off site. Facilitate natural run-off water and establish grades and drainage indicated as part of the contract work.
- B. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 3/4-inches (19 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- C. Finish Grading: Finish grading shall consist of finishing surfaces by raking smoothly and evenly to facilitate natural run-off water, and by removing and disposing of extraneous matter.
- D. Sub-grade: The surfaces upon which additional specified materials are to be placed, prepared, or constructed.
- E. Rough Grade: The establishment of grades to required tolerances.
- F. Finish Grade: Spot elevations (grades) are indicated based on the best available data. Contract Civil Drawings are referenced to provide additional site grading information. It is intended that constant slopes are maintained between spot elevations.
- G. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.04 MATERIAL OWNERSHIP

- A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.05 EXISTING UTILITIES

- A. Stake and mark the location of existing utilities before commencing work.
- B. Retain and protect in operating condition all active utilities traversing the site designated to remain.

1.06 QUALITY ASSURANCE

- A. Finish grade shall conform to contours, grades, lines, and shapes, as indicated on Contract Drawings, with uniform slopes between finish grades or between finish grades and existing grades.
- B. Establish finish landscape grades in a continuous, uniform line, resulting in a uniform surface with no ridges or water pockets.
- C. Finish landscape grade tolerance shall be 0.04-feet plus-or-minus from finish elevations indicated on site drawings.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS:

- A. Topsoil: A natural, fertile, friable soil, free from stones, roots, clods larger than 1" in diameter, noxious seeds, weeds, subsoil, undesirable insects, plant disease or any other natural objects detrimental to

normal plant growth.

1. Silt plus clay content of the import soil shall not exceed 20% by weight with a minimum 95% passing 2.0-millimeter sieve.
 2. Total pore space content on a volume/volume basis shall be at least 15 percent at field capacity.
 3. Permeability rate shall be not less than one inch per hour or more than 20 inches per hour.
 4. The sodium absorption ratio (SAR) shall not exceed 6 and the electrical conductivity (ECE) shall not exceed 2.0 milliohms per centimeter at 25 degrees centigrade.
 5. Soluble boron shall be no greater than 1.0 part per million (mg/l).
 6. Soil pH range shall be 6.0 - 7.9.
 7. Maximum concentration of soluble chloride shall be 150 parts per million.
 8. Maximum concentration of heavy metals shall not exceed the following when the pH is between 6 and 7:
 - a. Arsenic: 1 ppm
 - b. Cadmium: 1 ppm
 - c. Chromium: 5 ppm
 - d. Cobalt: 1 ppm
 - e. Lead: 15 ppm
 - f. Mercury: 0.5 ppm
 - g. Nickel: 2.5 ppm
 - h. Selenium: 1.5 ppm
 - i. Silver: 0.25 ppm
 - j. Vanadium: 1.5 ppm
 9. Petroleum hydrocarbons shall not exceed 100 mg/kg dry soil.
 10. Aromatic volatile organic hydrocarbons shall not exceed 2 mg/kg dry soil.
- B. Obtain imported topsoil from approved local sources.
- C. All topsoil to be used for planting, regardless of whether import or on-site in origin, shall be tested as described in Part 3 of Section 329300.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Verification of conditions: Prior to commencing the finish grading, review the installed work of other trades and verify that their work is complete.
1. Rough Grading: Grading in planting areas (except raised planter areas) shall be established to within plus or minus 0.10 foot prior to beginning of finish grading.
- B. Import topsoil only when necessary to supplement site soil to achieve grades shown on Drawings, or if site soil is unsuitable for planting.

3.02 PREPARATION:

- A. Weeding: Before finish grading, weeds and grasses shall be dug out by the root or sprayed with an herbicide and disposed of off-site. This procedure is outlined in Section 329300-Landscape Work.
- B. Remove debris, roots, branches, weeds, stones, in excess of 1/2-inch (13 mm) in size and clumps of earth that do not break up. Before and during finish grading, remove weeds and grasses, including roots, and dispose off-site.
- C. Remove soil contaminated with petroleum products and legally dispose off-site.

3.03 INSTALLATION:

- A. General: When rough grading and weeding have been completed, and the soil has dried sufficiently to be readily worked, lawn and planting areas shall be graded to the elevations indicated on the Drawings.
1. Grades indicated on Drawing are grades that will result after thorough settlement and compaction of the soil.
 2. Grades not otherwise indicated shall be uniform finish grades and, if required, shall be made at the direction of the Architect.
 3. Finish grades shall be smooth, even, and a uniform plane with no abrupt change of surfaces.
 4. Soil areas adjacent to buildings shall slope away from the building to allow a natural run-off of water, and surface drainage shall be directed as indicated on the drawings by remodeling surfaces to facilitate the runoff water at 2% minimum grade.
 5. Low spots and pockets shall be graded to drain properly.

- B. Drainage: Finish grade with proper slope to drains.
 - 1. Flow lines, designated or not, shall be graded and maintained to allow free flow of surface water.
 - 2. If any drainage problems arise during construction period due to Contractor's work (such as, but not limited to, low spots, slides, gullies and general erosion), the Contractor shall be responsible for repairing these areas to a condition equal to their original condition, and in so doing shall prevent further drainage problems from occurring.
- C. Prior to placing backfill, remove rock, aggregate base, concrete, and deleterious materials to a depth of 18 inches below soil grade in planter areas. Cross-rip subsoil of friable soil to a depth of 12-inches.
 - 1. Place a minimum of [15-inches] of topsoil backfill in planters.
 - 2. Refer to Section 329300 "Landscape Work" for soil materials.
- D. Toe of slope: To prevent soil creep or erosion across pavement, where pavement (walk, curb, etc.) is at the toe of a slope, finish grade is to level out or swale slightly at least 12-inches before reaching pavement.
- E. Moisture Content: The soil shall not be worked when the moisture content is so great that excessive compaction occurs, nor when it is so dry that dust may form in the air or that clods do not break readily. Water may be applied, if necessary, to provide moisture content for tilling and planting operations. It is the Contractor's responsibility to control dust that is spread as a result of grading operations.
- F. Grades: The finish grade in areas to be planted with turf shall be 1-inch below grade of adjacent pavement, walks, curbs, or headers. Finish grade in shrub areas shall be 1 1/2-inches below adjacent surfaces. Exceptions may be made when drainage conditions require flush grades, as directed by the Architect.
- G. Compaction: Soils in planted areas shall be loose and friable, yet firm enough that no settling occurs from normal foot traffic or irrigation.

3.04 FIELD OBSERVATION:

- A. It is the Contractor's responsibility to contact the Architect 48 hours or two working days in advance of each agreed observation or conference.
- B. Schedule for On-Site Reviews: at completion of finish grading and prior to any planting operations.
 - 1. See "Site Observation" in Part 3 of Section 329300-Landscape Work to coordinate inspections and review of work.

END OF SECTION

SECTION 32 9300 LANDSCAPE WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Soil Prep and Fertilization.
- B. Planting Operation.
- C. Planting Materials.
- D. Topsoil and Planter Mix.
- E. Agronomic Testing.
- F. Drainage Materials.
- G. Jute Mesh and Erosion Control.
- H. Mulching.
- I. Sod
- J. Pruning
- K. Root Barriers.

1.02 RELATED REQUIREMENTS

- A. Division 31 Section Site Clearing
- B. Division 32 Section Landscape Grading
- C. Division 32 Section Landscape Irrigation
- D. Division 32 Section Landscape Maintenance

1.03 REFERENCE STANDARDS

- A. American Association of Nurserymen, Inc. (AAN)
 - 1. American Standard for Nursery Stock, latest edition (ANSI).

1.04 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.
- D. Bare-Root Stock: Exterior plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.
- E. Clump: Where three or more young trees were planted in a group and have grown together as a single tree having three or more main stems or trunks.
- F. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.
- G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.
- H. Finish Grade: Elevation of finished surface of planting soil.
- I. Sub-grade Elevations: Excavation, filling and grading required to establish elevations is shown on drawings. Coordinate all work with grading contractor in order to arrive at rough grades that will allow tolerance for topsoil in planting areas, soil amendments and ornamental mulch as required in other sections of this specification. Contractor to assume tolerance of rough grades established at ± 0.09 feet (less than 1 tenths of a foot)

- J. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- K. "Diameter at breast height" (DBH) is measurement for tree trunk caliper.
- L. Multi-Stem: Where three or more main stems arise from the ground from a single root crown or at a point right above the root crown.
- M. Planting Soil: Native or imported topsoil; mixed with soil amendments.
- N. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
- O. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- P. Pruning: As designated on contract drawings. Items not specifically indicated or specified, but normally required to conform with such work, are considered part of the work.

1.05 SUBMITTALS

- A. WITHIN 30 DAYS OF START OF THE ROUGH GRADING OPERATIONS:
 - 1. Submit a certificate indicating all plant material has been secured for the project and is available.
 - 2. Submit documentation that all plant material has been ordered in accordance with Article 1.06 of this section.
- B. CERTIFICATION: Submit the following:
 - 1. Certificates of inspection as required by governmental authorities when transporting materials into the state.
 - 2. Bulk Materials: Submit a certificate of delivery for all material in containers or bulk.
- C. TEST REPORTS: Submit the following:
 - 1. Agronomic Soils Laboratory Test Report(s) including required amendments and maintenance recommendations.
- D. PRODUCT DATA: Submit the following:
 - 1. In accordance with Division 1 Section "Submittal Procedures", submit complete manufacturer descriptive literature and specifications for proprietary materials and any additional items required by the Architect. Prior to start of construction and submittals; furnish to the Architect the list of items to be submitted and reviewed.
 - a. Soil Amendments (as identified in Agronomic Soils Report).
 - b. Fertilizer (as identified in Agronomic Soils Report).
 - c. Plant Tablets.
 - d. Stakes and Guys.
 - e. Tree Ties and Vine Ties.
 - f. Hydroseed Materials.
 - g. Mulch.
 - h. Filter Fabric.
 - i. Drainage Materials.
 - j. Accessory Material.(Root barriers, Tree Grates, Metal edging, Boulders, etc.)
 - k. Other soil additives per Agronomic Soils Report.
 - l. Submit other data substantiating that materials comply with specified requirements. Such certificates may be tags, labels, and/or manufacturers literature. All submittals shall be reviewed and accepted by the Architect before contractor begins work.
 - m. Substitution Request
 - 1) If any plant specified is not obtainable, submit a written substitution request to the Architect during the bidding period.
 - 2) Substitutions of plant material will not be permitted unless accepted in advance in accordance with the provisions of Division 1 Section "Product Requirements."
 - 3) The Contractor is responsible for contract growing all required plant material for to project to ensure availability in the size and requirements of the project.
 - 4) All substitution requests for any material must be made during the bid process. No substitution requests will be permitted after the bid process or during.
 - n. With submittal of Bid Documents, submit complete list of plant materials to be provided, including unit prices for plants and for installation. Include:

- 1) Quantity.
- 2) Size.
- 3) Botanical Name.
- 4) Plant Unit Price.
- 5) Installation Unit Price.
2. PLANTING SCHEDULE: Submit proposed planting schedule at least two months prior to planting any materials, indicating dates for each type of landscape work coinciding with normal seasons for such work. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. If dates need to be revised after acceptance of planting schedule, document reasons for delays and submit for acceptance.
3. Submit two photos of each tree(include DBH, height and spread), shrub(include height and width) and groundcover(include height and width) with a person in the image to be used on the project to the architect for review. Photos are to be of the actual material tagged, or secured and that will be used for the project at the sourced nursery. No plants may be delivered or planted prior to approval by Architect.

1.06 QUALITY ASSURANCE

A. QUALIFICATIONS

1. Nursery Qualifications: Regularly engaged, for the preceding ten years, in the production of planting materials equivalent in species and size to those required.
 - a. Stocked, and having a demonstrated ability to provide plant materials required within the constraints of the accepted construction schedule.
 - b. Landscaper's Qualifications: Regularly engaged and specializing, for the preceding ten years, in the installation and maintenance of planting materials equivalent in species and size to those required.
 - 1) Capable of furnishing a verifiable list of not less than five projects of equivalent type successfully completed within the preceding two years.
 - 2) Subcontracts: Landscape work to a single firm specializing in landscape installation.
2. Pre-Installation Conference: Schedule in advance of beginning work of this section. Arrange for attendance by Owner, Architect, and landscaping subcontractor. Review intent of Contract Documents and resolve conflicts. Prepare minutes of conference and distribute to attendees within five (5) days.
3. Source Quality Control
 - a. General: Comply with regulations applicable to shipping of landscape materials.
 - b. Analysis and Standards: All materials shall be of standard, approved and first-grade quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacture's guaranteed analysis. The Contractor shall supply the Architect with a sample of all materials accompanied by analytical data from an approved laboratory source illustrating compliance of bearing the manufactures guaranteed analysis.
4. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
5. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
 - a. Report suitability of topsoil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.
6. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 3/4-inches (19 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
 - a. Obtain topsoil only from naturally, well drained sites where topsoil occurs in a depth of not less than 4"; do not obtain from bogs or marshes. All topsoil is to be tested and analyzed by an independent laboratory before delivery to site, as indicated in Article 3.03.
7. Contractor shall provide the Architect with location of soil, crops previously planted on such soil within the last two years, and the USGS soil survey classification and name.

8. Trees, Shrubs and Plants: Provide trees, shrubs and plants of quantity, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1-1980 "American Standard for Nursery Stock". Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free from disease, insects, insect eggs, larvae and defects such as knots, sun-scald, injuries, abrasions, overlapping surface roots, or disfigurement. Central leaders of all trees shall be intact, undamaged, with evenly spaced lateral branches.
 - a. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above the ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.
9. Label all trees and shrubs with securely attached waterproof tag bearing legible designation of botanical and common name. Where formal arrangements and consecutive order of trees is shown, select stock for uniform height/spread, and label with number to assure symmetry in planting.
10. Stock Review: The Architect will review trees and shrubs at site before planting with requirements for genus, species, variety, size and quality. The Architect retains right to further review trees and shrubs for size and condition of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of the work. Remove rejected vegetation immediately from project site. Contractor shall request review of such stock by the Architect by delivering notice, in writing, 72 hours in advance.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver exterior plants freshly dug.
- B. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- C. Packaged Materials: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.
 1. Protect plants from sun or drying winds. Protect and maintain plants that cannot be planted immediately upon delivery.
 2. Do not drop plant material.
 3. Do not pick up container planter material by stems or trunks.
 4. Protect from wind.
 5. Water as required.
 6. Do not prune trees and shrubs before delivery except as approved by Architect. Do not bend or bind trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery, and provide protection on site from traffic, pedestrians, and deleterious effects of climate while planting operations are in progress. Dropped or damaged stock will not be accepted.
 7. Deliver trees and shrubs after preparations for planting have been completed and plant immediately after approval of plant materials locations. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture. Do not remove container grown stock from containers until planting time.
 - a. Do not pick up plants by stems or truck. Handle planting stock by root ball.
 - b. Do not remove container - Grown stock from containers before time of planting.
 - c. Water root systems of exterior plants stored onsite with a fine-mist spray.
 - d. Water as often as necessary to maintain root systems in a moist condition.
 8. Plant material shall not be stored on the jobsite for more than 48 hours before planting. Contractor shall schedule nursery deliveries in sub-groups as necessary to comply with this requirement.
 9. Deliver accessory materials in manufacturer's original, unopened packaging with identifying labels affixed and legible in accordance with state law. Deliver plants with identifying tags affixed. Contractor shall notify Architect 72 hours in advance of plant material delivery for observation. Review plants with Landscape Architect to confirm that they are the plants which had previously been tagged and supplied. The Architect reserves the right to reject the following:
 - a. Plant materials not identifiable as previously selected.
 - b. Materials not accompanied by required certificates.
 - c. Plant materials where damage to rootball, trunks, or desiccation of leaves has been caused by inadequate protection during delivery.

- d. Plant material not matching the form, shape, or growth habit required for the design intent of the Project.
- e. Horticultural or visual defects in material.
- f. Plant material pruned prior to delivery.
- g. Plant material with detrimental pests.

1.08 PROJECT CONDITIONS

- A. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.
 - 1. Planting Restrictions: Coordinate planting periods with maintenance periods to provide required maintenance from date of substantial completion.
 - a. Plant or install materials during normal planting seasons for each type of landscape work required.
 - 2. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed without having detrimental effects on the plant material, or finished product.
 - 3. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns unless otherwise acceptable to Architect.
 - a. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.
 - 4. Contractor shall verify locations of all existing utilities, whether shown on plans or not. The Contractor shall notify members of Underground Service Alert (DigAlert) two (2) working days in advance of performing any excavation work by calling the toll-free number 1-800-227-2600 or 811.
 - 5. After determining location of underground utilities, perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
 - 6. When conditions detrimental to plant growth are encountered, such as rubble fill, hardpan condition, adverse drainage conditions, or obstructions, notify the Architect before planting. Remove all material deemed unsuitable for plant growth as directed by the Architect.
 - 7. No landscape materials may be planted before an irrigation operation and coverage test is completed by the Architect.
 - 8. No landscape materials may be planted before finish grade is reviewed by the Architect.
 - 9. Existing Trees:
 - a. Prior to the beginning of any clearing, grubbing, trenching, or excavation on site, the general contractor, grading contractor, project arborist, landscape contractor, and the Architect shall meet in a pre-construction conference to discuss grading near existing trees.
 - b. The contractor shall protect all existing trees and shrubs scheduled to remain against injury or damage, including cutting, breaking or skinning of roots, trunks or branches. No blasting of rock shall occur in any area adjacent to existing trees without prior written consent of the Architect.
 - c. No trees or shrubs are to be removed, trimmed, or cut without prior approval of the Architect.
 - d. Prior to the beginning of the clearing and grading phase of the project, a continuous, temporary, six foot (6') high chain link fence shall be erected around the drip line of all trees scheduled to remain, unless otherwise specified by the Architect. The temporary fencing shall be erected prior to commencing any other work on the project. No construction activity shall be allowed within the limits of this fencing unless directed by the Architect. The temporary fencing shall remain in place during the entire construction period and shall not be removed until directed by the Architect.
 - e. Grading beneath trees to be saved shall be given special attention. Every effort shall be made to avoid creating conditions adverse to the tree's health. The natural ground within the drip lines of trees to be preserved shall remain as undisturbed as possible. Grading within the protected root zone of trees to be preserved will not be permitted unless specifically approved by the Architect prior to beginning of proposed grading.
 - f. If during construction or grading (grading, excavation, etc.) tree roots of 2" in diameter or greater are encountered, work shall stop immediately and a Certified Arborist, approved in advance by the Architect, shall be contracted for a root inspection. Root cutting of any roots over 2" in diameter must have prior approval from the Architect. All cuts are to be made with appropriate equipment, as to not affect the plant material.
 - g. Major roots one inch (1") or greater in diameter encountered within the drip line of the tree in the course of excavation or trenching shall not be cut and shall be kept moist and covered with earth as soon as possible. Shredding of roots or damaged caused by trenching or grading

equipment is not permitted.

- h. Roots one half inch (1/2") to one inch (1") in diameter which are severed shall be trimmed cleanly and covered with earth as soon as possible.
- i. All trenching beneath the drip line of trees to remain shall be done with hand tools only. No mechanical trenching or excavation is allowed within the drip line of existing trees at any time, or where roots are encountered outside the dripline of the tree.
- j. Branches interfering with construction but not designated for removal may be removed only as directed by the Architect.
- k. Any pruning, cutting, or trimming of any trees will be performed by an International Society of Arboriculture Certified Arborist or certified tree worker or in accordance with the National Arborist Association and/or International Society of Arboriculture pruning standards. Cutting of 2" diameter limbs or greater or major dead wooding shall require approval of the Architect.
- l. Trees or shrubs scheduled to remain and damaged by construction operations shall be repaired by the contractor in a manner acceptable to the Architect. Damaged trees and shrubs shall be repaired promptly to prevent progressive deterioration. Repair or replacement of trees and shrubs shall be at the contractor's expense as determined by the Architect. Contractor shall be held fully liable for damage caused to trees and shall be assessed fees based on the International Society of Arboriculture "Guide for Plant Appraisal", as determined by the project Arborist; fees will be assessed for: 1) any injury to the trunk, limbs, or root system, and (2) for the value of any tree requiring removal subsequent to injury or treatment that varies from these Specifications.
- m. A permit from the City Arborist may be required prior to pruning or removing any trees, as required by applicable codes or ordinances.
- n. Parking of vehicles, equipment or storage of materials under the drip line of existing trees shall not occur at any time.
- o. Wash all existing and new trees weekly to remove dust and debris during construction.

1.09 SCHEDULING

- A. Within 30 days after the commencement of initial grading, furnish documentation to the Architect that all plant material has been secured for the project and is available. Contractor shall be responsible for payments and deposits required by the grower or plant consultant to secure, maintain, and grow plant material indicated on the Contract Drawings.

1.10 WARRANTY

- A. Special Warranty: Warrant all plant material in writing where installer agrees to repair or replace plantings and accessories that fail in materials, workmanship or growth within specified warranty period.
 - 1. Failures include, but not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, abuse by owner.
 - b. Structural failures including plantings falling or blowing over including during high wind events.
 - c. Faulty operation of tree stabilization edgings tree grates.
 - d. Deterioration of metals, metal finishes and other materials beyond normal weathering.
 - e. Material not thriving.
 - f. Warranty periods begin from date of final completion:
 - 1) Trees, vines, shrubs: One year.
 - 2) Ground cover and turf: One year.
 - 2. Warrant plant material, installed, or relocated under the contract, in writing, for a period of one year (after beginning of maintenance period) against defects including death, and unsatisfactory growth, except for defects resulting from neglect, abuse or damage by others.
 - 3. Remove and replace trees, shrubs or other plants found to be dead, yellowing, defoliating, or in unhealthy condition, or other defective materials during warranty period at no additional cost to the Owner. Replace trees and shrubs, which in the opinion of the Architect, are in unhealthy condition at end of warranty period. The Architect shall be the sole judge as to the condition of the material. All replacement materials and installation shall comply with the drawings and specifications. Another inspection may be conducted at end of warranty period to determine acceptance or rejection.
 - 4. Upon receipt of written notice from Owner of the loss of any warranted plant materials during the warranty period, the subject plant materials shall be promptly replaced with the same species originally planted, and of a size closely approximating the size of the plant, if normal growth had occurred since the original planting. Replacements shall be subject to the requirements of this specification.

5. When plants are replaced, advise the Owner, in writing, of the new establishment maintenance period equal to the one year.
6. Plant material must be replaced within ten (10) days of written notification, and shall be installed in accordance with these specifications.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Design is based on the use of products manufactured by the following.
- B. Texas
 1. MacLean Civil Products, Fort Mill, SC 800-925-5360.(check for local distributor)
 2. Landscape Forms, represented by
 - a. Lara Moffat, 269-337-1309 (Dallas)
 - b. Melissa Henao Robledo 269-337-1307 (Central & South Texas)
 3. Materials shall be the products of one manufacturer and shall be either the ones upon which the design is based, or the products of manufacturer accepted in advance. No substitutions will be permitted.

2.02 SOIL

- A. TOPSOIL: Site to be rough graded to elevations shown on Civil Drawings. Topsoil will be required behind curb areas and in planting area. Provide on-site, import, or non-processed topsoil in planting areas as needed to complete rough grading which is fertile, friable, and natural loam in accordance with Article 2.3. Topsoil shall be from agricultural sources, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 3/4-inch in any dimension, and other extraneous or toxic matter harmful to plant growth.
- B. All topsoil to be used for planting, regardless of whether import or on-site in origin, shall be tested as described in Part 3 of this Section.

2.03 SOIL AMENDMENTS

- A. The initial application of fertilizers and amendments to be tilled into the soil during soil preparation operations shall be established after soil testing has been conducted by Contractor. An estimated quantity is indicated below for bid purposes only. This estimated quantity does not include mulching, fertilizer tablets, additional topsoil necessary to meet specified grades and fertilizer applications for after planting. After soils analysis recommendations are made to the Architect quantifying the actual amount of amendments required and recommendations have been accepted by the Architect, the Contractor shall, without delay, determine any cost impacts whether credit, no change, or addition, to the Contract Amount. As an integral part of the bid for Landscape Work, provide a Lump Sum bid amount for fertilizers and amendments as described below.
- B. Application Rates (FOR BID PURPOSES ONLY):
 1. Sixty (60) lbs. of Tri-C Humate per 1,000 square feet.
 2. Nineteen (19) lbs. of 6-20-20 fertilizer per 1,000 square feet.
 3. Six (6) cubic yards of Aguiñaga GPS2, nitrogen stabilized compost per 1,000 square feet.
 4. 50-lbs Agricultural Gypsum, per 1,000 square feet.
- C. Actual amendment rates and type shall be per soil test recommendations.
- D. Imported Topsoil
 1. Provide natural, fertile, friable soil free from stones, noxious weeds, seeds, roots, subsoil or other material detrimental to normal plant growth. Topsoil acidity range (pH) shall be between 6.5 and 7.5 containing a minimum of 4 percent and a maximum of 25 percent organic matter.
 2. Reuse surface soil stockpiled onsite. Verify suitability of stockpiled surface soil to produce top soil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain top soil displaced from naturally well drained sites where topsoil occurs at least 4 inches deep; do not obtain from [agricultural land], bogs or marshes. Obtain soil from local sources acceptable to the Architect.
 - b. Silt plus clay content of soil shall not exceed 15 percent by weight with a minimum 95 percent passing a 2 millimeter sieve.
 3. Obtain imported topsoil from local sources acceptable to the Architect.

4. Silt plus clay content of soil shall not exceed 15 percent by weight with a minimum 95 percent passing a 2-millimeter sieve.
- E. Organic soil amendment:
 1. "Nitrified Redwood Compost": 0.56 to 0.84% N based on dry weight, treated with relative form of nitrogen (NH₃).
 - a. Particle Size
 - b. 95% - 100% passing 6.35 mm standard sieve.
 - c. 80% - 100% passing 2.33mm standard sieve.
 - d. Salinity: The saturation extract conductivity shall not exceed 3.5 millimhos/centimeter at 25 degrees (25N) centigrade as determined by saturation extract method.
 - e. Iron Content: Minimum 0.08% dilute acid soluble Fe on dry weight basis.
 - f. Ash: 0 - 6.0% (dry weight)
 - g. Acidity range (ph) shall be between 5.5 and 7.5.
 - h. Actual organic content shall be a minimum 280 pounds (lbs.) per cubic yard.
 - i. As available from: Redi-Grow Corporation, 909 Elder Creek Road, Sacramento, CA 95828
 2. Organic soil amendment shall be Aguinaga GPS2.
 3. Particle Size:
 - a. 90-100 percent passing 6.35 mm standard sieve.
 - b. 80-100 percent passing 4.75 mm standard sieve.
 4. Salinity: The saturation extract conductivity shall not exceed 6.5 milliohms/centimeter at 25 degrees Centigrade as determined by saturation extract method.
 5. Iron Content: Minimum 0.08 percent dilute acid soluble iron on dry weight basis.
 6. Actual organic content shall be a minimum of 280 pounds (lbs.) per cubic yard.
- F. Fertilizers
 1. Tri-C Humate. Provide per manufacturers specification.
 2. Fertilizer Tablets: Fertilizer Tablets: The following is to be used in the planting of container grown material. Follow manufacturer's application rates.
 - a. Best-Paks "20-10-5" fertilizer packets. Packets to be made up of a minimum of 20% Nitrogen, 10% Phosphorus, 5% Potash. Use 1 Pak per 1-gallon container, (G.C.), 3 Paks per 5 G.C., 9 Paks per 15 G.C. and 12 Paks per boxed specimen. Evenly distribute as shown in details.
 3. Commercial Fertilizer: First Quality Commercial Fertilizer, as specified in Agronomic Soils Report.
- G. Related Materials:
 1. Pre-Planting Herbicide: Phydura, or equal.
 2. Pre-Emergent Weed Control: Ronstar-G, Treflan, Eptam, Vegitex, or equal.
 3. Peat Moss: Sphagnum peat moss, Canadian or European variety, free from alkali.
 4. Soil Sulfur: First quality commercial grade.
 5. Ferrous Iron Sulfate: Chelated first quality commercial grade.
 6. Agricultural Gypsum: First quality commercial grade.
 7. Best "Ammonium Phosphate" 16-20-0 with net less than 16% total nitrogen, 20% available phosphoric acid and 0% soluble potash.
 8. Good Humus.
 9. Root Hormone: Super Thrive.

2.04 PLANT MATERIALS

- A. Quality: Provide trees, shrubs, and other plants of size, form, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock".
- B. Deciduous Trees: Provide trees of height and caliper scheduled or shown and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are shown or listed.
 1. Lateral scaffolds shall be radially distributed around the trunk. The lateral branch shall be no more than 2/3 the diameter of the trunk. Trunk to be measured 1" above the branch (lateral scaffold).
 2. The minimum acceptable length of the most recent season's shoot growth for slow growing trees shall be not less than 8"; for fast growing trees not less than 12".
 3. The minimum acceptable height of trees is 6'-0" when planted, or as determined by Architect.
- C. Needle Leafed and Broad Leafed Evergreen Trees: Provide evergreens of sizes shown or listed. Where dimensions are shown, they indicate minimum spread for spreading and semi-spreading type evergreens

and height for other types, such as globe, dwarf, cone, pyramidal, broad upright, and columnar. Provide normal quality evergreens with well-balanced form complying with requirements for other size relationships to the primary dimension shown.

- D. The minimum acceptable height of trees is 6'-0" when planted, or as determined by Architect.
- E. Multi-Trunk Trees: Provide sizes shown or listed. Tree is to have a minimum of three (3) dominant trunks with appropriate caliper size and adequate spread.
- F. Shrubs: Provide shrubs of the size shown and with not less than the minimum number of canes required by ANSI Z60.1 for type of shrub required. Provide container grown stock.
- G. Ground Cover: Provide plants established and well-rooted in removable containers, in flats, or integral peat pots and with not less than minimum number and length of runners required by ANSI Z60.1 for the size shown or listed.
- H. Vines: Provide vines with good, well-established root systems within the container, and devoid of any abrasions, and or damage to stem.

2.05 SOD

- A. Lawn Sod:
 - 1. Nursery-grown sod shall have the following characteristics:
 - a. Sod for planting areas shall be dense, healthy, field-grown on sand fumigated soil with the grass having been mowed at 1-inch height before lifting from field.
 - b. Sod for grass pave areas shall be dense and healthy, grown on a sand bed thin cut and washed.
 - c. Sod shall be dark green in color, relatively free of thatch, free from disease, weeds and harmful insects.
 - d. Sod shall be reasonably free of objectionable grassy and broadleaf weeds. Sod shall be considered weed free if no more than 2 such weeds are found per 100 square feet of sod.
 - e. Sod shall be rejected if found to contain the following weeds: common Bermuda grass, quack grass, Johnson grass, nimble weed, thistle, bindweed, bentgrass, perennial sorrel, and brome grass.
 - f. Sod variety shall be: Contract Drawings

2.06 MISCELLANEOUS LANDSCAPE MATERIALS:

- A. Tree Stakes: Provide stakes of sound new lodgepole pine 2 inch minimum diameter for tree caliper smaller than 3 inches; 3 inch minimum diameter for 3 caliper caliper and larger. Lodge pole minimum height, as indicated on Contract Drawings. Stakes shall have been treated with copper naphthanate or ACQ (alkaline) or Ca-B (copper azole) to a minimum wood depth of 1/16". All stakes shall be free of knots larger than 1/2" in diameter, holes and other defects.
- B. Tree Straps: Provide VIT black tree straps. Tree straps shall be attached to tree stake as shown in staking detail on the plans, color to be black.
 - 1. VIT "Cinch-Tie" for tree caliper smaller than 3 inches
 - 2. VIT "Cinch-Belt" for 3 inch caliper size and larger tree.
- C. Guying Materials
 - 1. At On-Grade Planting:
 - a. Anchor System: Duckbill Earth Anchor System, as manufactured by MacLean Civil Products, Inc.
 - 1) Model number per manufacturer recommendations based on tree caliper size.
 - b. Hose: White neoprene hose, 3/4-inch diameter, covering the entire length of wire rope.
- D. Mulch
 - 1. Bark Mulch:
 - a. Mulch shall be shredded bark mulch.
 - 1) Mulch shall consist of shredded bark mulch with a particle range of 2-3/4-inch to 1-inch in size.
 - 2. Weed Control Fabric: Place Mirafi Mirascape landscape fabric below rock mulch or as shown on drawings. Overlap all seams 12" minimum and pin down every 36" typical. Mirascape fabric available from: Towns & Associates, 800-222-6036
- E. Root Control Barriers: High-density polypropylene root control planter. Acceptable products include:
 - 1. Deep Root; Deep Root Corporation.

2. Size as specified on drawings.
 3. Length: 10 feet long per tree.
- F. Drainage Materials
1. Gravel in raised planters on structural slab and in pots shall be clean, coarse 3/8-inch to 3/4-inch diameter.
 2. Gravel for tree drainage shall be 3/4" diameter coarse clean gravel.
 3. Synthetic filter membrane cover over drainage course shall be woven synthetic fabrics.
 - a. Model 140N, as manufactured by Mirafi.
 4. Drain Pipe at trees: 4-inch diameter PVC perforated(within gravel), and non-perforated PVC drain pipe(stand pipe) with PVC adaptor connected to 4-inch ABS female reciever with 4-inch black ABS cleanout plug.
- G. Sand: Washed plaster sand.
- H. Jute Netting: A uniform open plan weave, single jute yarn not varying in thickness by more than 1/2 of its normal diameter, in rolled strips approximately 50 to 75 yards long and 50 to 60 inches wide. Contractor shall submit sample for approval prior to installation.
- I. Staples: 11 gage with 1-inch top and 6-inch legs.
- J. Sod Pegs: 1-inch square by 6-inch long pine or 6-inch lengths of lath.
- K. Weed Control: Phydura, or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected, and Architect has reviewed and accepted materials as defined within the section.

3.02 SITE OBSERVATION SCHEDULE

- A. General: Notify Landscape Architect at least 3 days in advance when requesting on-site reviews.
- B. Prior to commencement of site visits, items noted in previous observation reports shall have been either completed or remedied, unless such compliance has been waived. Failure to complete prior tasks or failure to prepare adequately for scheduled observations shall obligate Contractor to reimburse Architect for additional hourly services, plus transportation costs
- C. Schedule For On-Site Reviews by the Landscape Architect:
 1. Pre-construction conference with general contractor, grading contractor, landscape contractor, project arborist and landscape architect to discuss grading and protective measures to be followed in the vicinity of existing trees, or existing structures.
 2. At completion of finish grading, and roto-tilling
 3. Review of irrigation coverage prior to installation of any planting material.
 4. At completion of fine grading and at delivery of plant materials, together with plant layout; prior to excavating pits.
 5. Review of drainage system, standpipes, and plant material locations.
 6. After planting pits have been excavated, but prior to backfilling. Provide one sample plant pit mock up for review.
 7. After initial planting operations (One tree with each type of specified staking shall be approved prior to planting of trees).
 8. Stake all tree locations for review.
 9. See "Final Review and Acceptance" at the end of Part 3 in this Section for final site observations and acceptance of work.

3.03 TESTING

- A. Planting Soil: Agronomic Soil Testing
 1. Test shall be paid for by the Contractor. (TX) Testing lab shall be:
 - a. Texas A&M AgriLife Extension, College Station, TX.
 2. Agronomic Soils Testing
 - a. Take 4 samples of site soil at a depth of 6 to 12 inches, within proposed planting areas, after completion of final grading and prior to weed control and soil preparation. Refer to Planting

Plan for locations.

- b. Take samples to agronomic soils testing laboratory indicated above for soil evaluation.
- c. Request testing for fertility and suitability analysis with written recommendations for soil amendment, fertilizer and chemical conditioners, application rates for soil preparation, planting backfill mix, pot-soil mix, hydro-spray, and post-maintenance fertilization programs.
- d. Soils report recommendations shall take precedence over the amendment and fertilizer application rates specified in this section.
- e. Submit testing laboratory's interpretation, recommendations, and comments to Architect within 14 days after the completion of rough grading.
- f. Furnish a soils analysis of import soil, and organic soil amendment prior to backfill.
 - 1) Submit soil testing laboratory's findings to Architect within 5 days prior to backfilling.
- g. Take four additional soil samples after completion of planting in the soil preparation and backfill mix areas, to be determine effectiveness to amendments prior and during planting. Submit to the testing laboratory the original amendment specification with previously issued bulletins for soil amendments and installation procedures. Re-apply necessary amendments based on recommendation of new soils test.

3.04 PREPARATION

A. Final Grades

1. Finished grading shall insure proper drainage of the site. Conform to Division 31 Section "Earthwork" and Division 32 Section "Landscape Grading."
2. The following areas shall be graded so that the final grades shall be established below adjacent paved areas, sidewalks, valve boxes, headers, clean outs, drains, manholes, etc. before placement of mulch as follows:
 - a. Shrub/Groundcover Areas: 2-1/2 inches.
 - b. Turf areas: 1-inch.
 - c. Surface drainage shall be away from all building foundations, 2% minimum.
 - d. Dispose of excess or unacceptable soil from the site at no expense to the Owner.
 - e. Verify that final grades have been established prior to beginning planting operations.
3. Parking Lot Planters and areas adjacent to hardscape.
 - a. All aggregate base rock, lime-treated soil, soil sterilents, and other non-organic materials shall be removed from all parking lot planter areas down to the level of native soil. Scarify native soil to a depth of 12 inches and backfill planters to specified finish grade with native or approved topsoil and amend as specified.
 - b. Remove all concrete overpours or any material that may prohibit the placement of plant material, irrigation, grates, root barriers, or any other conflicting material.
4. Lightweight soil mix shall be sampled after mixing and delivery to the site, but prior to filling planters. Submit the original lightweight soil specification to the testing laboratory with previous bulletins for lightweight soil mix. Provide 1-quart of lightweight soil mix for every 65 cubic yards for organic and fertility analyses. Fertility analysis, recommendations and interpretations shall be furnished by the testing laboratory to ensure all specified amendments have been provided. Lightweight soil is to be used only in locations indicated on the Contract Drawings and as approved by the Architect.
5. Protect planting areas from compaction by foot, trucks and heavy equipment.

3.05 PLANTING BED ESTABLISHMENT

A. Preparation Of Planting Area

1. Cross-rip on-grade planting areas to a minimum depth of 12 inches minimum 2 perpendicular directions. Remove stones over 1/2 inch (13mm) in any dimension and sticks, roots, rubbish and other deleterious matter per Division 32 "Landscape Grading".
2. Where additional soil is needed, place the top 15" with topsoil. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil.
3. Leach soil prior to amending.
4. After approximate finished grades have been established and soil has been leached, soil shall be conditioned and fertilized in the following manner: Soil condition shall, at the rate specified in the approved soils test recommendations, be uniformly spread and cultivated thoroughly by means of mechanical tiller into the top (8) eight inches of soil.
5. Broadcast soil amendments uniformly over surface of the area to be treated. Roto-till the top (8) eight inches of planting areas to evenly distribute the amendments and conditioners into the soil.
6. Retest as required to verify leaching was successful. All soil areas shall be compacted and settled by application of irrigation to a minimum depth of six (6) inches prior to any plant materials being

- installed.
7. At time of planting, the top 12 inches of all areas to be planted shall be free of stones, stumps, or other deleterious matter one 1/2 inch in diameter or larger, and shall be free from all debris, or similar objects that would be a hindrance to planting and maintenance.
 8. Weed Eradication:
 - a. Manually remove all existing vegetation in planting areas and dispose of it offsite.
 - b. Fertilize planting areas with urea 30-0-0 commercial fertilizer at the rate of 0.5 pounds per 1000 square feet.
 - c. Water planting areas thoroughly and continuously (by irrigation system, hand/hose, water truck, or other) for a period of 3 consecutive weeks, or until the weed seed have germinated. If accepted in advance by the Landscape Architect, employ a specific watering duration and frequency program designed to germinate residual weed seeds.
 - d. Discontinue watering process for 2 days. Then apply a non-selective broad spectrum systemic herbicide for perennial weeds. (2 applications minimum) The type of herbicide to be used shall be determined by a licensed pest control applicator. If annual weeds are present, use straight contact herbicide in accordance with pest control applicator's recommendations.
 - 1) Do not use a pre-emergent herbicide.
 - e. Allow sufficient period of time to ensure that weeds are dead. Follow herbicide manufacturer's directions.
 - f. Water planting areas thoroughly and continuously (by irrigation system, hand/hose, water truck or other) for a period of 3 weeks. A shorter watering period may be permissible at the discretion of the Landscape Architect. Discontinue watering process for 1 day prior to the second application of the herbicide spraying. (2 applications minimum) Re-apply the spraying operation with straight contact weed killer in accordance with pest control adviser's recommendations.
 - 1) Do not use a pre-emergent herbicide.
 - 2) Avoid irrigation for a minimum of 4 days for effective final weed kill.
 - g. Clear desiccated weeds from the area.
 - h. Water Planting areas thoroughly and continuously for 3 consecutive days to saturate upper layers of soil prior to planting operations.
 - i. Allow planting area soil surface to dry out for 1 day only prior to the planting application. Exercise care to not allow the soil surface to be either super-saturated with water or bone dry prior to the planting installation. Ensure moderate residual moisture within the top 1/4 inch of the soil surface.
 - j. The hydraulic equipment used for pesticide applications shall consist of an ISO-gallon minimum capacity fiberglass tank with complete mechanical agitation. The pump capacity shall be 10 gallons per minute while operating at a pressure of 100 pounds. Per square inch.
 - k. Distribution lines shall be large enough to carry the volume of water necessary for even, chemical distribution. The spray nozzle must cover a 15-foot swath, with a minimum output of 5 gallons per minute at 80 pounds per square inch.
 9. Pre-emergent Weed Control: Immediately after planting, apply pre-emergent weed control to planted areas which will not be seeded.
 10. Excavation For Trees And Shrubs
 - a. Excavate pits, beds, and trenches as shown in details on the drawings.
 - B. Preparation for Lawn Areas: Limit preparation to areas which will be planted promptly after preparation.
 1. Prepare planting area as described in 3.05 A.
 2. Fine grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll, rake and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Establish smooth uniform surface. Limit fine grading to areas which can be planted immediately after grading.
 3. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.
 4. Restore lawn areas to specified conditions if eroded or otherwise disturbed after fine grading and prior to planting.

3.06 JUTE MESH

- A. Make check slots before the netting is rolled out. Dig a narrow trench across the slope perpendicular to the direction of the flow. Fold jute, the same length as the trench, and press together. Location of check slots shall be a maximum of 50 feet apart.
- B. Installation: Roll netting parallel to slope contours. The netting shall completely cover all areas as indicated on Contract Drawings. Overlaps shall be ample and well stapled.

1. Lay netting smoothly, and in continuous contact with the soil surface at all points.
2. Install without stretching. Where one roll of netting ends and a second roll starts, the up slope piece shall be brought over the buried end of the second roll so that there is a 12-inch overlap. Where two or more widths of netting are applied, side by side, the overlap shall be not less than 3 inches.
3. Staple overlapping edges that run parallel to the direction of the flow at 2-inch intervals. Outside edges, centers, and overlaps on banks shall be stapled across the slope at 6-inch intervals.
4. Top dress jute netting area with a thin layer of topsoil. After the top dressing, the yarns shall still be visible.
5. Spread loose topsoils over outside edges of netting to allow for smooth entry of water.
6. Clods that hold the jute off the ground shall be stamped into the soil. Force jute netting down into depressions and hold there with a staple.
7. Install plant material through netting.
8. Maintenance: Maintain jute netting until work on the Project has been completed and accepted and during the 90-day maintenance period. Maintenance shall consist of the repair of eroded areas and the repair or replacement and re-stapling of loose or undermined netting. Replace damaged planting materials as required.
9. Install jute netting in all areas of 30 percent slope or greater.

3.07 SOD

- A. Sod shall be laid with closely fitted joints on a smooth, level surface which has been prepared as previously specified. Ends of strips shall be staggered. On irregular areas, sod shall be laid in both directions from the longest straight line that can be drawn through the area.
- B. After a light initial watering immediately after installation, the sod shall be rolled to eliminate all irregularities.
- C. After compaction, the sodded area shall be wetted to a soil depth of at least 8 inches.
- D. Sod shall be as specified on the Contract Drawings
- E. Protect sod from pedestrian traffic for 21 days and from sports activity for 6 weeks.
- F. Sod is to be rolled minimum two times or as often as required in two directions with a water ballast roller to remove variations in grade. Sand infill all depresses. Sand to comply with turf manufacturer recommendations.
- G. Sod is to be machine placed from "Big Rolls".

3.08 PLANTING

- A. General
 1. Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice, as approved by the Architect.
 2. Only as many plants as can be planted and watered on that same day shall be distributed in a planting area.
 3. Container shall be opened and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken and they shall be planted and watered as herein specified immediately after removal from the containers. Containers shall not be opened prior to placing the plants in the planting area.
- B. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas and secure acceptance by the Architect before start of planting work. Make minor adjustments as may be requested.
- C. Excavation for Trees and Shrubs:
 1. Excavate pits, beds and trenches as shown in details on the Drawings.
 2. Roughen and score edges of planting pit to eliminate any glazing of the sides of the pit.
 3. Field Samples: Prior to planting, prepare one plant pit with standpipe, gravel, filter fabric, and root barriers for each tree size to be reviewed by the Architect.
 4. Do not cover standpipes.
 5. Excavation for planting shall include the stripping and stockpiling of all acceptable topsoil encountered within the areas to be excavated for trenches, tree pits, plant pits, and planting beds.
- D. Container Removal
 1. Cut containers on two sides with an acceptable cutter. Do not cut containers with spade or ax. Do not injure the rootball.

2. Carefully remove plants from containers without injury or damage to rootball.
 3. After removing plants, superficially cut edge roots with knife on three sides.
 4. For plants with sensitive roots, place container intact in flat pit $1\frac{1}{2}$ times the size of a standard plant pit. Insert blades of sharp, needle-nose shears into a drain hole and cut the container bottom away. Remove bottom from pit. Follow with a cut down one side of the container from top to bottom. Repeat cut on opposite side. Fill plant pit with prepared plant pit mixture. Carefully remove the detached pieces.
- E. Box Removal:
1. Remove bottom of planting boxes before planting.
 2. Remove sides of box without damage to rootball after positioning plant and partially backfilling.
- F. Planting Trees and Shrubs: Set container-grown stock, plumb and in center of pit or trench. Set top of rootball 2-inches above finish grade at trees, 1-inch above finish grade at shrubs, or as indicated on Contract Drawings. Do not use plant, if root system has severely kinked or circling roots, or if rootball is cracked, disturbed or broken. If root system is healthy, loosen spiraling roots and set in plant pit.
- G. Planting pit shall be backfilled with the following soil conditioner and organic amendment, per cubic yard:
1. Application Rates, (FOR BID PURPOSES ONLY) as determined by contractor's soils tests:
 - a. Potassium Sulfate - 0-0-50, $\frac{1}{4}$ -pound
 - b. Single Superphosphate - 0-20-0, $\frac{1}{4}$ -pound
 - c. Ammonium Sulfate - 21-0-0, $\frac{1}{4}$ -pound
 - d. Compost - 15% by volume
 - e. Agricultural Gypsum - 1.5 pounds
 - f. Good Humus - 15% by volume
 2. Final amendments and rates are to be determined by Agronomic Soils Test.
- H. When set, place additional fill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately $\frac{1}{2}$ -full, place appropriate number of fertilizer tablets and complete backfill operations.
- I. After backfilling, an earthen basin shall be constructed around each plant. Each basin shall be as indicated on the Contract Drawings. Basin shall be of a size suitable for the individual plant. In no case shall the basin for fifteen (15) gallon plant be less than four (4) feet in diameter; a five (5) gallon plant less than three (3) feet in diameter. The basins shall be constructed of amended backfill materials, and shall not be constructed for trees in turf areas.
- J. Repeat watering until no more is absorbed.
- K. Apply pre-emergent herbicide as per manufacturer's recommendations to all shrub and ground cover planting areas after planting.
- L. Mulch all planted areas that do not receive jute netting, other than lawn areas, at not less than 3" thickness of mulch.
1. Areas with 30% slope and greater shall be protected with jute mesh.
- M. Equally space and align trees and shrubs in both directions where designated on Contract Drawings.
- N. Pull bark mulch three (3) inches away from the rootballs of all plants to insure proper air circulation.
- O. Prune, thin out and shape trees and shrubs in accordance with standard horticultural practices. Prune trees and other plantings only if required. Pruning shall be limited to remove injured wigs and branches, and to compensate for loss of roots during transplanting, but never exceed $\frac{1}{3}$ of the branch structure. Never prune without prior review with Architect.
- P. Prune shrubs to retain natural character. Unless directed by the Architect, do not prune leaders or apices of any plant material. Do not prune into balled or boxed forms without prior written approval of the Architect.
- Q. Remove and replace excessively pruned or malformed stock resulting from improper pruning.
- R. Planting Ground Cover
1. Space plants as shown or scheduled.
 2. Dig holes large enough to allow for spreading of roots and compact area around plant. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover crowns of plants with wet soils.
 3. Mulch areas between ground cover plants with not less than three (3) inch deep mulch.
- S. Miscellaneous Landscape Work: Install headers and edgings where shown. See appropriate details.

- T. Planting Vines: Plant in accordance with details. Attach vine to vertical elements with vine ties as per manufacturer's recommendations.
- U. Tree Staking and Guying: Stake or guy all trees per landscape details, and tie with tree ties as specified. Remove all nursery stakes from trees unless directed otherwise by the Architect. Immediately after planting, stake and guy all trees in accordance with details indicated on Contract Drawings. One tree of each size shall be staked and guyed, and reviewed by Architect prior to continue work.
- V. Hardpan Conditions
 - 1. Where hardpan exists, whether it is in the form of caliche, rock or other impervious matter, and it is within the top 2½ feet of soil, or within the plant pit, use powered equipment to break through completely at each plant location to allow drainage and root growth. Remove hardpan at least 1½ feet greater than the rootball diameter of plant. Backfill with soil mix as specified.
 - 2. Where hardpan is within the first 12-inches of soil, it shall be completely penetrated for all trees and shrubs.

3.09 CLEANUP AND PROTECTION:

- A. During landscape work, keep pavements clean and work area in an orderly condition. Haul away and remove all debris from landscape areas, and do not leave any clippings, and or other material from landscape planting and/or maintenance period.
- B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and/or other trades. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.
- C. Powerwash all pavement and flatwork as necessary to remove all staining and tire marks and provide a clean surface.

3.10 REVIEW & FINAL ACCEPTANCE

- A. General: Notify Landscape Architect at least 5 days in advance when requesting on-site reviews.
- B. Site Observation requirements:
 - 1. Punch list at completion of landscape/irrigation work.
 - a. Review of grading, irrigation and planting.
 - b. Upon completion of punch list items the Maintenance Period begins.
 - 1) The maintenance period will not begin until all punchlist items are resolved and acceptance is provided by the Landscape Architect in writing.
 - 2. Final acceptance of project (at end of Maintenance Period).
 - a. Review of grading, irrigation and planting.
 - b. Upon completion of punch list items to the Client and Landscape Architect's satisfaction, the work is deemed completed.
 - 3. Refer to Division 32 Section "Landscape Maintenance."
 - 4. Where observed work does not comply with the Plans and Specifications, replace rejected work and continue specified maintenance period until reinspected by the Landscape Architect and determined to be acceptable. All replacement materials and installations shall be in accordance with the Plans and Specifications. Remove rejected work and materials immediately from project. Prior to the date of final observation, Contractor shall provide the Landscape Architect with all Record Drawings in accordance with the Plans and Specifications.
 - 5. Replace non-compliant and/or rejected work prior to final observation.
 - 6. Prior to the date of final observation, Contractor shall provide the Landscape Architect with all Record Drawings in accordance with the Plans and Specifications.

3.11 REPLACEMENT

- A. All plant material and other materials installed under the Contract shall be warranted against any and all poor, inadequate or inferior materials and/or workmanship or improper maintenance, as determined by the Landscape Architect, and shall be replaced by the Contractor at his expense. Warranty periods are noted in Part of this Specification.
 - 1. Trees, vines, and shrubs: One Year
 - 2. Groundcover and Turf: One Year
 - 3. Replacement: Any materials found to be dead, missing, or not in a satisfactory or healthy condition during the maintenance period shall be replaced immediately. The Landscape Architect shall be sole judge as to the condition of material. Material to be replaced within the guarantee period shall be replaced by the Contractor within five (5) days of written notification by the Landscape Architect.

- All replacement materials and installations shall comply with the Plans and Specifications.
- a. As soon as weather conditions permit, replace work that does not comply with the Plans and Specifications, without cost to the Owner. Remove rejected and non-compliant work and materials immediately from the project. Continue specified maintenance period until reinspected by the Landscape Architect and determined to be acceptable.
 - b. Any plant missing due to suspected theft shall be replaced by the Contractor. If the Contractor suspects that theft may be a problem, the Contractor shall provide written documentation to the Landscape Architect that security on this site needs to be intensified.
4. Contractor to schedule replacement work with the Owner's representative, and arrange for proper staging and access.
 - a. Contractor to include re-inspection dates as part of replacement work scheduling.
 5. The Contractor may relieve himself of theft responsibility if after the security notice, with no result, a written notice to the Landscape Architect shall be given that plant material will not be replaced for theft or vandalism due to lack of site security being maintained. This procedure may take place only during the Landscape Maintenance Period.

END OF SECTION

**SECTION 32 9345
TREATMENT OF EXISTING TREES**

PART 1 - GENERAL**1.01 SECTION INCLUDES**

- A. Work specified in this section: Provide all labor, materials, transportation, and services necessary to furnish tree protection fencing, tree armor, watering, pruning and fertilization to existing trees.

1.02 RELATED WORK

- A. The requirements of the "General and Supplementary Conditions of the Contract" and Division 1 specification sections shall apply to all work of this Section with the same force and effect as though repeated in full herein.
1. Irrigation System: Section 328423.
 2. Landscape Planting: Section 329300.

1.03 REFERENCES

- A. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1. (2014) Nursery Stock.
 2. (2017) Tree Care Operations- Pruning, Trimming, Repairing, Maintaining, and Removing Trees and Cutting Brush.
 3. (2017) Tree, Shrub and Other Woody Plant Maintenance- Standard Practices.

1.04 GOVERNING STANDARDS:

- A. Work procedures will be guided by the current provisions of the American National Standard Institute. Complete detail of the provisions are to be found in the references listed. The two basic objectives of the pruning operation shall include:
1. Hazard Reduction Pruning: Hazard reduction pruning shall be completed to remove visible hazards in a tree. Hazard pruning shall consist of one or more of the maintenance pruning types.
 2. Maintenance Pruning: Maintenance pruning shall be completed to maintain and improve tree health and structure and includes hazard reduction pruning.

1.05 DESCRIPTION OF WORK

- A. Contractor shall employ a qualified Arborist to monitor construction activities that impact trees, pruning and feeding. Arborist is to be acceptable to the Owner's Representative.
- B. Arborist shall have the following minimum qualifications:
1. Membership in:
 - a. NAA - National Arborist Association
 - b. ISA - International Society of Arborists
 2. Meet state requirements for insurance.
 3. Licensed for application and use of pesticides.
 4. Bonded.

1.06 SUBMITTALS

- A. Contractor shall submit:
1. Certification: Copy of Arborist qualifications.
 2. Mulch: Label from bag (Supplier's statement of analysis if bulk), and 1-gallon container of mulch sample.
 3. Fertilizer: Label from bag or Supplier's brochure.
 4. Tree Armor: Cut sheet of wood and plywood.
 5. Drip Irrigation: Cut sheet of dripline, valves, filters, air valves, and flush valves.

1.07 QUALITY ASSURANCE AND REQUIREMENTS

- A. General: Comply with applicable federal, state, county, and local regulations governing, landscape materials and work.
- B. Permits and Fees: The Contractors shall obtain and pay for any and all permits and all inspections as required. Contractor shall also be responsible for all fees and costs involved for work.
- 1) Contractor shall comply with City inspector directions with agreement from Landscape Architect without additional cost to Owner.

- C. Ordinances and Regulations: All local, municipal and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations or requirements of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.
- D. Personnel: Personnel shall be supervised by a Certified Arborist. Employ only experienced personnel who are familiar with the required work. Provide adequate supervision by a qualified foreman with minimum of five years experience.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

1.09 PROJECT CONDITIONS

- A. Inspection: Contractor, Arborist and Owner's Representative shall review pruning work to be completed prior to initiating work.

1.10 SCHEDULES

- A. The Contractor shall begin pruning and tree protection work upon acceptance of the Contract by the Owner. Arborist shall submit a schedule for the work to be performed to the Landscape Architect for approval.

1.11 PROTECTIONS

- A. All items required to complete this contract remain the property and responsibility of the Contractor until final acceptance. Take adequate precautions to protect all existing trees. Cooperate fully with other trades to insure a satisfactory completion.

1.12 MAINTENANCE SERVICE

- A. All existing trees to remain within shall have 6" layer of mulch at Root Protection Zone (RPZ) and to dripline and tree protection fencing properly maintained throughout construction work period.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Tree Barricade Fencing: Fabric of square link orange 4' width, high density polyethylene with 5-7 year life. Posts of 6' height studded T-posts with painted on finish for rust protection.
- B. Mulch:
 - 1. Mulch shall be free of deleterious material and shall be stored as to prevent inclusion of foreign material. Mulch shall be native shredded hardwood mulch, manufactured by New Earth, San Antonio, Texas, 210-661-5180.
 - 2. On-site existing tree mulch: Existing trees that are scheduled to be removed and removed branches may be grinded/double shredded and debris free.
- C. Tree Wound Paint: Bituminous based paint of standard manufacture specifically formulated for tree wounds.
- D. Fertilizer for Trees: Davey Arbor Green 30-10-7 for liquid suspended application, distributed by The Davey Company in San Antonio, Texas (210) 698-0515.
- E. Tree Armor:
 - 1. Wood: SPFA utility grade, 2x4.
 - 2. Plywood: SPFA utility grade, 3/4" nominal thickness.
 - 3. Wire: Annealed steel wire, 16 gage minimum.
- F. Drip Irrigation:
 - 1. Rainbird XFS dripline as manufactured by Rainbird Irrigation, Inc. distributed by Longhorn Supply, San Antonio, Texas, 210-340-3516. Contractor shall provide all necessary fittings and accessories as required by the manufacturer for the installation of the product. Drip line shall be XFS dripline, 12" o.c. emitters, 0.9 gph.
 - 2. Valve: Rainbird pre-assembled valve, filter and pressure regulator control zone kit.

3. Pressure Regulator: Pressure Regulator shall be Low flow for valves less than 4.5 gpm and High Flow for valves greater than 4.5.
4. Air/Vacuum Relief Valve, provide one per zone.
5. Flush Valve, provide one per zone.

PART 3 - EXECUTION

3.01 PROTECTION FOR EXISTING TREES TO BE PRESERVED

- A. All existing trees to remain within 30' of work on the project site shall be protected against damage from construction operations. Only remove those trees which are scheduled to be removed per plans. Contractor shall flagged tree to remain for review by Landscape Architect.
- B. Contractor shall erect fencing protection prior to beginning any clearing, demolition or construction activity, maintain in place until construction is completed.
- C. All trees to remain are to be protected by barricade fencing and is subject to approval of the Landscape Architect. The tree protection barricade shall be placed before any excavating or grading is begun and maintained in good repair for the duration of the construction work. No material shall be stored or construction operation shall be carried on within the tree protection barricade.
- D. Trees exposed to construction activity within the dripline or within twenty-five (25) feet of any construction activity are to have trunks protected with tree armor. See requirements per tree armor section of this specification.
- E. Tree protection barricade shall be erected at the edge of the dripline where possible. In circumstances where site improvements and construction operations interfere with fencing, fencing may be located at the edge of the root protection zone. The minimum distance the barrier shall be erected is five (5) feet from the trunk of tree or clump of trees.
- F. Protect trees that are to remain, whether within barricade fencing or not, from the following:
 1. Compaction of root area by equipment or material storage; construction materials shall not be stored closer to trees than the farthest extension of their limbs (dripline).
 2. No vehicular traffic shall occur within the drip line of any tree.
 3. The proposed finished grade within the root protection zone of any preserved tree shall not be raised or lowered more than three (3) inches. Retaining methods can be used to protect and/or provide lateral support to the area outside the root protection zone. No soil shall be spread, spoiled or otherwise disposed of under any tree within the drip line.
 4. Cutting on roots by excavating, ditching, etc. Prior to excavation within the tree driplines or the removal of trees adjacent to other trees that are to remain, make a clean cut between the disturbed and undisturbed root zones with a rock saw or similar equipment to minimize root damage.
 5. Strangling by tying ropes or guy wires to trunks or large branches.
 6. Poisoning by pouring solvents, gas, paint, etc., on or around trees and roots.
 7. Trunk damage by moving equipment, material storage, nailing or bolting.
 8. Damage of branches by improper pruning.
 9. Drought from failure to water or by cutting or changing normal drainage pattern past roots. Contractor shall provide means as necessary to ensure positive drainage.
 10. Changes of soil pH factor by disposal of lime base materials such as concrete, plaster, lime treatment at pavement subgrade, etc. When installing concrete adjacent to the root zone of a tree, use a minimum 6 mil. plastic vapor barrier behind the concrete to prohibit leaching of lime into the soil.
- G. Any damage done to existing tree crowns or root systems shall be repaired by the Arborist to the satisfaction of the Owner's Representative. Broken branches shall be cut cleanly. Any roots cut shall be cut cleanly with a saw other means approved by the Landscape Architect.
- H. Repairs to the trees necessitated by damage caused through negligence of Contractor or his employees will be completed at the Contractor's expense. When trees other than those approved for removal are destroyed or killed, or badly damaged as a result of construction operations, the contract sum will be reduced by the value of the tree as determined by using the accepted International Society of Arboriculture's formula.
 1. TREE ARMOR
- I. Trees exposed to construction activity within the dripline or within twenty-five (25) feet of any construction activity are to have trunks protected with tree armor to a height of 8' or to the limits of the lower branching in addition to barricade fencing. Butt 2x4's side to side completely around trunk. Wire wrap, do not nail,

around trees. Maintain armor the duration of construction operations.

- J. Where existing trees will be Root Zone (RPZ) shall be protected by plywood. Install 6" of shredded bark mulch and cover with 3/4" plywood. Install both to dripline of tree(s).
- K. Remove one week prior to Substantial Complete walk through.

3.02 TREE ARMOR

- A. Trees exposed to construction activity within the dripline or within twenty-five (25) feet of any construction activity are to have trunks protected with tree armor to a height of 8' or to the limits of the lower branching in addition to barricade fencing. Butt 2x4's side to side completely around trunk. Wire wrap, do not nail, around trees. Maintain armor the duration of construction operations.
- B. Where existing trees will be Root Zone (RPZ) shall be protected by plywood. Install 6" of shredded bark mulch and cover with 3/4" plywood. Install both to dripline of tree(s).
- C. Remove one week prior to Substantial Complete walk through.

3.03 ROOT PROTECTION ZONE

- A. The root protection zone (RPZ) is measured with a radius from the trunk of 12" for each caliper inch of trunk measured at four and one-half (4-1/2') feet above grade or at the point where the smallest diameter closest to the branching occurs. No disturbance shall occur closer to the tree than one-half the radius of the RPZ or within five (5) feet of the tree whichever is greater.

3.04 ROOT PROTECTION ZONE IMPACTS

- A. Those trees to remain which have some encroachment on their root protection zone shall have the following maximum allowable impacts:
 - 1. No disturbance of natural grade, e.g. trenching or excavation, can occur closer to the tree than one-half the radius of the RPZ or within five (5) feet of the tree whichever is greater.
 - 2. No cut or fill greater than three (3) inches will be located closer to the tree trunk than 1/2 the RPZ radius distance.
- B. Existing trees to remain shall have a minimum of a six (6) inch layer of mulch placed and maintained over the root protection zone and to the dripline. Immediate pruning and fertilization shall occur per the pruning and fertilization sections of this specification.

3.05 ARBORIST'S REQUIREMENTS

- A. General:
 - 1. Arborist is to survey the condition of existing trees to remain. Notify Landscape Architect of any problems/conditions affecting the livability of trees to remain. Document site as necessary.
 - 2. Arborist is to install and/or inspect tree protection barriers before start of demolition and excavation activities. Notify Landscape Architect of any problems/conditions that affect the livability of trees to remain.
 - 3. Arborist is to observe excavation of site around existing trees from start of excavation until its conclusion. Arborist shall direct excavation which occurs near major root systems, relocation of roots, and installation of tree aeration systems as required to ensure livability and good health of trees. Arborist shall prescribe additional measures or protection required to provide optimal growth conditions at the construction site. Report any problems/conditions affecting the livability of trees to remain to Landscape Architect.
 - 4. Arborist shall make periodic inspections of the construction site for possibly dangerous or damaging practices, in relation to the existing trees, occurring or developing at the site. Inform Landscape Architect of any problems/conditions and develop plan to repair damage that has occurred and prevent further damage.
- B. Reports:
 - a. Arborist shall provide a monthly inspection report of the construction site to the Landscape Architect during the course of construction work.

3.06 EXCAVATION AT EXISTING TREES

- A. Any excavation within the dripline of trees shall be under the direction of the Arborist. Excavate within the dripline of trees only where required and when absolutely necessary. Arborist shall be at site at all times while excavation is occurring within the dripline.
- B. When excavation is required within dripline of trees, hand excavate to minimize damage to root systems. Use narrow tine spading forks and comb soil to expose roots. Relocate roots back into backfill areas wherever possible. If large main lateral roots are encountered, expose beyond excavation limits as

required to bend and relocate without breaking.

- C. If root relocation is not practical, clean cut roots using sharp ax approximately three (3) inches back from new construction. Paint all exposed root cuts with tree paint.
- D. Where existing grade is higher than new finish grade, carefully excavate within the dripline to the new finish grade. Carefully hand excavate an additional eight (8) inches below the finish grade. Use narrow tine spading forks to comb the soil to expose the roots, and prune the exposed root structure as recommended by the Arborist. Keep the exposed roots damp by watering and mulch cover. Treat the cut roots as specified and as recommended by the Arborist. After pruning and treatment of the root structure is complete, backfill to finish grade with eight (8) inches of approved plant mix.
- E. Temporarily support and protect roots against damage until permanently relocated and covered with recommended landscape material.
- F. Where trenching is to occur within hitting distance of equipment to tree trunk, install tree armor per tree armor section of this specification.
- G. Where removal of existing trees comes in conflict with existing hardscape/utilities to remain, the contractor shall:
 - 1. Coordinate with utility companies (if necessary)
 - 2. Remove existing tree to grade.
 - 3. Expose roots
 - 4. Use chainsaw to cut roots
 - 5. Grind stump 18" below grade
 - 6. Use trencher 2'-3' deep to cut roots if necessary.

3.07 WATERING REQUIREMENTS

- A. Drought is defined as a protracted period of deficient precipitation resulting in extensive damage to plants, trees and lawn, resulting in loss.
- B. During construction operations, provide water in a slow drip manner to existing trees. Provide water to apply equivalent to 1 inch once per week to deeply soak in over the area within the dripline of the tree. Spray tree crowns periodically to reduce dust accumulation on the leaves.
- C. At Stage 2, 3 and 4 (Section 1.4, B. Watering Restrictions), install drip line (gallons per hour) within the dripline of the trees at grade. Install required drip valves with filters and pressure regulators with battery operated controllers. Install 6" of mulch over drip irrigation. Protect valves as required. All zones of temporary irrigation shall contain an isolation ball valve to separate from permanent irrigation system.

3.08 PRUNING

- A. Pruning shall be required only at protected existing trees where the removal of limbs and branches is needed to provide clearance for work as approved by the Owner's Representative or to repair damage to trees. Pruning shall be done per 3.9 Schedule. Pruning shall be completed to the satisfaction of the Owner's Representative.
- B. Pruning shall include but is not limited to removal of dead and broken branches, correction of structural defects or whenever the following conditions exist. Remove diseased wood, or structurally weak limbs that may cause a safety hazard. Remove branches that extend over buildings. Remove branches in front of windows and which obstruct traffic signs or street intersections. Provide clearance for emergency vehicles, buses, moving vans and similar vehicles along the streets. Prune trees according to their natural growth characteristics leaving trees well shaped and balanced.
- C. Remove all ball moss, mistletoe, etc. from all existing trees.

3.09 SCHEDULE

- A. Pruning shall be Class 1 Fine Pruning. All pruning shall be completed to accomplish the thinning of live branches. Thinning shall result in an even distribution of removal of branches on individual limbs and through-out the crown. Remove dead, dying, diseased and broken branches ½" in diameter or larger within the crown. No more than 25% of the crown shall be removed.

3.10 TREE CROWN PRUNING

- A. Existing trees disturbed by construction shall have a maximum of 30 percent of the viable portion of a tree's crown removed as approved by the Owner's Representative. Removal of more than 30 percent of the viable portion of a tree's crown will necessitate the tree's removal and replacement at the Contractor's expense. Replacement shall be governed at the ratio of 1 inch of new tree per inch of tree removed up to trees of size less than 24" caliper. For trees 24" caliper and greater the ratio shall be 3

inches per new tree per inch of tree removed. Replacement trees shall have permanent irrigation bubblers and a one (1) year warranty. Refer to Section 02900.

3.11 STERILIZATION:

- A. All tools used will be sterilized with alcohol between trees.

3.12 PAINT CUTS:

- A. Paint cuts more than 1 inch in diameter with an approved tree wound paint on all Oak species trees.

3.13 DISPOSAL:

- A. Wood and debris shall become property of the Contractor and shall be removed from the site. Cost of disposal to be paid by Contractor.

3.14 FERTILIZATION OF PRESERVED TREES:

- A. All existing trees that have root damage shall be fertilized. Feeding of existing trees shall be as follows:
1. Feeding shall be completed prior to construction of permanent improvements adjacent to all trees including site fill or paving including trenching operations.
 2. Liquid tree fertilizer applied with a standard hydrant sprayer at a pressure of 100 to 200 psi shall be injected in slightly slanted holes approximately twelve (12) inches in depth.
 3. Concentration of suspension to be forty (40) pounds of fertilizer for trees in each 100 gallons of water. Application rate: six (6) pounds of actual nitrogen per 1,000 square feet of area under dripline.
 4. Holes are to be made in concentric circles and 3' on center around the tree with the last ring located at the dripline of the foliage of the trees.
 5. Area beneath the dripline of the trees is to be well watered after the fertilization is placed.

3.15 MULCH:

- A. Mulch base of all existing trees with 6" deep mulch layer to RPZ or dripline whichever one is larger. If existing trees are grouped, the entire area is to be mulched in between the trees.
- B. If acceptable to Owner, wood from tree removal and pruning activities can be grinded/ double shredded and used on site as mulch at locations as approved by Owner's Representative. Mulch shall be less than 6" in length. All mulch shall be free of any debris.

3.16 CLEANUP:

- A. Wood and debris shall become property of the Contractor and shall be removed from the site. Cost of disposal to be paid by Contractor.

END OF SECTION