CONTRACT DOCUMENTS

AND

PROJECT SPECIFICATIONS

FOR

County of San Mateo
Grant Yard Radio Shop Project
752 Chestnut Street
Redwood City, CA 94063

County Project No. P30J1

Architect
The KPA Group
6700 Koll Center Parkway, Ste. 125
Pleasanton,CA 94566
KPA Project No.: 714.00

Issued: November 23, 2020

00 01 03

PROJECT DIRECTORY

Project Name:	Grant Yard Radio Shop - Project No. P30J1
Owner:	County of San Mateo Department of Public Works
Owner/SMC's Representative:	**King Leong, Capital Project Manager** II Capital Projects & Construction Services Facilities and Capital Project Division County Government Center 555 County Center, 5th Floor Redwood City, CA 94063 Tel: (650) 208-9855 E-mail: kleong1@smcgov.org
All bidding inquiries shall be directed only to:	King Leong, Capital Project Manager II Capital Projects & Construction Services Facilities and Capital Project Division County Government Center 555 County Center, 5th Floor Redwood City, CA 94063 Tel: (650) 208-9855 E-mail: kleong1@smcgov.org
Design Professionals:	**Architect, Civil & Structural Engineer** The KPA Group 6700 Koll Center Parkway, Ste. 125 Pleasanton,CA 94566 Tel: (925) 223-8217 Attn: Paul Powers
	Electrical Engineer Pharis Engineering 7110 Austinwood Rd Louisville, KY 40214 Tel: (502) 471-7963 Attn: Keith A. Pharis
	Mechanical and Plumbing Engineer Morrison Maierle, Inc. 125 Schoolhouse Loop Kalispell, MT 59901 Tel: (406) 751-5870 Attn: Jody T. Waverek

Address for Stop Notices:	King Leong, Capital Project Manager II Capital Projects & Construction Services Facilities and Capital Project Division County Government Center 555 County Center, 5th Floor Redwood City, CA 94063 Tel: (650) 208-9855 E-mail: kleong1@smcgov.org
Address for Demand for Arbitration:	King Leong, Capital Project Manager II Capital Projects & Construction Services Facilities and Capital Project Division County Government Center 555 County Center, 5th Floor Redwood City, CA 94063 Tel: (650) 208-9855 E-mail: kleong1@smcgov.org
A copy of the Demand for Arbitration must be sent to:	**County of San Mateo** Department of Public Works Attn: Owner's Responsible Administrator (See Agreement for Name of Responsible Admin.) County Government Center 555 County Center, 5th Floor Redwood City, CA 94063

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NOTICE - THIS SUMMARY OF DATES IS FOR INFORMATIONAL PURPOSES ONLY.

The dates and times listed may not be relied upon or enforced. This summary does not form a part of the Contract Documents and does not establish contractual obligations.

NOTICE – THIS IS A SUMMARY ONLY AND DOES NOT LIST ALL DATES, TIMES OR TIME PERIODS CONTAINED IN THE BIDDING AND CONTRACT DOCUMENTS.

All bidders and contractors must refer to the actual documents for all applicable dates, times, and time periods.

Grant Yard Radio Shop Project No. P30J1		
Event	**Date/Time**	**Location**
Contract Documents Issued for Bid (Released &Available):	November 23, 2020	https://publicworks.smcgov.org/projects-out-bid
Mandatory Pre-Bid Conference and Project Site Visit/Job Walk	December 7, 2020, at 2:00PM	702 Chestnut Street Redwood City, CA 94063 See Notice to Contractors Document 00 11 16 for instructions to attend.
Deadline for Questions –Last Day for prospective Bidders to submit questions, in writing, by email to Authorized Contact Person: kleong1@smcgov.org	December 28, 2020, by 5:00PM	N/A
Response to Questions – Issue Addendum #1	January 11, 2020, by 5:00PM	https://publicworks.smcgov.org/projects-out-bid
Bids Due:	Before January 25, 2020, 2:30PM	See Notice to Contractors Document 00 11 16
Bid Opening Date:	January 25, 2020, at 2:30PM	See Notice to Contractors Document 00 11 16
Bid Evaluation Period:	January 26-Feb. 1, 2021	N/A
Issue Notice of Intent to Award:	January 25, 2021	N/A
Protest Period:	January 26 – February 1, 2021	See Instructions to Bidders Document 11 21 13
Submission to County Board for Approval:	February 11,2021	N/A
Anticipated Contract Award Date:	February 23, 2021	N/A

END OF DOCUMENT

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DOCUMENT 00 11 16
NOTICE TO CONTRACTORS

NOTICE IS HEREBY GIVEN that the Board of Supervisors of the County of San Mateo, State of California, will receive sealed bids for the following construction contract:

GRANT YARD RADIO SHOP PROJECT
PROJECT NO. P30J1
752 CHESTNUT STREET
REDWOOD CITY, CA 44063

Engineer's Estimate: $4,400,000.00

Bids shall be received in accordance with the Contract Documents. The Contract Documents may be examined and/or downloaded at the Department of Public Works website at https://publicworks.smcgov.org/projects-out-bid (includes complete bid package).

A **Mandatory** Pre-Bid Conference followed by a Project Site Visit/Job Walk is scheduled for **Monday December 7, at 2:00 PM (Pacific Time)**. The mandatory pre-bid conference will meet at the project site entry gate, 702 Chestnut Street, Redwood City CA 94063. It is mandatory for interested contractors to attend the pre-bid conference, sign the attendance roster and visit the project site to become familiar with project. **Bids will not be accepted from any prime contractor not present at the mandatory pre-bid conference as evidenced on the attendance roster.**

Please review the Project Plans & Specifications in advance of the Mandatory Pre-Bid Conference and Project Site Visit.

Due to COVID-19 requirements in San Mateo County, interested Contractors are required to don appropriate Personal Protective Equipment (PPE) and maintain social distancing protocols at the Mandatory Pre-Bid Conference and Project Site Visit.

Contractors are expected to provide PPE for their personnel, as published by *Order No. c19-5c (Revised) of the Health Officer of the County of San Mateo*. The entire Order shall be followed by all who live and visit San Mateo County. Contractors shall comply with ALL applicable federal, state, and local health orders and ordinances and are required to continue to check for updates to such orders and ordinances.

Questions regarding this project should be directed to the Authorized Contact Person:
King Leong, Project Manager II – Capital Projects
Department of Public Works
555 County Center, 5th Floor, Redwood City, California 94063-1665
Office Phone: (650) 599-7268
Cell Phone: (650) 208-9855

Bids shall be submitted using forms furnished and bound in the Project Manual of the Construction Documents and in accordance with the Instructions to Bidders Document 11 21 13 and shall be accompanied by a Bid Bond.

Bids shall be sealed and filed with the Clerk of the Board of Supervisors of the County of San Mateo at the Hall of Justice and Records, 400 County Center, (formerly 401 Marshall Street) 1st Floor, Redwood City, California, 94063 and filed Bids shall receive the Clerk's timestamp before **January 25, 2021, 2:30PM (Pacific Time).** All sealed bids officially received and filed with the Clerk of the Board of Supervisors will be opened in public shortly thereafter outside in front of the 400 County Center Building or at another location as designated by County.

The Board of Supervisors of the County of San Mateo, State of California, reserves the right to reject any and all bids, alternate bids, or unit prices and waive any irregularities in any bid received.

No bidder may withdraw his bid for a period of ninety (90) days after the date set for the opening thereof.

Prospective bidders must be fully qualified, licensed, certified, and insured to perform the Work requested for the Project. All work performed must meet all current applicable laws and regulations.

Pursuant to Labor Code Sections 1770, et seq., the Director of the Department of Industrial Relations has determined the general prevailing rate of wages in the County of San Mateo for each craft, classification, or type of workman needed to execute the contract. The prevailing rates so determined are based on an 8-hour day, 40-hour week, except as otherwise noted. Existing agreements between the Building Trades and the Construction Industry groups relative to overtime, holidays and other special provisions shall be recognized. It shall be mandatory upon the Contractor and upon any sub-contractors under him, to pay not less than the said specific rates to all laborers, workmen or mechanics employed by them in the execution of this contract.

Pursuant to State Senate Bill SB 854 (Stat. 2014, Ch. 28), effective January 1, 2015:

(1) No Contractor or Subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 (with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)).

(2) No Contractor or Subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

(3) This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. All Contractors and Subcontractors must

furnish electronic certified payroll records directly to the Labor Commissioner (aka Division of Labor Standards Enforcement).

Contractor and its subcontractor(s) agree to pay not less than prevailing rates of wages and be responsible for compliance with all the provisions of the California Labor Code, Article 2-Wages, Chapter 1, Part 7, Division 2, section 1770 et seq and section 1810 et seq. A copy of the prevailing wage scale established by the Department of Industrial Relations is on file in the office of the Director of Public Works, and available at www.dir.ca.gov/DLSR or by phone at 415-703-4774. California Labor Code section 1776(a) requires each contractor and subcontractor keep accurate payroll records of trades' workers on all public works projects and to submit copies of certified payroll records upon request.

A bid security bond will be required for the faithful performance of the contract in amount of not less than one hundred percent (100%) of the amount of the bid. See Document 00 61 16 Bid Bond.

A payment bond and performance bond will be required pursuant to California Public Contract Code Section 7103 and Section 10221 if a contractor is awarded a contract.

The Work to be performed consists, in general, of providing all labor, materials, tools, appurtenances, and equipment required, as well as any other items and details not mentioned above but required by the Contract Documents and as directed by the Director of Public Works.

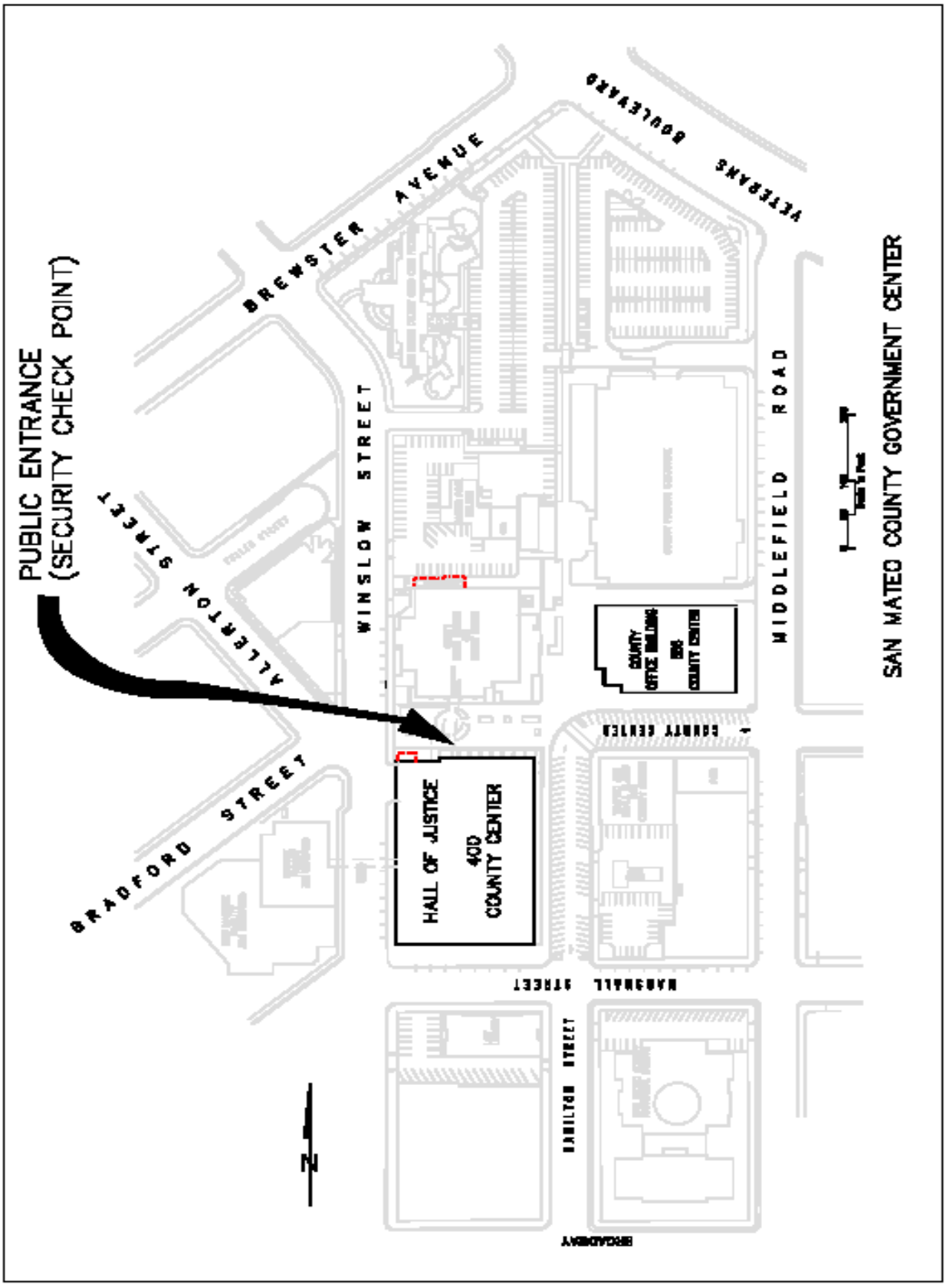
The Grant Yard Radio Shop Project consists of a two (2) story building, approx.13,400 SF, Type II-B construction, with fire protection systems, HVAC, electrical & lighting, plumbing, underground utilities, storm drainage, exterior pavements, site work, landscaping, irrigation and other specified work. See Document 00 21 13 Instructions to Bidders.

The engineer's estimate for the scope of work of this Project is Four Million Four Hundred Thousand Dollars ($4,400,000).

The Contract Time for completion of all the Work of the Project is Two Hundred Ninety-six (296) calendar days, as defined as sufficiently complete in accordance with the Contract Documents.

Liquidated Damages are $1000.00 per calendar day and shall be based on the Contract Time. Pursuant to California Government Code Section 53069.85, Owner may withhold Liquidated Damages from payments to the Contractor as such damages accrue, or, at Owner's discretion, withhold Liquidated Damages from any payments due or that become due pursuant to the Contract, including Retention and final payment.

END OF DOCUMENT 00 11 16


PUBLIC ENTRANCE
(SECURITY CHECK POINT)
BREWSTER AVENUE
VETERANS BOULEVARD
WINSLOW STREET
ALLERTON STREET
BRADFORD STREET
MIDDLEFIELD ROAD
SAN MATEO COUNTY GOVERNMENT CENTER
HALL OF JUSTICE
400
COUNTY CENTER
COUNTY CENTER
MARSHALL STREET
HAMILTON STREET
BROADWAY
N

DOCUMENT 00 21 13

INSTRUCTIONS TO BIDDERS

1. General

1.1 Bids shall be received in accordance with the Contract Documents. Each Bidder shall carefully read the complete Contract Documents including these instructions.

1.2 Before submitting a bid, each Bidder shall attend the mandatory pre-bid conference and visit the project site and evaluate all conditions and limitations involved thereon as no allowance will be made because of the lack of such examination and knowledge.

1.3 Only licensed Contractors authorized to do business under the laws of the State of California and able to qualify as follows will be eligible to submit a bid.

1.4 Contractors shall meet the following qualifications for this project:

A. Contractors bidding to the County shall have a minimum five (5) years continuous experience as a prime contractor on projects in California of comparable quality, size, complexity, and type.
B. Contractors bidding to the County shall have completed as the prime three (3) projects of comparable quality, size, complexity and type, preferably in an operating facility, and the projects have been closed with compliance.
C. Contractors bidding to the County shall submit Superintendent's qualifications with a minimum of three (3) years supervising projects of comparable quality, size, complexity, and type.
D. Subcontractors shall meet the above two requirements in A. and B. as it pertains to their Work.
E. Contractor is legally authorized to do business in the State of California.
F. Within two (2) business days of request by County, Contractor shall submit evidence of compliance to the above qualifications (in A. B., and C.) and a list of all project work performed, both complete and incomplete, within the previous five (5) years including the names and phone numbers of the Owners and Architects.

1.5 Contractors shall meet the following construction requirements:

A. Permits: All work is subject to inspection and acceptance of the Authority Having Jurisdiction (AHJ).

B. Differing Site Conditions: Contractor is advised the work will be performed in an existing structure.

C. Work shall be performed between the construction hours of 7:00AM to 5:00PM, unless otherwise agreed upon between the County and Contractor due to extenuating factors.

D. Contractor is advised the County intends to maintain active Grant Yard utility operations specific to facility systems during construction. Existing systems and utility outages, and shutdowns shall be approved in advance by the County.

E. Contractor to coordinate with the County and AHJ regarding providing temporary construction barriers and maintain public sidewalk access in the street Right-of-Way for duration of project.

F. Not Used.

G. Schedule: Contractor's attention is directed to the Contract Time and the requirement of the Contractor to achieve substantial completion of the work within said time period. Construction shall be completed within Contract Time defined as sufficiently complete in accordance with the Contract Documents to allow the Owner to occupy or utilize for its intended use.

H. Sequence of Construction. Contractor shall submit for approval by the County the proposed sequence of construction.

I. Contractor shall be required to attend weekly construction project meetings with County and County's Representatives for the duration of the project. Contractor shall track meeting action items and provide updates per Contract Documents.

J. Contractor's Personnel: Contractor shall submit within ten (10) working days from the execution of the Contract a list of names, addresses, and telephone numbers of key personnel who are to be contacted in case of emergencies on the job during non-working hour, including Saturdays, Sundays, and Holidays. Contractor shall update the list during the project and ensure the latest revision is posted in project office and provided to County Representatives.

All personnel who will have access to the work site shall carry photo identification at all times. The County reserves the right to reject personnel with current parole or probationary status and/or criminal records. County staff reserves the right to request a worker be excused from the job site for not carrying appropriate photo identification issued by the State of California. No claims for delays will be allowed for failure on the part of the Contractor to enforce this requirement.

1.6 Contract Documents:

Questions regarding the Contract Documents, such as discrepancies, conflicts, omissions, doubt as to meanings, or regarding scope of work

shall be referred to the County Authorized Contact Person. Inquiries must be received by the Authorized Contact Person not later than 96 hours before bid time. Inquiries will be answered in writing to all bidders of record if a response or written clarification is warranted in the opinion of the Owner. The Owner will not be responsible for oral clarifications. Regarding questions on the Contract Documents in the absence of written clarifications, Contractor is instructed to bid the more expensive method or materials.

2. Bid Proposals

2.1 Bids shall be submitted in accordance with the Contract Documents. Bid documents shall be submitted on County forms provided in these Contract Documents, and are to be properly and fully completed, including the designation of all subcontractors who will perform work or labor or render service on behalf of Contractor, in an amount in excess of one-half of one percent of the Contractor's total bid. Bidders must complete and submit all of the following documents with their Bid:

1. Document 00 41 13 – Bid Form and Designated Subcontractor List
2. Document 00 45 19 - Non-Collusion Declaration
3. Document 00 45 36.01 – EEO Certification of Compliance & Intent
4. Document 00 45 36.02 – EEO Program Contractor Report Form
5. Document 00 45.36.03 - EEO Program Questionnaire
6. Document 00 45 46 - Anti-Trust Laws Questionnaire
7. Document 00 61 16 - Bid Bond (Bid Security) Form

2.2 No bid will be considered which makes exceptions, changes, or in any manner makes reservations to the terms of the Contract Documents.

2.3 Unit Prices on all classes of work as specified or required shall be submitted. Additions to or deductions from the contract sum shall be based on these unit prices. However, none will be acceptable that are above and beyond a fair and just amount and may be subject to third party estimator verification and reasonable adjustment before the signing of the Contract or bid disqualification.

2.4 Each bid must give the full business address of the bidder and be signed by the bidder with his usual signature. Bids by partnerships must furnish the full name of all partners and must be signed in the partnership name by one of the members of the partnership or by any authorized representative, followed by the signature and designation of the person signing. Bids by corporations must be signed with the legal name of the corporation, followed by the name of the State of incorporation and by the signature and designation of the president, secretary, or other person authorized to bind it in the matter. Corporations must furnish a Certificate

attesting to the existence of the corporation. The name of each person signing shall also be typed or printed below the signature. When requested by the Owner, satisfactory evidence of the authority of the officer signing on behalf of the corporation shall be furnished.

2.5 Bids are to be submitted in separate sealed envelopes. Envelopes shall be marked in lower left corner "Bid for" (provide contract title) and "Bid Opening" (provide bid opening date and time).

Deliver all bids to Clerk of the Board of Supervisors of the County of San Mateo at the Hall of Justice and Records, 400 County Center, (formerly 401 Marshall Street) 1st Floor, Redwood City, California, 94063 for the Clerk's timestamp of receipt before the day of **January 25, 2021, 2:30PM.**

2.6 All sealed bids officially received and filed with the Clerk of the Board of Supervisors of the County of San Mateo on or before the day of **January 25, 2021, 2:30PM** will be opened in public shortly thereafter outside of the 400 County Center building or at another location as designated at that time by County Clerk of the Board.

2.7 No bid will be considered which is received after the date and time set for the deadline to receive bids as stated herein, as determined by County.

3. Bonds and Insurance

3.1 Bids shall be accompanied by a cashier's check or a certified check payable to County, or a Bid Bond of not less than ten percent (10%) of the amount of the base Bid, plus all additive alternates as required. Required form of corporate surety, a Bid Bond Form, is provided by County and must be used and fully completed by Bidders choosing to provide a Bid Bond as security. The Surety on Bidder's Bid Bond must be an insurer admitted in the State of California and authorized to issue surety bonds in the State of California. Bids submitted without necessary bid security will be deemed non-responsive and will not be considered.

3.2 Two bonds, as itemized below and in the forms presented in these Contract Documents, shall be furnished by the successful Bidder within ten (10) calendar days after notification of award, and by which documents shall be filed with the Department of Public Works, Capital Projects Division, 555 County Center, 5th Floor, Redwood City, California. The bonds shall be in the form of surety bonds issued by corporations duly and legally licensed to transact business in the State of California, satisfactory to the County. Premiums for said bonds shall be paid by the Contractor and maintained at Contractor's expense during the period prescribed herein for the completion of the work to be performed under the contract.

3.3 Performance Bond in amount of 100 percent (100%) of the Contract Amount to insure County during construction and for the guarantee period after completion against faulty or improper materials or workmanship and to assure County of full and prompt performance of Contract.

3.4 Payment Bond in amount of 100 percent (100%) of the Contract Amount in accordance with the laws of the State of California to secure payment of any and all claims for labor and material used or consumed in performance of this Contract.

3.5 Workers' Compensation Insurance, Comprehensive General Liability Insurance, and Motor Vehicle Liability Insurance and evidence thereof shall be furnished to County and shall be maintained by the Contractor as detailed in the General Conditions.

4. Wage Rates

4.1 The Director of Industrial Relations has determined the general prevailing rate of wages in the County of San Mateo.

4.2 In accordance with the General Conditions, it shall be mandatory upon the Contractor and Subcontractors to pay not less than the said prevailing wage rates to all laborers, workmen, or mechanics employed by them in the execution of this Contract. When applicable, both Contractor and Subcontractor hereby agree to pay not less than prevailing rates of wages and be responsible for compliance with all the provisions of the California Labor Code, Article 2-Wages, Chapter 1, Part 7, Division 2, Section 1770 et seq and Section 1810 et seq. A copy of the prevailing wage scale established by the Department of Industrial Relations is on file in the office of the Director of Public Works, and available at www.dir.ca.gov/DLSR or by phone at 415-703-4774. California Labor Code Section 1776(a) requires each Contractor and Subcontractor keep accurate payroll records of trades workers on all public works projects and to submit copies of certified payroll records upon County's request.

4.3 The Contractor's attention is further directed to the following requirements of State Senate Bill SB 854 (Stat. 2014, Chapter 28), effective January 1, 2015:

(1) No Contractor or Subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 (with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)).

(2) No Contractor or Subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015)

unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

(3) This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

4.4 The Contractor is further advised that, pursuant to State Senate Bill SB 854 (Stat. 2014, Chapter 28), effective January 1, 2015, all contractors and subcontractors working on a contract for public work on a public works project (awarded on or after April 1, 2015) must furnish electronic certified payroll records to the Labor Commissioner.

5. Non-Discrimination

5.1 All Contractors with contracts over $5,000 must comply with the County Ordinance No. 4026, Chapter 2.93 of the County of San Mateo Ordinance Code with respect to the provision on employee benefits. The ordinance mandates that Contractors provide to employees with domestic partners benefits equal to those provided to employees with spouses.

6. Contractor Employee Jury Service Ordinance

6.1 For contracts over $100,000, Contractor shall comply with the County Ordinance No. 4324, Chapter 2.85 of the County of San Mateo Ordinance Code with respect to provision of jury duty pay to employees. Refer to Document 00 45 29 Jury Service and Wage Compensation.

7. Recycling and Diversion of Debris from Construction and Demolition Ordinance

7.1 All Contractors with demolition contracts exceeding $5,000 in value; or construction contracts exceeding $250,000 in value; or construction contracts consisting of at least 2,000 square feet shall comply with the County Ordinance No. 4099, Chapter 4.105 of the County of San Mateo Ordinance Code for with respect to construction and demolition debris. Refer to Document 00 62 63 Recycling and Diversion of Debris from Construction and Demolition.

8. Sole Source Products and/or County Vendors

8.1 The County has found and determined that the following item(s) shall be used on this Project based on the purpose(s) indicated. Public Contract Code Section 3400(b): A particular material, product, thing, or service is designated by specific brand or trade name for the following purpose(s):

(1) In order to match other products in use at the Grant Yard facility

(2) In order to obtain a necessary item that is only available from one source.

See Drawings and Specifications for specific project requirements.

8.2 Fire Alarm System and Product Manufacturer:
Siemens Industry, Inc.
25821 Industrial Boulevard
Hayward, CA 94545
Contact: Jon Meurer, jon.meurer@siemens.com
Phone: (510) 305-8510

8.3 Access Control Vendor:
Johnson Controls, Inc.
Contact: Andrew Aguero
Phone: (510) 600-5175

8.4 SMC Sign Vendor:
GNU Group
Contact: Andrea Guzman
Phone: (925) 444-2024
Mobile: (925) 219-2232
Email: aguzman@gnugroup.com

9. Contractor Selection and Contract Award

9.1 Before a contract is awarded, the Director of Public Works may, at his sole discretion, require from the proposed contractor evidence of his ability to faithfully, capably, and reasonably perform such proposed contract within the Contract Time and for the Contract Amount and may consider such evidence before making a decision on the award of such proposed contract.

9.2 The County reserves the right to reject any and all bid proposals, to contract work with whomever and in whatever manner, to abandon work entirely, or waiver of any irregularities in receiving bids.

9.3 The contract shall be awarded to the lowest and most responsible bidder as interpreted by the County in accordance with the Contract Documents. The Base Bid shall be used to determine the lowest bidder. Alternates may be accepted and awarded to the lowest and most responsible bidder, as determined above, in any combination or order.

9.4 Once a decision has be made to award a contract to a bidder, the County will issue a Notice of Intent to Award to notify all bidders of the selected bidder

10: Protests

Protests that do not comply with the protest procedures outlined below will be rejected.

10.1 Protest Eligibility, Format, and Address

(1) Protests or objections may be filed regarding the procurement process, the content of the solicitation, Construction Documents, or any addenda, or contract award.

(2) The County will only review protests submitted by an interested party, defined as an actual or prospective bidder whose direct economic interest could be affected by the County's conduct of the solicitation. Subcontractors do not qualify as interested parties.

(3) Submit protests to the Department of Public Works by registered mail to:

Kevin Sporer, Deputy Director
Department of Public Works
County of San Mateo
555 County Center, 5th Floor
Redwood City, Ca 94063.

10.2 Protest Deadlines

Submit Protests with any supplemental materials by 2:00PM, Pacific Standard Time, (PST), as appropriate, on the deadlines set forth below. The date of filing is the date the County receives the protest, unless received after 2:00PM PST, or on other than a Business Day, in which case the date of filing will be the next Business Day. Failure to file by the relevant deadline constitutes a waiver of any protest on those grounds. Supplemental materials filed after the relevant deadline may be rejected by the County.

(1) If relating to the content of the solicitation or to an addendum, file within five (5) Business days after the date the County releases the solicitation or addendum.

(2) If relating to any notice of non-responsiveness or non-responsibility, file within five (5) Business Days after the County issues such notice.

(3) If relating to intent to award, file within five Business Days after the County issues notice of Intent to Award. No protests will be accepted once actual award has been made.

10.3 Protest Contents

(1) The letter of protest must include all of the following elements:
a) Detailed grounds for the protest, fully supported with technical data, test results, documentary evidence, names of witnesses, and other pertinent information related to the subject being protested; and
b) The law, rule, regulation, ordinance, provision or policy upon which the protest is based, with an explanation of the violation.

(2) Protests that simply disagree with decisions of the Department of Public Works will be rejected.

10.4 Reply to Protest

The County will send a written response to the protestor and to any other party named in the protest.

10.5 No Stay of Procurement Action during Protest

Nothing in these protest requirements will prevent the County from proceeding with negotiations or awarding a purchase order or contract while a protest is pending.

11. Public Records

11.1 General

(1) All bids, protests, and information submitted in response to this solicitation will become the property of the County and will be considered public records. As such, they may be subject to public review.

(2) Any contract arising from this solicitation for bids will be public record.

(3) Submission of any materials in response to this solicitation for bids constitutes:

a) Consent to the County's release of such materials under the Public Records Act without notice to the person or entity submitting the materials; and
b) Waiver of all claims against the County and/or its officers, agents, or employees that the County has violated a proposer's right to privacy, disclosed trade secrets, or caused any damage by allowing the bid or materials to be inspected; and

c) Agreement to indemnify and hold harmless the County for release of such information under the Public Records Act; and
d) Acknowledgement that the County will not assert any privileges that may exist on behalf of the person or entity submitting the materials.

11.2 Confidential Information

(1) The County is not seeking proprietary information and will not assert any privileges that may exist on behalf of the proposer: Proposers are responsible for asserting any applicable privileges or reasons why a document should not be produced in response to a public record request.

(2) If submitting information protected from disclosure as a trade secret or any other basis, identify each page of such material subject to protection as “CONFIDENTIAL”. If requested material has been designated as confidential, the County will attempt to inform the proposer of the public records request in a timely manner to permit assertion of any applicable privileges.

(3) Failure to seek a court order protecting information from disclosure within ten (10) days of the County’s notice of the request to the proposer will be deemed agreement to disclosure of the information and the proposer agrees to indemnify and hold the County harmless for release of such information.

(4) Requests to treat and entire proposal as confidential will be rejected and deemed agreement to County disclosure of the entire proposal and the proposer agrees to indemnify and hold the County harmless for release of any information requested.

(5) Trade secrets will only be considered confidential if claimed to be a trade secret when submitted to the County, marked as confidential, and compliant with Government Code Section 6254.7.

END OF DOCUMENT 00 21 13

DOCUMENT 00 41 13

BID FORM

STIPULATED SUM SINGLE-PRIME CONTRACT

To: The County of San Mateo
State of California

From: _____
(Proper Name of Bidder)

For: **Grant Yard Radio Shop Project**
752 Chestnut Street, Redwood City, CA 94063
Project Number: P30J1

Bid Opening Date: January 25, 2021, at 2:30PM

1. SCOPE OF BIDS – The undersigned, doing business under the name of

_____,
declares that the only persons or parties interested in this Bid proposal as Principals are those named herein; that this Bid is made without collusion with any other person, firm or corporation; that Principals have carefully examined the location of the proposed Work, the form of Agreement, and the Contract Documents therein referred to; that they propose, and agrees if this Bid is accepted, that Principals will contract with the County of San Mateo, in the form of the Agreement in the Contract Documents, and shall perform all the Work and furnish all the materials specified in the Contract Documents for the following amount(s). The base bid, unit prices, alternates, allowances, as applicable, shall include all labor, materials, equipment, supervision, overhead, profit, and incidentals necessary to complete the Work in accordance with the Contract Documents. The Base Bid will be used to determine the lowest responsible bidder.

2. BASE BID – Base bids shall include all Work specified in the Contract Documents. Write base bid in words and numbers. The base bid is the Contract Amount.

_____Dollars

($_____)

3. UNIT PRICES: Not used.

4. ALLOWANCES: Not Used.

5. ALTERNATES: Not Used.

6. CONTRACT – If written notice (by electronic mail and U.S. Mail) of the acceptance of this Bid to the undersigned occurs within ninety (90) calendar days after the date of opening the bids, or any time thereafter before the bid is withdrawn, the undersigned will, within ten (10) calendar days after the date of such notice, execute and deliver a contract in the Form of Agreement provided in these Contract Documents and submit with Agreement required Payment and Performance Bonds in the form provided in these Contract Documents. The undersigned designates the address provided in Section 14 of this form to be the place of business to which such notice of acceptance may be mailed or delivered.

7. TIME OF COMPLETION – The undersigned agrees, if awarded the Contract, to complete this entire work within Contract Time specified in Document 00 11 16 Notice to Contractors.

8. BONDS – The undersigned agrees, if awarded the Contract to execute within ten (10) calendar days, two corporate surety bonds as called for in Document 11 21 13 Instruction to Bidders.

9. INSURANCE – Bidder's Insurance as required for this Contract is placed with:

_____

Bidder's Workers Compensation Insurance is placed with:

_____

Bidder's All Other Risk Insurance is placed with:

_____

10. ADDENDA – All Addenda during Bidding are bound with Contract Documents and issued during the time of bidding.

11. ADDENDA RECEIPT – The receipt and acceptance of the following addenda is hereby acknowledged:

ADDENDUM NO. _____ DATED_____
ADDENDUM NO. _____ DATED_____
ADDENDUM NO. _____ DATED_____

12. This Bid may be withdrawn at any time prior to the scheduled time for the opening of bids or any authorized postponement thereof.

13. CONTRACTOR'S LICENSE – The undersigned agrees, if awarded the contract, to maintain and keep current through the completion of the contract the valid licenses

for the work to be performed as required by the California Contractors License Law and all other applicable licensing requirements.

License No.	License Class	Expiration Date

14. By the signature below, the Bidder certifies, under penalty of perjury, the accuracy of the representations made in this Bid proposal.

Dated _____, 20_____.

Company
Business Type _____Corporation _____Partnership _____Sole Proprietorship

State of Incorporation of Location of Business Registration:_____

Name of Bidder: _____

Type of Organization: _____

Signed by: _____

Print Name of Signer: _____

Title of Signer:_____

Address of Bidder: _____

Phone:_____ Fax:_____

Email: _____

Taxpayer Identification Number of Bidder:_____

Department of Industrial Relations Registration Number:_____

If Bidder is a partnership, give full names of all
partners:_____

If Bidder is a corporation, affix corporate seal.

Name of Corporation: _____

President/Secretary/Treasurer/Other: _____

15. DESIGNATION OF SUBCONTRACTORS – In compliance with the provisions of Sections 4100-4108 of the Public Contract Code of the State of California, and any amendments thereof, each Bidder shall set forth and list below the name and the location of each subcontractor who will be employed, and the kind of form that each will perform work or labor or render service to the Bidder in or about the construction of the Work in an amount in excess of one-half of one percent (1/2 of 1%) of the Bidder's total Bid to County, if the Contract is awarded to the Bidder. Any work that the Bidder fails to list, Bidder agrees to perform that portion itself or be subject to penalty under applicable law.

In case more than one subcontractor is named for the same kind of work, state the portion that each will perform. Vendors or suppliers of materials only do not need to be listed.

Reference: Notice to Contractor regarding State Senate Bill SB 854

DESIGNATION OF SUBCONTRACTORS - Please List All Subcontractor's

DESIGNATED SUBCONTRACTOR LIST	
Project Number: P30F1	**Project Name: Prevent Self Harm and Ligature Project**

Name and City of Subcontractor **(1) (4)**	Description of Work: Reference to Contract Items **(1)**	Price Under Contract **(2) (3)**	State of California Contractor's License **(2)**	Department of Industrial Relations Registration No. (DIR) **(2)**

(1) Submit this information with sealed bid.
(2) This information shall be required of the two (2) apparent low bidders, no later than two days following the bid opening. **DO NOT INCLUDE THIS INFORMATION WITH BID**.
(3) Dollar amounts will be treated as proprietary and will solely be for the use of County staff. **DO NOT INCLUDE THIS INFORMATION WITH BID**.
(4) Submit full address of Subcontractors two days following bid opening.

Attach additional page as necessary. Indicate "none" or number or pages attached here: _____ pages attached.

END OF DOCUMENT 00 41 13

DOCUMENT 00 45 19

NON-COLLUSION DECLARATION

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

Project: **Grant Yard Radio Shop Project**
752 Chestnut Street, Redwood City, CA 94063

Project No.: P30J1

The undersigned declares:

I am the _____ of _____, the party making the foregoing bid. The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____date], at _____city], _____state]."

_____ _____

Signature Title

(ATTACH NOTARIAL ACKNOWLEDGMENT FOR THE ABOVE SIGNATURE)

END OF DOCUMENT 00 45 19

DOCUMENT 00 45 26

WORKERS' COMPENSATION CERTIFICATION

Contract Between County Of San Mateo (The "County" Or The "Owner") and _____ (The "Contractor" Or The "Bidder") for the construction of:

GRANT YARD RADIO SHOP PROJECT NO. P30J1 (The "Contract" Or The "Project")

Labor Code §3700 provides:

"Every employer, except the State, and all political subdivisions or institutions thereof, shall secure the payment of compensation in one or more of the following ways:

(a) By being insured against liability to pay compensation by one or more insurers, duly authorized to write compensation insurance in this State.

(b) By securing from the Director of Industrial Relations a certificate of consent to self-insure, which may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to employees."

I am aware of the provisions of §3700 of the Labor Code that require every employer to be insured against liability for Worker's Compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this Contract.

Date: _____ 20_____

By_____ Print Name:_____
(Signature of Contractor) (Name of Contractor)

_____ (Official Title)

(Labor Code §1861 requires that this Contractor certification must be signed and filed by the Contractor with the public agency prior to performing any Work.)

END OF DOCUMENT 00 45 26

DOCUMENT 00 45 29

JURY SERVICE AND WAGE COMPENSATION

COUNTY OF SAN MATEO
CONTRACTOR EMPLOYEE JURY SERVICE
ORDINANCE NO. 4324, CHAPTER 2.85

2.85.010 Definitions

For the purposes of this chapter:
(a) "Contract" means a legal agreement between the county and a contractor for public works, consulting, or other services, or for purchase of supplies, material or equipment.

(b) "Contractor" means a party who enters into a contract with the county for which the contractor receives consideration of $100,000 or more.

(c) "Contract Authority" means the Board of Supervisors or the head of the department or agency presenting the proposed contract to the Board of Supervisors.

(d) "Employee" means any California resident who is a full-time employee of a contractor under the laws of California.

(e) "Full time" means 40 hours or more worked per week, or a lesser number of hours if
(1) the lesser number is a recognized industry standard as determined by the County Manager, or
(2) the contractor has a long standing practice that defines the lesser number of hours as full time. (Ord. 4324, 08/15/06)

2.85.020 Contractor Jury Service Policy

(a) A contractor shall have and adhere to a written policy that provides that its employees shall receive from the contractor, on an annual basis, no less than five days of regular pay for actual jury service in San Mateo County. The policy may provide that employees deposit any fees received for such jury service with the contractor or that the contractor deduct from the employees' regular pay the fees received for jury service.

(b) At the time of seeking a contract, a contractor shall certify to the County that it has and adheres to a policy consistent with this chapter or will have and adhere to such a policy prior to award of the contract.

(c) The Board of Supervisors may waive the requirements of this chapter when it determines that it is in the best interests of the County for such reasons as follows:

1. Award of a contract or amendment is necessary to respond to an emergency;

2. The Contractor is a sole source;
3. No compliant contractors are capable of providing goods or services that respond to the County's requirements;
4. The requirements are inconsistent with a grant, subvention or agreement with a public agency;
5. The County is purchasing through a cooperative or joint purchasing agreement.

(d) Contractors should submit requests for waivers of the terms of this chapter to the Contract Authority or the County Manager.

(e) The County Manager may reject a contractor’s bid or proposal, or terminate a contract, if he determines that the contractor is in violation of the requirements of this chapter or was established, or is being used, for the purpose of evading the intent of this chapter.

(f) No contract shall be executed with a contractor unless such contractor is in compliance with this chapter. (Ord. 4324, 08/15/06)

2.85.030 Powers and duties of the County Manager

The County Manager's office shall have the authority to:
(a) Adopt rules and regulations, in accordance with this chapter and the Ordinance Code of the County of San Mateo, establishing standards and procedures for effectively carrying out this chapter;

(b) Receive notification from employees of contractors regarding violations of this chapter;

(c) Determine and recommend to the Board of Supervisors for final decision the imposition of appropriate sanctions for violation of this chapter by contractors including, but not limited to:

1. Disqualification of the contractor from bidding on or being awarded a County contract for a period of up to 5 years, and
2. Contractual remedies, including, but not limited to termination of contract.

(d) Impose other appropriate contractual sanctions for violations of this chapter;

(e) Allow for remedial action after a finding of noncompliance.

(g) Perform such other duties as may be required or which are necessary to implement the purposes of this chapter. (Ord. 4324, 08/15/06)

2.85.040 Date of Application

The provisions of this chapter shall apply to any contract awarded or amended on or after September 01, 2005, provided that if the contractor is then signatory to a collective bargaining agreement, this chapter shall only apply to any contract with that contractor which is awarded or amended after the effective date of the next collective bargaining agreement. (Ord. 4324, 08/15/06)

END OF DOCUMENT 00 45 29

DOCUMENT 00 45 36.01

EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS

CERTIFICATION OF COMPLIANCE

WITH LAWS PROHIBITING DISCRIMINATION

THIS FORM MUST BE COMPLETED IN FULL AND SUBMITTED WITH THE BID

We are in compliance with the Equal Employment Opportunity Requirement of Executive Order 11246, Title VII of the Civil Rights Act of 1964, the California Fair Employment Practices Act, Section 503 of the Rehabilitation Act of 1973, and any other federal or state laws relating to equal employment opportunity and the provisions of Title 2, Chapter 2.50 of the San Mateo County Ordinance Code and the Board established guidelines implementing them.

We will not discriminate against any employee or applicant for employment based on race, religion, color, national origin, age, ancestry, physical or mental disability, sexual orientation, or sex. This pertains to the areas of recruitment, hiring, training, upgrading, transfer, compensation, and termination.

CERTIFICATION OF INTENT

We will develop and implement, during the course of the work concerned, an Equal Employment Opportunity Program of hiring and employment conducted without regard to race, religion, color, national origin, age, ancestry, physical or mental disability, sexual orientation, or sex of the applicants. With this certification we shall submit any and all information which may be required by the County in connection with this program.

Date: _____

Bidder/Company Name: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT 00 45 36.01

DOCUMENT 00 45 36.02

EQUAL EMPLOYMENT OPPORTUNITY PROGRAM
CONTRACTOR REPORT FORM

THIS FORM MUST BE COMPLETED IN FULL AND SUBMITTED WITH THE BID

Project: **Grant Yard Radio Shop Project**
752 Chestnut Street, Redwood City, CA 94063

Project No.: P30J1

Company Name: _____ Date: _____

RACIAL/ETHNIC MAKEUP OF THE COMPANY

Be sure to include the total of all employees in each classification in the first column, not just minorities. Report the number of employees enrolled in formal on-the-job (apprenticeship) training programs in parenthesis () for each classification.

Minority Employees										
Job Classification	Total All Employees	Ethnicity								
		American-Indian or Native Alaskan	Asian	Native Hawaiian or Pacific Islander	Black American or African American	Caucasian	Filipino	Hispanic or Latino (1)	Other (2)	Unidentified (3)
Total(s)										

Ethnicity Notes:
(1) “Hispanic” includes all persons of Mexican, South and Central American, Puerto Rican, Cuban or Spanish ancestry.
(2) “Other” includes all others whose origin consists of two or more races other than Hispanic or Latino.
(3) Use this category for employees who have chosen not to identify any race or ethnicity, including “Other”.

END OF DOCUMENT 00 45 36.02

DOCUMENT 00 45.36.03

EQUAL EMPLOYMENT OPPORTUNITY PROGRAM QUESTIONNAIRE

THIS QUESTIONNAIRE MUST BE COMPLETED IN FULL BY AN OFFICIAL OF THE COMPANY AND SUBMITTED WITH THE BID

Project: **Grant Yard Radio Shop Project**
752 Chestnut Street, Redwood City, CA 94063

Project No.: P30J1

Company Name: _____

Name of Company Official: _____

Phone: _____ Date: _____

1. _____Yes _____No Have you read and are you acquainted with the Equal Employment Opportunity Requirement of Executive Order 11246, Title VII of the Civil Rights Act of 1964, Section 503 of the Rehabilitation Act of 1973, the California Fair Employment Practices Act and Title 2, Chapter 2.50 of the San Mateo County Ordinance Code?

2. _____Yes _____No Is it the policy of your company to recruit, hire, train, upgrade, transfer, compensate, and discharge without regard to race, religion, color, national origin, age, ancestry, physical or mental disability, sexual orientation, or sex?

3. _____Yes _____No Have you appointed an Equal Employment Opportunity Officer? Give his name, position in the company, office address, and phone number.

_____

_____

_____

4. _____Yes _____No Does your employment

advertising state that you are an Equal Opportunity Employer?

5. _____Yes _____No Have all recruitment sources been advised that all qualified applicants will be considered for employment without regard to race, religion, color, national origin, age, ancestry, physical or mental disability, sexual orientation, or sex?

6. _____Yes _____No Were any employees hired by means other than the union hiring hall in the past year?

How many? _____

What positions? _____

_____

7. If non-union personnel are employed by the company, or if a position cannot be filled by the union hall, specify the advertisement and recruitment sources that are used. (For example, State HRD, newspapers, high schools, vocational schools, referral agencies/organizations, community groups).

_____

_____

8. How many apprentices do you employ? _____

How many of these are minorities? _____

9. _____Yes _____No Do you have a program for upgrading and counseling present employees?

Describe: _____

_____

_____

10. _____Yes _____No Do you have a collective bargaining agreement with a labor union or other organization?

Please list these groups: _____

_____

_____

11. What percentage of your work force is covered by union agreement?_____

12. _____Yes _____No Have you advised the labor union and/or worker organization of your company's responsibility under the Equal Employment Opportunity Program?

13. _____Yes _____No Does your company's collective bargaining agreement include a provision for non-discrimination in employment?

14. _____Yes _____No Have you notified all subcontractors submitting bids to you that they will be subject to the same minority employment requirements should you be the successful bidder?

15. Describe any previous experience with Equal Employment Opportunity Programs:

_____

_____

_____

_____

16. State what Equal Employment Opportunity Program you plan to take in connection with this project:

_____

_____

_____

_____

If your company has a written Equal Employment Opportunity Program now in effect, please attach a copy of it.

END OF DOCUMENT 00 45.36.03

DOCUMENT 00 45 36.04

County of San Mateo
Contractor's Declaration Form

I. CONTRACTOR INFORMATION

Contractor Name:		Phone:	
Contact Person:		Fax:	
Address:		Number of employees:	

II. EQUAL BENEFITS (check one or more boxes)

Contractors with contracts in excess of $5,000 must treat spouses and domestic partners equally as to employee benefits.

- ☐ Contractor complies with the County's Equal Benefits Ordinance by:
  - ☐ offering equal benefits to employees with spouses and employees with domestic partners.
  - ☐ offering a cash equivalent payment to eligible employees in lieu of equal benefits.
- ☐ Contractor does not comply with the County's Equal Benefits Ordinance.
- ☐ Contractor is exempt from this requirement because:
  - ☐ Contractor has no employees, does not provide benefits to employees' spouses, or the contract is for $5,000 or less.
  - ☐ Contractor is a party to a collective bargaining agreement that began on _____ (date) and expires on _____ (date), and intends to offer equal benefits when said agreement expires.

III. NON-DISCRIMINATION (check appropriate box)

- ☐ Finding(s) of discrimination have been issued against Contractor within the past year by the Equal Employment Opportunity Commission, Fair Employment and Housing Commission, or other investigative entity. Please see attached sheet of paper explaining the outcome(s) or remedy for the discrimination.
- ☐ No finding of discrimination has been issued in the past year against the Contractor by the Equal Employment Opportunity Commission, Fair Employment and Housing Commission, or any other entity.

IV. EMPLOYEE JURY SERVICE (check one or more boxes)

Contractors with original or amended contracts in excess of $100,000 must have and adhere to a written policy that provides its employees living in San Mateo County up to five days regular pay for actual jury service in the County.

- ☐ Contractor complies with the County's Employee Jury Service Ordinance.
- ☐ Contractor does not comply with the County's Employee Jury Service Ordinance.
- ☐ Contractor is exempt from this requirement because:
  - ☐ the contract is for $100,000 or less.
  - ☐ Contractor is a party to a collective bargaining agreement that began on _____ (date) and expires on _____ (date), and intends to comply when the collective bargaining agreement expires.
  - ☐ Contractor has no employees.
  - ☐ Contractor has no employees who live in San Mateo County.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that I am authorized to bind this entity contractually.

_____ _____
Signature Name

_____ _____
Date Title

DOCUMENT 00 45 46

ANTI-TRUST LAWS QUESTIONNAIRE

THIS QUESTIONNAIRE MUST BE COMPLETED IN FULL AND SUBMITTED WITH THE BID

Project: **Grant Yard Radio Shop Project**
752 Chestnut Street, Redwood City, CA 94063

Project No.: P30J1

Company Name: _____

In accordance with instructions from the State of California Attorney General's Office, with regard to California and Federal Anti-Trust Laws, answers to the following must be included with the bid.

1. _____Yes _____No Were bid depository of registry services used in obtaining subcontractor bid figures in order to compute your bid?

2. If the answer to No. 1 is "Yes" please list the subcontractors using a bid depository or registry service.

_____

_____

3. _____Yes _____No Did you have any source of subcontractor's bids other than bid depositories?

4. _____Yes _____No Has any person or group threatened you with subcontractor boycotts, union boycotts, or other sanctions to attempt to convince you to use the services or abide by the rules of one or more bid depositories?

Date: _____ Name: _____

Nature of the threats: _____

Additional comments: _____

END OF DOCUMENT 00 45 46

DOCUMENT 00 52 13

AGREEMENT FORM – STIPULATED SUM

THIS AGREEMENT, entered into this _____ day of _____, 20__, by and between the COUNTY OF SAN MATEO, a Political Subdivision of the State of California, hereinafter called the "County", and _____, hereinafter called the "Contractor".

WITNESSETH that the Contractor and the County, in consideration of the mutual covenants, considerations and agreements herein contained, agree as follows:

STATEMENT OF WORK – The Contractor shall furnish all labor and materials and perform all work for:

Project: **Grant Yard Radio Shop Project**
752 Chestnut Street, Redwood City, CA 94063

Project No.: P30J1

in strict accordance with the Contract Documents.

TIME FOR COMPLETION – The work shall be commenced on a date to be specified in the Notice to Proceed issued by the County. Construction shall be completed within **Two Hundred Ninety-Six (296) calendar days** defined as sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize for its intended use.

COMPENSATION TO BE PAID TO CONTRACTOR – The County will pay and the Contractor will accept in full consideration for the performance of the contract, subject to additions and deductions and procedures for payment as provided therein, the sum of _____ ($_____) which is the Contractor's Bid. The Contract as defined in paragraph 1.1 of the General Conditions constitutes the sole agreement of the parties hereto relating to said work and correctly states the rights, duties, and obligations of each party as of the document's date. Any prior agreement, promises, negotiations, or representations between the parties not expressly stated in this document are not binding. All subsequent modifications shall be in writing.

PREVAILING WAGE RATES - In accordance with the provisions of Section 1770 of the Labor Code, the Board of Supervisors of the County of San Mateo has ascertained the prevailing rate of wages applicable to the work to be done, which prevailing wage rates have been established as indicated in the Notice to Bidders and are incorporated herein by reference.

The Contractor's attention is further directed to the following requirements of State Senate Bill SB 854 (Stat. 2014, chapter 28), effective January 1, 2015:

(1) No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].

(2) No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

(3) This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

IN WITNESS WHEREOF, the parties hereto on the day and year first above written have executed this agreement in three counterparts, each of which shall, without proof or accounting for the other counterparts, be deemed an original thereof.

COUNTY OF SAN MATEO

A Political Sub-Division of the State of California

By _____
President, Board of Supervisors

Attest:

_____
Michael Callagy, County Manager

_____
Clerk of the Board of Supervisors

By _____
Contractor

END OF DOCUMENT 00 52 13

DOCUMENT 00 61 13.13

PERFORMANCE BOND FORM
(100% of Contract Price)

(Note: Bidders must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

That WHEREAS, the County of San Mateo, hereinafter designated as the "County," has awarded to _____(CONTRACTOR'S NAME), hereinafter designated as "Principal," a contract dated _____ (CONTRACT AWARD DATE), hereinafter designated as the "Contract," which Contract is by this reference made a part hereof, for the work described as the **Grant Yard Radio Shop, 752 Chestnut Street, Redwood City, CA 94063, Project No.P30J1.**

And WHEREAS, Principal is required to furnish a bond in connection with the Contract, guaranteeing the faithful performance thereof;

NOW THEREFORE, THESE PRESENTS WITNESSETH:

That the said Principal and the undersigned, (SURETY'S NAME), as corporate Surety, are held and firmly bound unto the County in the sum of

_____ Dollars ($_____)
lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

The condition of this obligation is such, that if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extensions thereof that may be granted by the County, with or without notice to the Surety, and during the life of any guarantee required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to Surety being hereby waived, on Principal's part to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify, defend, protect, and hold harmless the County as stipulated in the Contract, then this obligation shall become and be null and void; otherwise it shall be and remain in full force and effect.

No extension of time, change, alteration, modification, or addition to the Contract, or of the work required thereunder, shall release or exonerate Surety on this bond or in any way affect the obligation of this bond; and Surety does hereby waive

notice of any such extension of time, change, alteration, modification, or addition.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety this _____ day of _____, 20_____.

Principal	Surety
Signature	Signature
Printed Name	Printed Name of California Agent Surety
	Address of California Agent Surety
	Telephone Number of California Agent Surety

(Affix Corporate Seal)

NOTE: Notary acknowledgement for Surety signatures and Surety's Power of Attorney and Certificate of Authority for Surety must be attached. The California Department of Insurance must authorize the Surety to be an admitted surety insurer.

END OF DOCUMENT 00 61 13.13

DOCUMENT 00 61 13.16

PAYMENT BOND FORM

Contractor's Labor & Material Payment Bond
(100% of Contract Price)

(Note: Bidders must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

That WHEREAS, the County of San Mateo hereinafter designated as the "County," has awarded to _____ (CONTRACTOR NAME) hereinafter designated as the "Principal," a contract dated _____ (CONTRACTOR AWARD DATE) hereinafter designated as the "Contract," which Contract is by this reference made a part hereof, for the work described as the **Grant Yard Radio Shop Project, 752 Chestnut Street, Redwood City, CA 94063, Project No. P30J1.**

And WHEREAS**,** pursuant to law, the Principal is required, before entering upon the performance of the work, to file a good and sufficient bond with the body by whom the Contract is awarded to secure the claims to which reference is made in Sections 9550 to 9566 and 9100 to 9364 both inclusive, of the Civil Code of California.

NOW THEREFORE, THESE PRESENTS WITNESSETH:

That the said Principal and the undersigned _____,
(Surety's Name)

as corporate Surety, are held and firmly bound unto all laborers, material men and other persons referred to in said statutes in the sum of

_____ Dollars ($_____)

lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, or assigns, jointly and severally, by these presents.

The condition of this obligation is that if the above bonded Principal, contractor, person, company or corporation, or his or its sub-contractor, fails to pay any claimant name in Section 9100 of the Civil Code of the State of California, or amounts due under the Unemployment Insurance Code, with respect to work or labor performed by any such claimant, that the Surety on this bond will pay the same, in an amount not exceeding the aggregate sum specified in this bond, and also, in case suit is brought upon this bond, a reasonable attorney's fee, which shall be awarded by the court to the prevailing party in said suit, and attorney's fees to be taxed as costs in said suit.

It is hereby expressly stipulated and agreed that this bond shall inure to

the benefit of any and all persons, companies and corporations entitled to file claims under Section 9100 to 9364 of the Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

This bond is executed and filed to comply with the provisions of the act of Legislature of the State of California as designated in the Civil Code, Sections 9550-9566 inclusive, and all amendments thereto.

Should the condition of this bond be fully performed, then this obligation shall become null and void, otherwise it shall be and remain in full force and effect.

And the said Surety, for value received, hereby stipulates and agrees that no change will be made which increases the total Contract price more than twenty percent (20%) in excess of the original Contract price without notice to the Surety, then, this obligation to be void, otherwise to remain in full force and virtue.

Correspondence relating to this bond shall be sent to the Surety at the address set forth below.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety this _____ day of _____, 20___.

_____	_____
Principal	Surety
_____	_____
Signature	Signature
_____	_____
Printed Name	Printed Name of California Agent Surety
	_____
	Address of California Agent Surety
	_____
	Telephone Number of California Agent Surety

(Affix Corporate Seal)

NOTE: Notary acknowledgement for Surety signatures and Surety's Power of Attorney and Certificate of Authority for Surety must be attached. The California Department of Insurance must authorize the Surety to be an admitted surety insurer.

END OF DOCUMENT 00 61 13.16

DOCUMENT 00 61 16

BID BOND

(Bid Security Form)

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned,

_____, as Principal ("Principal"),

and _____, as Surety ("Surety"), are hereby held and firmly bound unto the County of San Mateo in the State of California, as represented by the County Board of Supervisors, hereinafter called the "Owner" in the sum of

_____ Dollars ($_____)
lawful money of the United States of America, for payment of which sum, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

The condition of the above obligation is such that, whereas the Principal has submitted to the County a certain Bid, attached hereto and hereby made a part hereof, to enter into a contract in writing for the **Grant Yard Radio Shop Project**, 752 Chestnut Street, Redwood City, CA 94063, Project No. P30J1 in strict accordance with the Contract Documents.

NOW, THEREFORE,

a. If said Bid shall be rejected, or, in alternate

b. If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Agreement attached hereto and shall execute and deliver Performance and Payment Bonds in the Forms attached hereto (all properly completed in accordance with said Bid), and shall in all other respects perform the agreement created by the Acceptance of said Bid.

Then, this obligation shall be void; otherwise, the same shall remain in force and effect, it being expressly understood and agreed that the liability of the Surety for any and all default of the Principal hereunder shall be the amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligation of said Surety and its bond shall be in no way affected or impaired by any extension of the time within which the County may accept such Bid and said Surety does hereby waive notice of such extension.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals this _____ day of _____, 20__, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In presence of:

_____

(Individual Principal) (Affix Corporate Seal)

(Business Address)

By_____

Attest: _____
(Corporate Principal)

_____

(Business Address)

(Affix Corporate Seal)

By_____

Attest: _____
(Corporate Surety)

_____
(Business Address)

(Affix Corporate Seal)

By

_____

The rate or premium on this bond is _____ per thousand.

Total amount of premium charge, $_____
(The above must be filled in by Corporate Surety.)

(Note: If Bidder is providing a bid bond as its bid security, Bidder must use this form, NOT a surety company form.)

Bidder must attach Power of Attorney and Certificate of Authority for Surety and a Notarial Acknowledgement for all Surety's signatures. The California Department of Insurance must authorize the Surety to be an admitted Surety Insurer.

END OF DOCUMENT 00 61 16

DOCUMENT 00 62 23

RECYCLING AND DIVERSION OF DEBRIS FROM CONSTRUCTION AND DEMOLITION

UNDER THE

COUNTY OF SAN MATEO, ORDINANCE NO. 4099, CHAPTER 4.105

AND THE

COUNTY OF SAN MATEO WASTE MANAGEMENT PLAN FORM

4.105.010 Definitions

For purposes of this chapter, the following definitions apply:

(a) “Construction and demolition debris” means and includes:

1. Discarded materials generally considered to be not water soluble and non-hazardous in nature, including but not limited to steel, copper, aluminum, glass, brick, concrete, asphalt material, pipe, gypsum, wallboard, and lumber from the construction or destruction of a structure as part of a construction or demolition project or from the renovation of a structure and/or landscaping, including rocks, soils, tree remains, trees, and other vegetative matter that normally results from land clearing, landscaping and development operations for a construction project;

2. Remnants of new materials, including but not limited to: cardboard, paper, plastic, wood, and metal scraps from any construction and/or landscape project.

(b) “Contractor” means any person or entity holding, or required to hold, a contractor’s license of any type under the laws of the State of California, or who performs (whether as contractor, subcontractor, owner-builder, or otherwise) any construction, demolition, remodeling, renovation, or landscaping service relating to buildings or accessory structures in the unincorporated area of San Mateo County.

(c) “Covered Project” means and includes any project which consists of one or more of the following:

1. Demolition work only, where the cost of the work exceeds $5,000 as determined by the Building Official;

2. The renovation, remodel or addition to an existing structure, or the construction of a new structure where the cost of the work exceeds $250,000, as determined by the Building Official;

3. Commercial, residential, or multi-family residential development, and any new structure that is equal to or greater than 2,000 square feet.

(d) “Designated recyclable and reusable materials” means and includes:

1. Inert solids

2. Wood materials, including any and all dimensional lumber, fencing or construction wood that is not chemically treated, creosoted, CCA pressure treated, contaminated or painted;

3. Vegetative materials, including trees, tree parts, shrubs, stumps, logs, brush or any other type of plants that are cleared from a site for construction or other use;

4. Metals, including all metal scrap such as, but not limited to, pipes, siding, window frames, door frames and fences;

5. Roofing materials including wood shingles and shakes as well as asphalt, stone and slate based roofing material;

6. Salvageable materials and structures, including, but not limited to doors, windows, fixtures, hardwood flooring, sinks, bathtubs and appliances;

7. Any other materials that the Building Official determines can be diverted due to the identification of a recycling facility, reuse facility, or market accessible from the County.

(e) “Inert solids” includes asphalt, concrete, rock, stone, brick, sand, soil and fines;

(f) “Salvage” means the controlled removal of materials from a covered project, for the purpose of reuse or storage for later reuse;

(g) “Structure” means anything constructed or erected. (Ord. 4099, 02/26/02)

4.105.020 Deconstruction and Salvage and Recovery

(a) Contractors are encouraged to make every structure planned for demolition available for deconstruction, salvage, and recovery prior to demolition; and to

recover the maximum feasible amount of salvageable designated recyclable and reusable materials prior to demolition.

(b) Recovered and salvaged designated recyclable and reusable materials from the deconstruction phase shall be counted towards the diversion requirements of this chapter. (Ord. 4099, 02/26/02)

4.105.030 Diversion Requirements

(a) One hundred percent (100%) of inert solids, and at least sixty five percent (65%) of the remaining construction and demolition debris tonnage shall be diverted.

(b) For each covered project, the diversion requirements of this chapter shall be met by submitting and following a “Waste Management Plan” that includes the following:

1. Deconstructing and salvaging all or part of the structure as practicable. AND

2. Directing one hundred percent (100%) of inert solids to reuse or recycling facilities approved by the County. AND

3. Either:

a. Taking all mixed construction and demolition debris to the Mixed Construction and Demolition Debris Recycling facilities approved by the County and taking all sorted or crushed construction and demolition debris to approved facilities; OR

b. Source separating non-inert materials, such as cardboard and paper, wood, metals, green waste, new gypsum wallboard, tile, porcelain fixtures, and other easily recycled materials, and directing them to recycling facilities approved by the County and taking the remainder (but no more than 50% by weight or yardage) to a facility for disposal. In this option, calculations must be provided to show that 50% of construction and demolition debris (in addition to 100% of inert solids) has been diverted. (Ord. 4099, 02/26/02)

4.105.040 Information Required Before Issuance of Permit:

Every contractor shall submit a properly completed Waste Management Plan on a form prescribed by the County, as an integral part of the building or demolition permit application process for a covered project. The Waste Management Plan shall indicate the intended salvage, reuse, and recycling facilities, chosen from a list of facilities approved by the County, for all construction and/or demolition

debris from the project. Approval of alternative facilities or special salvage or reuse options may be requested of the Building Official. Approval by the Building Official, or designee, of the Waste Management Plan as complying with this chapter shall be a condition precedent to the issuance of any building or demolition permit for a covered project. (Ord. 4099, 02/26/02)

4.105.050 Administrative Fee

As a condition precedent to the issuance of any building or demolition permit for a covered project, the applicant shall pay to the County a fee as established by resolution to compensate the County for all expenses incurred in administering this chapter. (Ord. 4099, 02/26/02)

4.105.060 Reporting

(a) No later than thirty (30) days following the completion of a demolition project or construction project, the contractor shall, as a condition of final approval and for issuance of any certificate of occupancy, submit documentation to the County that demonstrates compliance with the requirements of this chapter.

(b) The documentation shall consist of photocopies of receipts and weight tags or other records of measurement or equivalent documentation from recycling companies, deconstruction contractors, and landfill and disposal companies. The contractor's approved Waste Management Plan shall be completed by recording and confirming the type of debris diverted and the facilities to which it was taken. The contractor shall sign the completed Waste Management Plan form to certify its accuracy as part of the documentation of compliance.

(c) Progress reports during construction may be required.

(d) All documentation submitted pursuant to this section is subject to verification by the County.

(e) It is unlawful for any person to submit documentation to the County under this section which that person knows to contain any false statements, including but not limited to false statements regarding tonnage of materials recycled or diverted, or to submit any false or fraudulent receipt or weight tag or other record of measurement. (Ord. 4099, 02/26/02)

4.105.070 Penalties and Enforcement

(a) Each violation of the provisions of this chapter shall constitute a misdemeanor and shall be punishable by imprisonment in the county jail for up to six (6) months, or by a fine of up to one thousand dollars ($1,000), or both. Each day that a violation continues shall be deemed a new and separate offense.

(b) The Building Official shall have the authority to enforce this chapter as specified in section 9021 of the San Mateo County Building Regulations, including but not limited to the authority to order that work be stopped where any work is being done contrary to the provisions of this chapter. (Ord. 4099, 02/26/02)

END OF DOCUMENT 00 62 23

See the next page for "The County of San Mateo Waste Management Plan" fillable form.

County of San Mateo

WASTE MANAGEMENT PLAN

Case/group number(s):
BLD _____ - _____

Project address:

Street: _____

City: _____

Zip Code: _____

Green Halo number(s):

_____

Submit to:
County of San Mateo
Office of Sustainability
455 County Center, 4th Floor
Redwood City, CA 94063
Mon-Fri, 8:30 am-12:00 pm, 1:00 pm-4:30 pm

Information and support: 888-442-2666
www.smcsustainability.org/waste-reduction/construction-demolition

WMP required because project is a:

❑ Residential ❑ Demolition

❑ Nonresidential ❑ New Construction

❑ Addition

Section One: Permit Application

This Waste Management Plan (WMP) must be completed, submitted for review with a **$95 administration fee**, and approved to obtain a building permit. Separate WMPs are required for demolition and construction at the same site unless the Building Department requires only one permit. Need for a WMP is at the discretion of the Building Official or designee.

Applicant's Name: _____ Owner's Name:_____

Phone Number: _____ Email: _____

Applicant is (please check one): ❑ Owner ❑ Architect ❑ Builder ❑ Owner/Builder ❑ Other _____

Contractor (if applicable): _____ Contact Phone Number: _____

Project Description: _____

Project Square Footage: _____ Estimated Completion Date: _____

Waste Management Requirements:
You are required to recycle or re-use all inert solids (asphalt, brick, concrete, dirt, fines, rock, sand, and stone) and 65% of all construction and demolition debris.

I understand that I am required by San Mateo County Building Regulations Section 9210 - Adoption Of 2016 California Green Building Standards Code (Building Regulations) to salvage, reuse, or recycle **all inert solids** (asphalt, brick, concrete, dirt, fines, rock, sand, and stone) and **a minimum of 65%** of all construction and demolition debris (C&D). _____(Initial)

I understand that failure to meet the requirements of the Building Regulations shall constitute a misdemeanor, and shall be punishable by imprisonment in the county jail for up to 6 months and/or a fine of up to $1,000, calculated as a percentage of the required 65% diversion of C&D debris, and that the fine must be paid as a condition of final approval. _____ (Initial)

At the completion of this project, or more frequently if required, all weight tags or other equivalent documentation from salvage, recycling and waste facilities will be provided and I understand that I may not be issued my final inspection unless all original receipts and documentation are submitted to the County of San Mateo Office of Sustainability. _____ (Initial)

Recycling and waste facilities ask for the correct origin of the materials generated as they come through the scale house. These tons are reported to the State of California. I understand that I need to advise my debris box company, waste haulers, and my drivers that the materials generated on this project originated in Unincorporated County of San Mateo. _____ (Initial)

1) Deconstruction/salvage/reuse:

What materials will be salvaged/reused? _____

Deconstruction or salvage company (if applicable): _____

What materials will be reused on site? _____

How will this be documented? _____

2) Material transportation:

Will you be using a hauling company, debris box company or hauling the material yourself?

❏ Hauler ❏ Debris Box ❏ Self-haul

If using a hauling or debris box company, which company? _____

Have they been notified that the diversion of 65% mixed debris and all insert solids is required? ❏ Yes ❏ No

3) Waste management plan:

Check the materials you anticipate generating and fill in the facilities that you plan to use.

Category	Material	√	Reuse, Recycling or Disposal Facility
Mixed C&D	Mixed Debris		
Inerts	Asphalt		
	Bricks		
	Concrete		
	Dirt		
	Other inert solids		
Source Separated	Cardboard		
	Metals		
	Wood		
	Roofing		
	Carpet		
	Drywall		
	Yard trimmings		
	Other		
Disposal	Waste		

The undersigned hereby agrees to comply with the Waste Management Plan as submitted and is the owner or authorized agent to sign for the owner of this project.

Applicant Signature _____ **Date** _____

County Approval: ❏ Approved ❏ Approved with comments ❏ Denied

All receipts, weight tags and documentation for salvage, recycling, and disposal must be submitted:

❏ On completion of project ❏ Other _____

Office of Sustainability Approval: _____ Date: _____

OFFICE OF SUSTAINABILITY
COUNTY OF SAN MATEO

County of San Mateo
WASTE MANAGEMENT PLAN

Case/Group Number(s):
BLD _____ - _____

Project Address:

Street: _____

City: _____

Section Two: Final Report Approval

Please complete, submit, and get this section approved by the Office of Sustainability, prior to obtaining final approval by the Building Department no later than 30 days after completion of the demolition or construction project. Please provide weight of materials in **tons**. If needed, please use the conversion table on the next page to convert cubic yards to tons.

This section must be completed and signed, and all receipts or other supporting documentation must be attached in order to receive final project approval.

Category	Date	Material/items	Name of facility debris was hauled to	Weight (Tons)	Volume (CU. YD.)
Mixed C&D					
Salvage/Reuse					
Inerts Asphalt, bricks, concrete, dirt, rock, sand, soil, stone					
Source Separated Cardboard, wood, metal, sheetrock, wire, carpet, yard trimmings					
Disposal (Waste)					

❑ All receipts or equivalent documentation for salvage, recycling, and disposal are hereby attached.

❑ This project has recycled all of the inert solids and at least 65% of all debris generated.

Applicant Signature _____ **Date** _____

County Approval: ☐ Approved ☐ Approved with Comments ☐ Fine Payment Required

Comments:

_____

Fine Calculation: 1 – (C&D Diversion % Achieved ____ / 65%) x $1000 = $_____

Office of Sustainability Approval: _____ Date: _____

OFFICE OF SUSTAINABILITY
COUNTY OF SAN MATEO

County of San Mateo

WASTE MANAGEMENT PLAN

Cubic Yards to Tons Conversion Table

Category	Material	Cubic Yards	Pounds	Tons
Mixed C&D	Mixed load C&D	1	500	0.25
Inerts	Asphalt	1	1380	0.69
	Bricks	1	3000	1.5
	Concrete	1	1860	0.93
	Dirt	1	2000	1
	Other inert solids	1	1240	0.62
Source Separated	Cardboard	1	100	0.05
	Metals	1	900	0.45
	Wood	1	300	0.15
	Asphalt roofing	1	1188	0.59
	Carpet	1	600	0.3
	Drywall	1	400	0.2
	Green waste	1	300	0.15
	Gravel	1	2600	1.3
Disposal	Waste	1	300	0.15

DOCUMENT 00 65 36

WARRANTY FORM

(Contractor's or Subcontractor's own letterhead)

WARRANTY GUARANTEE FOR THE:

Project: **Grant Yard Radio Shop Project**
752 Chestnut Street, Redwood City, CA 94063

Project No.: P30J1

We, _____(Contractor's name) hereby guarantees

(Scope of Contractor's Work) _____

_____which Contractor has installed for the County of San Mateo for the above project

beginning _____ for _____ year(s) in accordance with the Contract Documents.

We agree to repair or replace to the satisfaction of the Owner any and all such work that may prove defective in workmanship or materials within that period, ordinary wear and tear and unusual abuse or neglect excepted, together with all other Work which may be damaged or displaced in connection with such Work. This Warranty includes labor and materials.

In the event of our failure to comply with the above-mentioned conditions within seven (7) calendar days after being notified in writing, we collectively and separately do hereby authorize the Owner to proceed to have the defects repaired and made good at our expense, and will pay the costs and charges therefore immediately upon demand.

I hereby certify that I am authorized to sign this document.

Date_____ _____
(Signature of Contractor)

_____
Print Name and Title

Date_____ _____
(Signature of Subcontractor)

Print Name and Title
(Subcontractor must co-sign with Contractor)

Representative(s) to be contacted for service subject to terms of Contract:

NAME: _____

ADDRESS: _____

PHONE NO.: _____

END OF DOCUMENT 00 65 36

DOCUMENT 00 72 13

GENERAL CONDITIONS

DOCUMENT 00 72 13

GENERAL CONDITIONS

1 THE CONTRACT

1.1 CONTRACT DESCRIPTION

The Contract Documents form the entire Contract between the Contractor and the Owner. The Contract supersedes prior negotiation and representations, either written or oral.

1.2 CONTRACT DOCUMENTS

A. The Contract Documents consist of the Notice to Contractors, Instructions to Bidders, Agreement, General Conditions, Special Provisions, Supplementary Conditions, Specifications, Drawings, Addenda, Revisions , Construction Change Directives, Change Orders (including Unilateral Change Orders), RFI Responses, Shop Drawings and other documents listed in the Agreement or included in the Project Manual, and written interpretations and instruction when issued in accordance with the provisions herein.

B. The Contract Documents are complementary and what is required by anyone shall be as binding as if required by all. The Contract Documents are not necessarily complete in every detail. The Contract is to include all labor, materials, equipment and other items as necessary for the proper execution and completion of the work as specified or reasonably inferable as being necessary to produce the intended results in accordance with high quality industry standards.

C. An item designated by reference to the number, symbol, or title of a specific standard such as a commercial standard, a Federal Specification, a Trade Association Standard or other similar standard, shall comply with the requirements in the latest revision thereof and any amendments or supplement thereto in effect on the date of the bid. The standards referred to shall have full force and effect as though printed in the Specifications.

D. The County will arrange for the Contractor to have access to one set of reproducible Drawings. The Contractor may at his expense, reproduce the Drawings and Specifications as needed. All Drawings and Specifications and copies thereof are the property of the Owner. They are not to be used on other projects.

E. For convenience, the Specifications may be arranged in sections and the Drawings may be arranged by system or otherwise. Such separation shall not be considered as the limit of Work required of any separate trade. The terms and conditions of such limitations are wholly between the Contractor and his

Subcontractors.

F. In general, the Drawings will indicate dimensions, position, quantity and type of construction; and the Specifications will indicate quality and method. Work indicated in one but not the other shall be furnished as though fully set forth in both. Work not specifically marked, specified, or detailed shall be the same as similar work that is marked, specified, or detailed.

G. The Project Manual is a collection of documents assembled for the convenience of the parties and usually includes, but is not limited to, the Notice to Contractors, Instructions to Bidders, General Conditions, Supplementary General Conditions, Special Provisions, Bid Documents, Agreement, and Specifications.

1.3 ERROR IN THE DOCUMENTS

A. Should an error or conflict appear in the Contract Documents, or a conflict with the documents and actual conditions, the Contractor shall notify the Owner, Owner's Representative, and Architect at once, and the Architect will provide a response and/or issue instructions. If the Contractor proceeds with the work without a written response/instructions, he shall make good any resulting unacceptable work or consequences.

B. Whenever the documents could be construed to be ambiguous or conflicting at the time of Bid, the Contractor is deemed to have included the cost of the more expensive material, method, or requirement in the Contract Amount.

C. Figured dimensions shall govern over scaling and large scale details shall govern over smaller scale details.

1.4 SEPARATE CONTRACTS

A. The Owner reserves the right to let other contracts in connection with this Project. Contractor shall afford other County contractor(s) reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs as required by the Owner.

B. If any part of Contractor's Work depends for proper execution or results upon the work of another contractor, the Contractor shall inspect and measure the work of other contractor and promptly report to the Owner all defects or discrepancies that render it unsuitable for such proper execution or results. Contractor's action of proceeding with his work shall constitute his acceptance of the prior work as fit and proper for the reception of his work.

C. The Contractor and its respective Subcontractors shall repair any damage he may do to another County contractor's work to the Owner's satisfaction.

1.5 CONTRACT TERMINATIONS

A. Owner's Right to Terminate Contract for Cause

If Contractor should be adjudged as bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver by the Surety should be appointed on account of his insolvency, or if he should fail to supply enough properly skilled workmen or materials to maintain the schedule, or if he should fail to diligently and expeditiously prosecute the Work, or if he should fail to commence the Work on the Project site per the Owner's Notice to Proceed, or if he should fail to make prompt payments to Subcontractors or for materials or labor, or persistently disregard laws, ordinances or the instructions of the Owner or Architect, or otherwise breach any provision of the Contract between the Contractor and Owner, the Owner may without prejudice to any right or remedy the Owner may have and after giving the Contractor seven (7) calendar days written notice, terminate the Contract or terminate the Contractor's right to proceed with the Work and take possession of the premises and of all materials, tools and equipment thereon and finish the Work by whatever method the Owner may deem expedient. In such case, Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Amount shall not exceed the expense of finishing the Work, including compensation for additional managerial and administrative services, such excess amount of the Contract shall be paid to the Contractor. If such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the Owner.

B. Owner's Right to Terminate Contract for Convenience

The Owner reserves the right to terminate this contract at any time. Contractor shall be compensated on the basis of the reasonable value of the portion of Work completed as prorated against the Contract Amount or shown as a separate price and the cost incurred for portions of the Work performed but not completed. The total payments to contractor shall not exceed the Contract Amount.

C. Contractor's Right to Terminate Contract

Except as provided by paragraph 1.5.D Emergency Termination, if the Work should be stopped by the Owner, or an order of the court, or other public authority for a period of six months, through no act or fault of the Contractor or of anyone employed by him, then the Contractor may, upon twenty-one (21) days written notice to the Owner, terminate this Contract and recover from the Owner the amount owed under the Contract for the portion of Work, if any, which was completed.

D. Emergency Termination

This Contract is subject to termination as provided by Section 4410 and 4411 of the Public Contracts Code of the State of California, being portions of the

Emergency Termination of Public Contracts Act of 1949. Said Sections read as follows:

"Sec. 4410. TERMINATION OF CONTRACT FOR PUBLIC WORK IN EVENT OF NATIONAL EMERGENCY. In the event a national emergency occurs, and public work, being performed by Contract, is stopped, directly or indirectly, because of the freezing or diversion of materials, equipment, or labor, as the result of an order or of a proclamation of the President of the United States, or of an order of any federal authority, and the circumstances or conditions are such that it is impracticable within a reasonable time to proceed with a substantial portion of the Work, then the public agency and the Contractor may, by written agreement, terminate said Contract."

"Sec. 4411. INCLUSION OF TERMS AND CONDITIONS OF TERMINATION OF CONTRACT IN AGREEMENT: COMPENSATION TO CONTRACTOR. Such an agreement shall include the terms and conditions of the termination of the Contract and provision for the payment of compensation or money, if any, which either party shall pay to the other or any other person, under the facts and circumstances in the case."

"Compensation to the Contractor shall be determined on the basis of the reasonable value of the Work done, including preparatory Work. As an exception to the foregoing, in the case of any fully completed separate item or portion of the work for which there is a separate Contract price, the Contract price shall control. The parties may in any other case adopt the Contract price as the reasonable value of the Work or any portions thereof."

1.6 ALLOWANCES

A. The Contractor shall include in the Contract Amount all allowances stated in the Contract Documents. Items or services covered by these allowances shall be supplied as the Owner may direct.

B. Allowances for material and equipment shall cover the cost to the Contractor, less any applicable trade discount, delivered at the site, and all applicable taxes. The Contractor's costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses required to complete the Work shall be included in the Contract Amount and not in the allowance.

C. Whenever the cost of the material, equipment or service is more than or less than the allowance, the Contract Amount shall be adjusted by the procedure in Section 2, Contract Modifications.

1.7 DISPUTES

Should any dispute including breach, arise out of or relate to this Contract the

Contractor shall continue to perform the Work in accordance with the Contract Documents and the Owner and Contractor agree to pursue resolution of the disagreement by whatever means available. Neither a dispute resolution process, the resolution, nor lack of resolution shall delay, hinder, or alter the completion of the Work in accordance with the undisputed portion of the Contract Documents and in accordance with the Owner's direction to Contractor regarding disputed portions of the Contract.

1.8 SEVERABILITY

In the event that any provision or any part of a provision of this Contract shall be finally determined to be superseded, invalid, illegal or otherwise unenforceable pursuant to applicable laws by an authority having jurisdiction, such determination shall not impair or otherwise affect the validity, legality, or enforceability of the remaining provisions or parts of provisions of this Contract, which shall remain in full force and effect as if the unenforceable provision or part were deleted.

1.9 HEADINGS

The headings of any section or provision of this Contract are for convenience only and shall not be deemed to limit, restrict or alter the content, meaning or effect thereof.

2 CONTRACT MODIFICATIONS

2.1 MODIFICATION DOCUMENTS

A. The Owner, without invalidating the Contract and without consent of surety, may accomplish changes in the Work within the general scope of the Contract consisting of additions, deletions, additional instructions, or other revisions, to the Contract Documents, and where applicable, the Contract Amount and/or the Contract Time being equitably adjusted accordingly. All such changes in the Work may be accomplished by Owner's Instructions, Architect's Supplemental Instructions, a Construction Change Directive, a Change Order (including a Unilateral Change Order), as may be applicable in accordance with the provisions of the Contract. The Contract Amount and/or the Contract Time may be changed only by a Change Order. Contractor agrees to promptly proceed with changes in the Work according to the respective form of documentation issued. All changes to the Work and all Contractor requests for additional compensation shall be resolved in accordance with this Section 2, Contract Modifications.

B. A Change Order is a written order from the Owner ordering a change in the Work. Upon receipt of a Change Order, the Contractor shall promptly proceed with the Work as changed. The Contractor will not delay the Work for any reason. Within ten (10) working days after receiving a Change Order and prior to or simultaneously with proceeding with the change in the Work, Contractor shall advise the Owner and Architect of Contractor's inability to proceed with the Work,

and shall state in writing. Proceeding with the Work as changed without submitting a notice to Owner or Owner's Representative indicates Contractor's full acceptance of the Change Order including the Contract Amount and/or Contract Time.

C. The signature of the Owner and Contractor on the Change Order indicates their final and conclusive acceptance of the stated terms and provisions as full compensation for the change to the Work. In the event the Owner and Contractor do not agree upon an adjustment to the Contract Amount and/or Contract Time resulting in a Change Order, the Owner may issue a Unilateral Change Order. A Unilateral Change Order is signed by the Owner and issued to the Contractor authorizing an adjustment in the Contract Amount and/or Contract Time as the Owner deems equitable. A Unilateral Change Order does not require the Contractor's signature, but may be signed by the Contractor and returned to the Owner.

D. If Contractor is in disagreement with the terms or provisions of a Unilateral Change Order, the Contractor shall give the Owner and Architect written notice of his disagreement, the basis thereof, and supporting documentation within ten (10) working days of receiving the Unilateral Change Order. Such notice of disagreement does not excuse performance by the Contractor of all obligations under the Contract Documents and the Contractor shall proceed with the Work including the Work involved with the disagreement. Failure to present such notice of disagreement constitutes a waiver by the Contractor of any entitlement to additional cost or time, or subsequent claim.

E. The Owner and Architect have the authority to issue Owner's instructions or Architect's Supplemental Instructions respectively to the Contractor which may require minor changes in the Work not involving an adjustment in the Contract Amount or an extension of Contract Time. If Contractor believes an adjustment of Contract Amount or Contract Time is justified, Contractor shall not incur additional cost or delay and notify the Owner or Architect in writing within 24 hours of upon receipt.

F. A Construction Change Directive is a written document signed by the Owner and issued to the Contractor to perform as specified. The Contractor shall immediately comply with and perform to the Construction Change Directive. If the Contractor believes an adjustment of Contract Amount or Contract Time is justified, a request may be submitted in accordance with Section 2.4, Contractor Claims. If the Owner concurs with the Contractor a Change Order will be issued.

2.2 VERBAL INSTRUCTIONS

Contractors shall not act or rely upon verbal instructions. If a verbal instruction is provided on site to the Contractor, Contractor shall document such verbal instruction through a confirming RFI. No work will be accepted by the Owner that differs from the Contract Documents as modified in writing.

2.3 METHOD OF DETERMINING ADJUSTMENT

A. An adjustment to the Contract Amount or Contract Time pursuant to a Change Order resulting from a Construction Change Directive, Claim, or other provision herein shall be determined in one or more of the following ways at the Owners discretion.

1 By negotiation based upon Contractor's estimate. The estimate shall include quantities of materials and man hours, and a breakdown of cost showing labor, materials, profit, overhead, and all other items of cost. Labor rates for Change Orders shall be agreed upon between the Owner and the Contractor withing thirty (30) calendar days of Contract Award date General requirements, labor burden, project supervision, project management and facilities are not allowed. Overhead and profit shall not exceed the percentages specified in the Contract Documents.

2. By unit prices stated in the Contract or subsequently agreed upon.

3. By acceptance of a lump sum price proposal of Subcontractor to Contractor.

4. By determination of the Owner and issued unilaterally by a Unilateral Change Order.

B. If the adjustment is not determined by the above methods prior to the Contractor starting Work pursuant to the Change Order, Contractor shall proceed with the Work and keep daily accurate records of the labor hours, materials, and other items of cost used in the performance of the changed Work. Copies of the records shall be given to the Owner or Owner's Representative daily. Contractor shall present at such time and in such form as Owner may prescribe, an itemized accounting together with appropriate supporting data as may be required by Owner to fully substantiate the cost of the changed Work. Owner shall consider such accounting in its determination of equitable adjustment. Overhead and profit shall not exceed the percentages specified in the Contract Documents.

C. Extension of Contract Time will be granted only to the extent that the time required to complete the Work as changed or delayed extends the schedule critical path beyond the contract completion date. If changes or delays do not extend the critical path of the schedule beyond the contract completion date, there will be no contractor entitlement to extended or additional home office expenses. Float, as used in this agreement, is the sum of the amount of time available to a task before the task becomes critical and the amount of time between the scheduled completion date and the contract completion date. Float may be used in the order needed by either the Owner or the Contractor.

2.4 CONTRACTOR CLAIMS AND DISPUTES

A. If the Contractor wishes to request an adjustment in the Contract Amount or Contact Time, other than pursuant to a Change Order or Construction Change Directive, Contractor shall give the Owner and Architect a written Notice of Claim.

B. Contractor shall file with the Owner any written Claim, including the documents necessary to substantiate it, on or before Substantial Completion, but no later than the day of Contractor's submittal of final payment on the Contract.

C. The Notice of Claim shall be given by the Contractor to the Owner before conditions occur which are the basis for the Claim, except in an emergency endangering life or property in which case the Contractor should proceed in accordance with Section 6.7, Emergencies. Failure to present such Notice of Claim constitutes a waiver of such Claim.

D. Notices for claims or disputes are valid only if written and shall be a document issued for the sole purpose of notification and titled clearly "Notice of (specify category i.e., delay) Claim." A separate written notice is required for each subject and issue.

E. Written notice shall be deemed to have been duly served if delivered in person to the individual to whom it is addressed, or if sent by certified mail to the address specified in the Contract Documents as may be revised in writing.

F. The Contractor shall continue to perform its Work under the Contract and shall not cause a delay in the Work during any dispute, claims definition, negotiation, mediation, or arbitration proceeding, except by written agreement by the Owner.

G. The adjustment to the Contract Amount or Contract Time, if any, as the result of a settled claim, shall be determined and issued in accordance with this Section 2, Contract Modifications.

H. All procedures for Claims and Disputes resolution shall be duly processed pursuant to the California Public Contract Code, Division 2, Part 1, Chapter 9 Sections 9201 – 9204.

I. The attention of the Contractor is drawn to Government Code Section 12650, et seq. regarding penalties for false claims.

2.5 DELAYS BEYOND CONTRACTOR'S CONTROL

A. If the Contractor is delayed at any time in the progress of the Work by acts or neglect of the Owner or by any separate contractor employed by Owner, or by labor disputes, fire, unusual delays in transportation, unusually adverse weather conditions, unavoidable casualties or by any other unforeseeable cause of delay beyond the Contractor's control, which the Owner decides justifies the delay, then the Contract Time may be extended for such reasonable time as the Owner in his discretion may decide. Contractor's Claim for extension of Contract Time shall be

made in writing to the Owner in accordance with Section 2.4, Contractor Claims. Only one Claim is necessary in the case of continuing delay.

B. Unusually adverse weather conditions for the purposes of this Project are agreed to be work days lost from weather or the effects of weather greater than the number of lost days specified in Section 7.5, Schedule.

2.6 HIDDEN CONDITIONS

Should concealed or unknown conditions be encountered in the performance of the Work below the surface of the ground or in an existing structure be at variance with the conditions indicated by the Contract Documents, or differ materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract, the Contract Amount and/or Contract Time shall be equitable adjusted as provided herein upon Claim by Owner or Contractor. Contractor Claims shall be in accordance with Section 2.4, Contractor Claims.

2.7 HAZARDOUS MATERIALS

Asbestos or other hazardous material may be present in County buildings or on County property. Asbestos is typically in the form of pipe lagging, fire proofing, floor tiles, mastic, and plaster. Soil may be contaminated by petroleum products or other substances. In the event any suspected asbestos or other hazardous material is encountered during construction that may be disturbed by the Work, the Contractor shall stop immediately and notify the County. The Contractor and all Subcontractors shall instruct their employees of the type and location of the most likely forms of hazardous material to be encountered and of the procedure to be taken if encountered. Contractor will be responsible for the mitigation and abatement of the hazardous material upon authorization of Owner. All Claims for adjustment in time or money shall be processed in accordance with Section 2.6, Hidden Conditions.

2.8 OVERHEAD AND PROFIT

A. Adjustments to the Contract Amount due to changes in the Work or any other reason, shall include overhead and profit as follows:

1. Contractor’s overhead and profit on the direct cost of Work (labor, material, and equipment) performed by his forces and all Subcontractors shall be a total sum not exceeding twenty percent (20%) in aggregate of such costs.

2. Contractor’s overhead and profit on the direct cost of Work (labor, material, and equipment) performed by Subcontractors shall be a total sum not exceeding ten percent (10%).

3. Subcontractor’s overhead and profit on the direct cost of the Work (labor,

material, and equipment) performed by Subcontractor shall be a total amount not exceeding fifteen percent (15%). Subcontractor overhead and profit will be allowed for one tier only.

4. Bonds and Insurance shall not exceed one percent (1%) of the sum of the direct cost of the work, the Subcontractor's overhead and profit, and the Contractor's overhead and profit.

5. Changes to the Work ordered by the Architect or Owner which decrease the Contract Amount shall include overhead and profit in accordance with the above provisions. Value engineering revisions initiated by the Contractor and accepted by Owner which decrease the Contract Amount shall be at cost only.

6. The "direct cost of the Work" is considered to be the cost of labor, material, and equipment incorporated into the construction. Supervision and administration of the work, changes, or claims shall not be included in direct cost.

2.9 MAINTAIN RECORDS

Contractor and Subcontractor shall maintain records, in accordance with generally accepted accounting principles, relating to costs of changes to the Work or Claims for 4 years after the final completion. The Owner will have the right to audit these records at any time up to 4 years after completion of the Project and recover from the Contractor or Subcontractor any amount paid but not substantiated by audit.

2.10 PROPOSAL REQUESTS

Contractor is required to provide preliminary estimates using their best judgment of time and cost impact of potential changes to the Project as requested by the Architect and/or Owner. Estimates shall be provided to the Architect and Owner within 10 working days of receiving the Proposal Request. Contractor will be responsible for any cost increase or schedule impact resulting from Contractor's failure to respond within the allowed time.

3 CONTRACTOR

3.1 DEFINITIONS

A. The term Contractor, as used herein, is the person or organization identified as such in the Agreement, and is referred to as if singular and masculine and includes his authorized representatives.

B. The term Subcontractor, as used herein, includes only those persons or organizations having a direct Contract with the Contractor to perform a portion of

Contractor's Work.

3.2 GENERAL

A. Contractor agrees to perform all Work required by the Contract Documents.

B. All Work shall be done in accordance with the best practices of the various trades and/or suppliers and highest industry standards.

C. The Contractor shall keep on the Project site during the progress of the Work a competent superintendent satisfactory to the Owner. The Superintendent shall not be changed except with the consent of the Owner. The Superintendent shall represent the Contractor and all directions given to him shall be as binding as if given to the Contractor.

D. It is the Contractor's responsibility to diligently prosecute the Work, using his best skills and attention, and the most appropriate techniques and equipment that are required to provide a finished product in compliance with the Contract requirements. Contractor shall insure that no Work is done that does not comply with the Contract Documents.

E. The Contractor shall attend a preconstruction meeting, weekly progress meetings and other meetings as necessary to accomplish the Work and administer the provisions of the Contract.

F. Contractor shall submit to Owner a daily record of Contractor's activity. Such record shall be delivered to Owner's Representative daily for previous day's activity and shall include Project name, date, weather, names of Subcontractors, count of personnel by company, material deliveries, description and location of activity and events. The record of daily activity shall not be used as a Notice to Owner.

3.3 SUBCONTRACTS

A. The Contractor shall not be permitted to substitute any person or organization for any Subcontractor, person or organization listed by him in his bid without the prior, written consent of the Owner, as provided for in the California Public Contract Code, Division 2, Part 1, Chapter 4, Section 4017.

B. In addition to the information required in Division 00 Bidding Documents regarding Subcontractors, the Contractor, after execution of the Contract but prior to execution of a subcontract, shall submit the following information on each Subcontractor: name, address, and nature of Subcontractor's work, Subcontract Amount, and all other information the Owner deems relevant. The Contractor shall not Contract with any such proposed Subcontractor or entity to whom the Owner objects.

C. Contractor shall bind every Subcontractor and every Subcontractor agrees to be bound by the terms of the Contract Documents insofar as applicable to their portions of the Work. The Contractor shall be responsible for the acts and omissions of Subcontractors.

D. Contractor agrees to pay to each Subcontractor promptly upon receiving payment from Owner.

E. Neither the acceptance of the Subcontractor nor any other act of the Owner, nor anything contained in any contract document is to be construed as creating any contractual relation between the Owner and any Subcontractor.

3.4 PERSONNEL AND LABOR POLICY

A. Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ any unfit person or anyone not skilled in the work assigned to them. The Contractor shall be responsible to the Owner for the acts and omissions of its employees and other persons performing work for the Contractor.

B. No person shall be excluded from participation in, denied benefits of, or be subject to discrimination under this Contract on the basis of their race, color, religion, national origin, age, sex, sexual orientation, pregnancy, childbirth or related conditions, medical condition, mental or physical ability, or veteran's status. Contractor shall ensure full compliance with federal, state and local laws, directives and executive orders regarding non-discrimination for all employees and subcontractors under this Contract.

Violation of the non-discrimination provisions of this Contract shall be considered a breach of this Contract and subject the Contractor to penalties, to be determined by the County Manager, including but not limited to: i) termination of this Contract; ii) disqualification of the Contractor from bidding on or being awarded a County contract for a period of up to 5 years; iii) liquidated damages of $2,500 per violation; iv) imposition of other appropriate contractual and civil remedies and sanctions, as determined by the County Manager.

To effectuate the provisions of this paragraph, the County Manager shall have the authority to: i) examine Contractor's employment records with respect to compliance with this paragraph; ii) set off all or any portion of the amount described in this paragraph against amounts due to Contractor under the Contract or any other Contract between Contractor and County.

Contractor shall report to the County Manager the filing by any person in any court of any complaint of discrimination or the filing by any person of any and all charges with the Equal Employment Opportunity Commission, the Fair Employment Housing Commission or any other entity charged with the investigation of allegations within 30 calendar days of such filing, provided that within such 30

calendar days such entity has not notified Contractor that such charges are dismissed or otherwise unfounded. Such notification shall include the name of the complainant, a copy of such complaint and a description of the circumstance. Contractor shall provide County with a copy of its response to the complaint when filed.

For contracts over $5,000, with respect to the provision of employee benefits, Contractor shall comply with the County Ordinance which prohibits contractors from discriminating in the provision of employee benefits between an employee with a domestic partner and an employee with a spouse. See Document 00 7373 Supplemental Conditions, Equal Benefits Compliance Ordinance No. 4324, Chapter 2.84.

C. Contractor shall ensure equal employment opportunity based on objective standards of recruitment, selection, promotion, classification, compensation, performance evaluations, and management relations, for all employees working on the Project. Contractor's affirmative action policies shall be made available to Owner upon request. See Document 00 45 36.01 Equal Opportunity Requirements, Certification of Compliance with Laws Prohibiting Discrimination.

D. It is the policy of the Owner that Contractors on public Projects employ their workers from the local labor market whenever possible. Consistent with that policy, the Contractor is requested to employ his workers from the local labor market. Local labor market within the meaning of this section is defined as the labor market within the geographical confines of the County of San Mateo, State of California.

E. The Contractor shall forfeit, , as per the San Mateo County Office of Labor Standards and Enforcement (OLSE) and/or the State of California Department of Industrial Relations (DIR) penalties for each laborer, workman, or mechanic employed in the execution of the Contract by Contractor, or by any Subcontractor under Contractor, upon any of the Work performed for the Contract, for each calendar day during which said laborer, workman, or mechanic is required or permitted to labor more than eight (8) hours in violation of the provisions of the California Labor Code, Division 2, Part 7, Chapter 1, Article 3, Section 1810.

F. Apprenticeship Program: Contractor shall comply with the provision of California Labor Code, Division 2, Part 7, Chapter 1, Article 2, Section 1777.5.

G. The Contractor shall comply with the provisions of the California Labor Code, Division 2, Part 7, Chapter 1, Article 2, Section 1776, and the regulations implementing it in Title 8of the California Administrative Code. The Contractor shall be responsible for compliance by his Subcontractors. A certified copy of all weekly payroll records shall be furnished upon request of the Owner, the Division of Labor Standards Enforcement, or the Division of Apprenticeship Standards of the Department of Industrial Relations.

H. Payrolls shall contain the full name, address, and social security number of each employee, his correct classification, rate of pay, daily and weekly number of hours worked, itemized deductions made and actual wages paid. They shall also indicate apprentices and ratio of apprentices to journeymen.

I. The penalties specified in Subdivision (h) of Labor Code Section 1776 for noncompliance with the provisions of Section 1776 may be deducted by the County from any moneys due or which may become due to the Contractor.

4 OWNER

4.1 DEFINITION

The Owner is the person or organization identified as such in the Agreement and is referred to as if singular in number and masculine in gender and includes his authorized representatives. The Owner may be the County of San Mateo, sometimes referred to as "The County".

4.2 GENERAL

A. The Owner may furnish information after the bid date and not included in the Contract Documents in the form of drawings, reports, survey data, utility locations, plans of existing facilities and such other information. This information is not part of the Contract Documents.

B. The Owner shall receive copies of all correspondence, notices, approved shop drawings, test reports and such material pertinent to the Contract. The Owner shall have access to the Work at all times.

4.3 THE DIRECTOR OF PUBLIC WORKS

The Director of Public Works for the County of San Mateo or his duly appointed representative is the duly appointed agent for the Owner and as such is empowered to act for the Owner in all matters as stated in the Contract Documents or as provided by law.

4.4 OWNER'S CONSTRUCTION MANAGER

A. The Owner may engage a Construction Manager as an Owner's Representative for the Project. The Owner's Construction Manager shall receive copies of all communications regarding the Project, have full access to the Work, and be kept informed of all actions taken by the Contractor.

B. The Owner's Construction Manager shall not interpret the plans, coordinate the Work, order changes in the Work, supervise the workmen, or perform any duty which is the responsibility of the Architect or the Contractor.

5 ARCHITECT

5.1 DEFINITION

For the purpose of this Contract, the Architect is identified in the Project Manual. The term "Architect" is the individual, partnership, corporation, joint venture, or any combination thereof, who will have the rights and authority assigned to the Architect in the Construction Documents. The Term Architect means the County's Architect on this Project or the Architect's authorized representatives and consultants. Nothing contained in the Contract Documents shall create any contractual relationship between the Architect and the Contractor.

5.2 GENERAL

A. The Architect and the Construction Manager will provide general administration of the Contract between Owner and Contractor.

B. The Architect will have authority to act on behalf of the Owner to the extent provided in the Contract Documents. The Owner's instructions to the Contractor may be issued through the Architect.

C. The Architect shall at all times have access to the Work. The Contractor shall provide facilities for such access so the Architect may perform his functions under the Contract Documents. The Architect will make periodic visits to the site to familiarize himself with the progress and quality of the work and to determine if the work is proceeding in accordance with the Contract Documents. Architect will endeavor to guard the Owner against defects and deficiencies in the Work.

D. The Architect will be the interpreter of the requirements of the Contract Documents and the judge of the Contractor's performance thereunder. The Architect will, within ten (10) working days, render interpretations or answers to questions submitted by Contractor. All interpretations and decisions of the Architect shall be consistent with the intent of the Contract Documents. In Architect's capacity as interpreter and judge he will exercise his best efforts to insure faithful performance by all parties of the Contract. The Architect's decision in matters relating to esthetic effect will be final.

E. The Architect will review submittals, samples, adjustments to the Contract, applications for payment, written guarantees, operation and maintenance manual and other documents required by the Contract.

6 PERFORMANCE OF THE WORK

6.1 DEFINITION

A. The term "Work" as used herein is all of the Contractors obligations under the

Contract including, but not limited, to providing all labor, material, equipment and services indicated by the Contract Documents, as-built drawings, punchlist, inspections and approvals required or necessary for occupancy, and guarantees.

B. The term “Project” is the total construction planned or contemplated by the Owner of which the Work may be the whole or a part. The Owner may perform or contract for other work on the Project site during the progress of the Work.

6.2 GENERAL

A. The Contractor shall provide, maintain and remove upon completion of the Work, all tools, machinery, equipment, temporary rigging, scaffolding, hoisting equipment, rubbish chutes, barricades around openings and excavation, ladders between floors, fences around buildings, and all other items as required for safe completion of the Work, whether specifically designated or not and shall conform to all requirements in regard to operation, safety, and fire hazards of State and local authorities and of underwriters.

B. Deliver all materials and equipment in the manufacturer’s original sealed, labeled containers and protect items against moisture, rust, dust, tampering, or damage.

C. Place all materials and equipment orders in time to avoid job delay or hindrance. Schedule deliveries to coincide with the construction schedule so that materials and equipment are promptly installed upon delivery.

D. Except as specifically noted otherwise, the installation and/or maintenance directions provided by the manufacturer shall be followed for all materials and equipment.

E. All materials and equipment shall be new, unless specifically marked otherwise.

F. All materials and equipment not conforming to the Contract Documents shall be rejected and shall be immediately removed from the site of the Work.

G. All utilities and services required by the Contractor including electrical power, water, temporary telephones, temporary sanitary facilities, and temporary heat as required for the proper installation of materials and the completion of the Work shall be provided by Contractor.

H. Shut down of utilities for any reason or duration shall be subject to approval by the Owner. The Owner requires a minimum notice per Document 00 35 13.19 Special Project Procedures for a utility shut down. When shut-downs of 30 minutes or more are required, the Contractor shall provide alternate service for normal occupancy requirements. Utility shut-downs shall be scheduled during non-business hours.

I. Prior to ordering materials, the Contractor shall verify all measurements, material

handling pathway and logistical dimensions at the site and shall be held responsible for their accuracy. No extra compensation will be allowed for differences between actual measurements and the dimensions shown on the Drawings.

J. Fences, office facilities, enclosures, storage sheds, etc., required by the Contractor in the performance of the Work shall be located where approved by the Owner.

K. The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with any materials or equipment.

L. During the progress of the Work, Contractor shall keep the premises orderly and safe and free from accumulation of waste materials and rubbish.

M. At the completion of the Work, Contractor shall remove all waste, surplus materials, and rubbish and shall clean all surfaces, removing all extraneous paint, mortar, dust, and stains, leaving the Work bright, clean and polished.

N. The project is not exempt from any Federal, State or local taxes.

O. Royalty and License Fees incidental to the use of any patented material, device or process shall be paid by the Contractor and in the event of a Claim of alleged infringement of patent rights, the Contractor shall save the Owner free and harmless from loss on account thereof; and also defend, at his own expense, all suits that may be brought in such connection.

P. Contractor shall continuously maintain adequate protection of all Work and shall protect the Owner's property from damage or loss arising in connection with this Contract.

Q. Precaution shall be exercised at all times for the protection of persons (including Contractor's and Owner's employees) and property. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery, equipment and all hazards shall be guarded or eliminated in accordance with the safety provisions of the latest safety orders of the State of California: California Code of Regulations, Title 8, Construction Safety Orders (see Department of Industrial Relations at: https://dir.ca.gov), the California Occupational Safety and Health Administration (CAL/OSHA) Safety Orders (at https://dir.ca.gov/dosh/), and CAL/OSHA and Statewide Industry Guidance on COVID-19 (at https://dir.ca.gov/dosh/coronavirus/Health-Care-General-Industry.html).

R. All materials and workmanship shall be subject to inspection, examination, test, and acceptance by the Owner at all times during manufacture and construction and at all places where such manufacture and construction occurs.

6.3 EXISTING CONDITIONS

A. The Contractor by executing the Contract represents that he has visited the site and familiarized himself with the local conditions under which the Work is to be performed and has correlated his site observations with the requirements of the Contract Documents.

B. The contractor shall carefully study and compare the Contract Documents and existing conditions and dimensions and the connection of the Work to existing conditions and shall report to the Architect any error, conflict, inconsistency, omission, or any variance with laws, ordinances, codes, rules or regulations bearing on the Work. Contractor shall report such conditions to the Architect in writing at such time as to allow at least ten (10) working days for a response with no delay to the Work. All necessary changes shall be accomplished in accordance with Section 2, Contract Modifications.

6.4 ADJACENT FACILITIES

A. The Contractor shall provide adequate protection for all parts of the Project site, and adjacent property, its improvements and its occupants throughout the Work. All damage done to existing property shall be repaired or replaced at the Contractor's expense and determined to be acceptable by the Architect and Owner.

B. Work shall be executed in careful, orderly manner, with the least possible disturbance to public and occupants of the area.

C. The Owner will continue to use adjacent areas of the facilities. Contractor shall take care to disrupt the Owner as little as possible. Contractor shall provide legal and safe access to all facilities at all times. In order to facilitate use of adjacent facilities Owner may order Contractor to alter or temporarily cease operations.

6.5 PERMITS

A. It shall be the responsibility of the Owner to obtain and pay for all permits, licenses, certificates, approvals, utility connections and services necessary for the proper execution and completion of the Work.

B. All fees which are for temporary approvals or services, such as those which are necessary for construction procedures, shall be paid by the Contractor.

C. In the event the Special Provisions require the Owner to pay any fee, the Contractor shall notify the Owner in writing, twenty (20) working days in advance of a required fee payment.

D. It is the policy of the County to cooperate with State, County and City officials in

regard to the construction of this Project, and it is the responsibility of the Contractor and all his Subcontractors to meet the requirements of government officials having responsibility for inspecting or observing construction by taking out permits for the Work, calling for inspections and adhering to safety practices in accordance with standard practice. In the case of conflict of any of these provisions, the Owner shall be notified. The term Inspector means a Public Building Construction Inspector or an individual performing the inspection as required by building codes or jurisdiction.

6.6 LAWS

A. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work. If the Contractor performs any Work contrary to such laws, ordinances, rules and regulations, he shall bear all costs and delays arising therefrom.

B. Owner and Contractor have all rights provided by law not specifically waived by this Contract.

6.7 EMERGENCIES

A. In an emergency affecting the safety of life, the Work, or property, the Contractor, without special instruction or authorization from the Owner, is hereby permitted to act, at his discretion, to prevent such threatened loss or injury; he shall so act without appeal if so instructed or authorized. Any compensation, claimed by the Contractor on account of emergency work, beyond Contractor's contractual obligations, shall be determined by agreement. The Contractor shall immediately notify the Owner in writing.

B. In an emergency affecting the safety of life, the Work, or property or if an unsafe condition exists, the Owner may, but is not obligated, take measures to mitigate the condition. Such measures may include expending labor or material, engaging other contractors, entering the Project site utilizing materials, equipment, or facilities of Contractor. The Owner's actions may be performed immediately and without notice to Contractor. Contractor shall pay Owner for all costs which are attributable to Contractor.

6.8 SUBMITTALS

A. Submittals include, but are not limited to shop drawings, product data, maintenance information, samples, manufactures instructions, certifications, and similar documents or items which demonstrate the way the Contractor proposes to perform the Work to the information in the Contract Documents. Contractor shall review the entire Contract Documents for other provisions relating to submittals and individual submittal requirements, if any.

B. The Contractor shall review, stamp with his approval and submit to the Architect in

orderly sequence so as to cause no delay in his Work or in the work of any other contractor, all submittals required by the Contract. Submittals shall be properly identified with specification section. At the time of submission, the Contractor shall note in writing any deviation in the submittals from the requirements of the Contract Documents. By approving and submitting shop drawings and samples, the Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data, and that he has checked and coordinated each shop drawing and sample with the requirements of the Work and of the Contract Documents.

C. The Architect will review submittals for conformance with the designed concept and with the information given in the Contract Documents. A minimum of 10 working days is required for each submittal review. The Architect's review will not relieve the Contractor of responsibility for complying with the Contract Documents. If a submittal is required to be resubmitted, the time and cost of resubmission is the responsibility of the Contractor.

6.9 SUBSTITUTIONS

A. The intent of the Specifications is to specify high grade equipment and materials appropriate for the Project. It is not the intent of the Specifications to exclude or limit the products of any responsible manufacturer, except when the Owner has adopted a specific system or product which will be noted, "No Substitutions Allowed", or similar language. Where equipment, material, or process is specified by trade name or by patentee, manufacturer or dealer, it shall mean the specified item or product. No substitution shall be made by the Contractor without written approval of the Architect. The Architect shall be the sole judge of a Contractor proposed substitution. See Division 01 for Substitution requirements. The Architect's refusal to approve a substitution shall not effect the progress of the Work and is not grounds for a Claim against the Owner.

B. The Contractor shall pay a $200, lump sum, for the Architect's time to review substitution requests. Payment is to be included with the substitution request package.

6.10 CORRECTING WORK

A. The Contractor shall promptly correct all Work rejected by the Owner or Architect, whether observed before or after the Notice of Completion and whether or not fabricated, installed or completed. The Contractor shall not receive a time extension for correcting such rejected Work. All such defective or non-conforming Work shall be corrected to comply with the Contract Documents without cost to the Owner. The Contractor shall bear the cost of making good all Work of separate contractors which may be destroyed or damaged by such removal or correction.

B. If any Work should be covered before it is inspected, the Contractor at his expense, must uncover the Work for inspection and then replace the Work.

C. If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, or fails to perform any provisions of the Contract Documents, the Owner may, after seven (7) working days written notice to the Contractor and without prejudice to any other remedy Owner may have, and without Contract termination or ordering the Contractor to stop Work make good such deficiencies in any manner the Owner deems expedient. In such case an adjustment to the Contract shall be made in accordance with Section 2, Contract Modifications, deducting from the payment then or thereafter due the Contractor, the cost of correcting such deficiencies, including the cost of additional services made necessary by such default, neglect or failure.

D. If the Owner deems it not expedient to correct Work damaged or not done in accordance with the Contract Documents, a deduction from the Contract price shall be made.

E. If the Contractor fails to correct defective Work or fails to supply materials or equipment in accordance with the Contract Documents, the Owner may order the Contractor to stop the Work or any portion thereof until the cause of such order for the Work has been eliminated. Contractor shall not receive a time extension or compensation as a result of stopping Work as required by this provision.

6.11 TESTING

A. The Owner will provide for testing of materials or workmanship as required by these Specifications. The Contractor shall coordinate and schedule tests directly with the testing firm. The costs of tests on materials at the Project site will be borne by the Owner, except for retesting, as specified below, the material required for testing, and the Contractor's labor required to facilitate the test or delayed by the test, which the Contractor shall furnish. The Contractor will cooperate with the Owner's testing representative in the taking of test Samples. The Contractor shall pay for all tests which are not performed at the job site.

B. Required tests are specified elsewhere in the Specifications.

C. Should the results of any required tests fail to meet the requirements of the Contract Documents, Contractor shall either correct the unacceptable condition or furnish new materials, as directed by the Owner. Additional tests shall be made at the Contractor's expense until the materials are found to meet the requirements of the Contract Documents.

D. Should the results of any soil compaction tests fail to meet the requirements of the Specifications, Contractor shall recondition and/or recompact the fill, and additional tests shall be made at the Contractor's expense until the compaction is found to meet the requirements of the Specifications.

E. Testing or inspection services required outside of regular working hours shall be

paid for by the Contractor.

F. When existing building systems such as fire alarms, fire sprinkler systems, smoke detectors, halon systems, etc., are modified by the Work, the Contractor shall test the entire system at the completion of the Work and demonstrate to the Owner that the system is functioning correctly and reliably.

6.12 RECORD DOCUMENTS

A. The Contractor shall maintain at the site record documents consisting of all Drawings, Specifications, addenda, approved shop drawings and samples, Change Orders, Construction Change Directives, instructions from the Architect, and other documents relating to the Project. All record documents shall be marked legibly by the Contractor to record all changes to the Work, field measurements, actual conditions, and adjustments made during construction.

B. Upon completion of the Work, Contractor shall transfer all record document information to a clean set of Drawing and Specifications and electronic media compatible with the Owner's software and deliver them to the Architect. CAD documents shall be in sheet format. Contractor shall provide any explanation or clarification of the record documents requested by Owner or Architect.

6.13 OPERATING AND MAINTENANCE MANUALS

Assemble and bind two (2) hardcopy sets and one (1) electronic PDF file, clearly categorized according to the Project Specifications, of all guarantees, certificates, warranties, operating instructions, as-built specification, and maintenance manuals into clearly organized files with an index, a list of Subcontractors and suppliers including their names, addresses, and phone numbers and present to Architect at the completion of the Work.

6.14 TRAINING TO OWNER/OWNER'S REPRESENTATIVE

Contractor shall provide training to the Owner and Owner's representatives for all operating systems, features, and equipment. Training shall be sufficient to explain and demonstrate the location, function, and operation and shall be a minimum of four (4) hours for each item of Work. Training shall be given by a person familiar with the Project. Operation and Maintenance manuals must be available to the Owner prior to training and referenced during the training. Contractor to provide Owner with videos taken of the training(s), particularly of systems such as fire alarm, HVAC, and building management system(s). Contractor and Owner shall agree which systems will require videos of training.

7 TIME

7.1 DEFINITION OF OFFICIAL DATES

A. The Contract Time is the period of time indicated in the Agreement for achieving completion of the Work. Time is of the essence for the Contract. The term day as used in reference to Contract Time shall mean calendar day.

B. The Notice to Proceed from the Owner shall establish the official date the Work may commence and the start of the Contract Time.

C. The date of Substantial Completion of the Work is the date established by the Architect. The date of beneficial occupancy or acceptance of the Work may be determined by the Owner but not effect the Contract Time or terms of the Agreement.

D. The date of Final Completion is the date established by the Architect after Substantial Completion when the Work is complete in every detail. Retention may be withheld until after Final Completion.

7.2 SUBSTANTIAL COMPLETION

A. Substantial Completion is the stage in the progress of the Work when the entire Work, or a designated portion thereof, is sufficiently complete in accordance with the Contract Documents to allow the Owner to use and occupy the entire Work or portion as intended. Prior to Substantial Completion the Contractor shall have inspected the Work, completed corrective measures, obtained all approvals necessary for occupancy, placed into operation all equipment and systems, and obtained the Architects concurrence that Substantial Completion of the Work has been achieved.

B. When the Contractor considers that the Work, or designated portion thereof , is substantially complete, the Contractor shall provide a written notice to the Architect and Owner in which the Contractor certifies that the Work or portion is Substantially Complete, lists all remaining incomplete deficiencies of the Work, and requests inspection and acceptance. The failure to include any items on such list does not alter the responsibility of the Contractor to complete the Work in accordance with the Contract Documents.

C. Upon receiving notice in accordance with paragraph 7.2.B, the Architect and/or Owner will review the Work or designated portion thereof. If the Architect determines the Work or portion is substantially complete, the Architect will establish a date of Substantial Completion. If the Architect determines the Work or portion is not Substantially Complete the Contractor will be notified. Contractor is required to initiate re-inspections by providing notice in accordance with Section 7.2B and reimburse the Owner for the cost of the reinspection.

D. The guarantee period, and associated warranty period(s), shall begin on the date of Substantial Completion. A separate date of Substantial Completion shall be established for designated portions of Work according to the Contract Documents

or as agreed to by Owner.

E. Any Work used by Contractor prior to Substantial Completion shall be made new as of the date of Substantial Completion. Such Work may include lights, filters and systems or equipment requiring periodic maintenance.

7.3 LIQUIDATED DAMAGES

A. Should the Work not be Substantially Complete, as defined herein, and within the Contract Time, damages will be sustained by the Owner. The Owner may impose liquidated damages to portions of the Work. As it may be extremely difficult, not feasible, or may be impracticable to use County resources to determine the amount of actual damage the County may suffer should Contractor fail to complete the work withing the time specified, it is understood and agreed the Contractor shall pay the Owner as fixed and liquidated damages, and not a penalty, the amount set forth in the Agreement for each calendar day of delay in completion. Contractor and its surety shall be liable for the amount thereof pursuant to Government code Section 53069.85. It is therefore agreed that the Contractor will pay the Owner the amount specified in the Notice to Contractors Document 00 11 16, as and for the Owner's liquidated damages. The liquidated damages amount covers Owner's damages only and is not in lieu of the indemnification obligations set forth separately in Section 9 nor shall these liquidated damages cover damages, including delay damages, claimed by third parties. Third parties shall include other contractors working on the Project. In the event the Contractor fails to make such payment, the Owner may deduct the amount thereof from any money due or that may become due to the Contractor under the Contract and should the balance due under the Contract not be sufficient to cover the amount owed, the Owner shall have the right to recover the balance from the Contractor, or from the Contractor’s sureties.

B. The Owner may impose liquidated damages to portions of the Work.

7.4 USE AND OCCUPANCY PRIOR TO SUBSTANTIAL COMPLETION

A. The Contractor agrees to use and occupancy of a portion of the Work by the Owner upon Substantial Completion.

B. Prior to the Owner occupying a portion of the Work, a list of Work to be completed or corrected shall be prepared jointly by the Contractor and Architect.

C. Occupancy by the Owner shall not be construed by the Contractor as being an acceptance of the Work by Owner of that part of the Work to be occupied.

D. The Contractor shall not be held responsible for any damage to the occupied part of the Work resulting from the Owner’s occupancy after Substantial Completion.

E. Occupancy by the Owner shall not be deemed to constitute a waiver of any claims

which Owner or Contractor may have.

F. Use and occupancy of a portion of the Work by the Owner prior to Substantial Completion does not relieve the Contractor of his responsibility to maintain all insurance and bonds required under the Contract until the Work is completed and accepted by Owner.

7.5 SCHEDULE

A. Contractor shall submit to the Owner and Architect a schedule for the Work.

The schedule shall be a series of tasks representing the Contractor's plan for performing the Work including all activities both onsite and offsite, submittal due dates, submittal review periods, material purchasing, lead or fabrication times, a period for punchlist and corrections, final inspection and approvals, and other events or activities having an effect on the progress or completion of the Work. For each task, the schedule shall show the duration, the starting and finish dates, predecessors, successors, and the average manpower and equipment planned. The schedule shall be submitted in bar chart and pert chart format and with a separate task list showing all data in spreadsheet format. No single task on the schedule may exceed two weeks in duration. See General Requirements 01 00 00 for additional Schedule requirements.

(1) PRELIMINARY SCHEDULE

A. Submission

1. Submit the Preliminary Contract Schedule to Owner either within 10 working days after receipt of Notice of Award and/or with the Agreement.

2. Within seven (7) working days after receipt of the Preliminary Schedule, Owner will notify Contractor of its acceptance of, or its review comments about, the schedule so that appropriate adjustments may be made by Contractor in the development of the Schedule.

B. Form

1. Prepare the Preliminary Schedule in sufficient detail to demonstrate preliminary planning for the Work and to represent a practical plan to complete the Work within the Contract Time

2. Identify the following milestone events on the Preliminary Schedule:

Demolition
Utilities Shutdowns

Exterior Work
Rough Framing
Interior Partitions
Rough-Outs (Mechanical, Plumbing, Electrical and Fire Alarm, Fire Sprinklers)
Trimming
Electrical
Interior Drywall
Finishes
Painting
Signage
Agencies' Inspections
Beneficial Occupancy
Punchlist
Project Closeout

3. Identify all holidays and non-working days on the Preliminary Schedule.

C. Activities

1. Identify all Work activities which constitute the critical path, including any known material and equipment lead times.

2. Shutdowns for all utilities as determined from listing provided by Owner's Representative as part of Contract Documents.

(2) SCHEDULE

A. Submission

1. Submit the Schedule, also known as the Baseline Schedule, in the form and having general content acceptable to Owner and shall be based on the review and comments to or acceptance of the Preliminary Schedule, within ten (10) working days following Owner's written acceptance of the Preliminary Schedule.

2. Owner, with Owner's Representative will determine acceptability of the Schedule within seven (7) working days after its receipt.

3. No Application for Payment will be processed nor shall any progress payment become due until the Baseline Schedule is accepted by Owner in writing.

B. Form

1. The Schedule shall be suitable for monitoring progress of the Work, in sufficient detail to demonstrate adequate planning for the

Work, and shall represent a practical plan to complete the Work within the Contract Time.

2. Identify the milestone events as indicated above including additional milestones identified by Owner upon review of the Preliminary Schedule.

3. Identify all holidays and non-working days on the Schedule.

4. If the Schedule is shown on more than one (1) sheet, provide a summary sheet.

C. Activities

1. Identify all Work activities in correct sequence for the completion of the Work. Work activities shall include the following:

a. Major Contractor-furnished equipment, materials, and building elements, lead times, and scheduled activities requiring submittals or Owner's prior approval.

b. Show dates for the submission, review, and approval of each submittal. Dates shall be shown for the procurement, fabrication, delivery, and installation of major equipment, materials, and building elements, and for scheduled activities designated by Owner.

c. For Submittals, a minimum of ten (10) working days shall be allotted in the Schedule for the Architect to review each submittal.

d. Contractor’s internal pre-functional testing and final System test dates.

e. Scheduled overtime Work if required by Contract Documents.

f. Dates Contractor requests designated working spaces, storage areas, access, and other facilities to be provided by Owner.

g. Dates Contractor requests orders and decisions from Owner on designated items.

h. Dates Contractor requests Owner-furnished equipment.

i. Dates Contractor requests Owner-furnished utilities.

j. Connection and relocation of existing utilities.

k. Connecting to or penetrating existing structures.

l. Scheduled inspections as required by Codes, or as otherwise specified.

2. Identify all Work activities that constitute the critical path.

3. Critical Work activities are defined as Work activities which, if delayed or extended, will delay the scheduled completion of one or more of the milestones specified in this Section or the scheduled completion of the Work, or both. All other Work activities are defined as non-critical Work activities and are considered to have float.

4. Float is defined as the time that a non-critical Work activity can be delayed or extended without delaying the scheduled completion of milestones specified in this Section or the scheduled completion of the Work, or both. Neither Contractor nor Owner shall have an exclusive right to the use of float. The party using float shall document the effect on the updated Schedule.

5. Delays of any non-critical Work activity shall not be the basis for an extension of Contract Time until the delays consume the float associated with that non-critical Work activity and cause the Work activity to become critical.

6. The presentation of each Work activity on the Schedule shall include a brief description of the Work activity, the duration of the Work activity in days, and a responsibility code identifying the organization or trades performing the Work activity.

7. See 8.2 Contract Amount Breakdown – Schedule of Values for requirements to establish costs for each Work activity of the Schedule which cumulatively equal the total Contract amount.

(3) PROGRESS SCHEDULE

A. Updating the Schedule provides the Owner with a schedule of the progress of the work (Progress Schedule). The Contractor must submit Progress Schedule(s) prepared in accordance with the requirements of the Contract Documents.

B. Updating

1. Review the Schedule with Owner once each week to incorporate in the Progress Schedule all changes in the progress, sequences, and scope of Work activities.

2. Prepare and submit to Owner an updated Schedule, as the Progress Schedule, once each month, or as mutually agreed.

a. A Progress Schedule shall accurately represent the as-built condition of all completed and in-progress Work activities as of the date submitted.

b. The Progress Schedule shall incorporate all changes mutually agreed upon by Contractor and Owner during preceding periodic reviews and all changes resulting from Change Orders, Field Orders and Amended Construction Documents.

c. Contractor shall perform the Work in accordance with the updated Schedule. Contractor may change the Project Schedule to modify the order or method of accomplishing the Work only with prior agreement by Owner.

3. Contractor shall submit the updated Schedule, as the Progress Schedule, in the form acceptable to Owner, at least five (5) working days prior to submitting the Application for Payment. Contractor will provide a written progress report of the Schedule to the Owner in a format approved by Owner.

4. Owner's Representative will determine acceptability of each Progress Schedule within five (5) working days after its receipt.

5. No Applications for Payment will be processed nor shall any progress payments become due until updated Progress Schedules are accepted by Owner.

6. The accepted Progress Schedule shall be the Schedule of record for the period it is current, shall be in compliance with the Contract Documents, and shall be the basis for the Owner's approval of the Contractor's monthly (or as mutually agreed) payment requests during that period.

7. The Owner's review and acceptance of the Contractor's updated Progress Schedule is for compliance with the requirements of the Contract Documents only. Review and acceptance by the Owner of the Contractor's Progress Schedule(s) does not mean approval of the sequence or duration of the tasks shown, and does not relieve the Contractor of any of the Contractor's responsibility for the accuracy or feasibility of the Schedule, or of the Contractor's obligation to meet the milestone dates established in the Schedule and the date of contract completion to the Contract Time.

8. The Owner's review and acceptance of the Contractor's Progress Schedule does not expressly or implicitly warrant, acknowledge, or admit the reasonableness of the logic, durations,

cost, manpower or equipment loading indicated in the Progress Schedule.

(4) 3-WEEK LOOK AHEAD SCHEDULE

A. During the course of construction, Contractor shall provide a 3-week schedule at each construction meeting referred to as a 3-week look ahead schedule. This schedule shall indicate the construction schedule activities for that time period. This schedule shall identify any critical items impacting the Schedule or progress and any items requiring additional Work or Time.

B. The Contractor shall carry on with the Work, for the construction of the various elements of the project concurrently, to the extent reasonable, and shall not defer construction of any portion of the work in favor of any other portion without the express written approval of the Owner.

B. The Schedule may be revised as required by the progress and conditions of the Work, change orders and all other factors that could influence the date of Substantial Completion and/or Contract Time.

C. Contractor shall post the current Schedule on the Project site in a location readily accessible to the Owner and Architect.

D. Weather delays shall be allowed for in the Contractor's Schedule. Additional time will be granted for adverse weather to the extent the number of scheduled work days lost due to weather.

7.6 DETERMINATION OF WEATHER DELAYS

A. Except for rain, if weather conditions are the basis for delays for continuing or completion of the Work or any designated portion of the Work, Contractor must substantiate that the weather conditions were abnormal, based on the climatologically data for the immediate preceding 10-year period. The Contractor must establish that the adverse weather conditions could not have been reasonably anticipated to constitute a weather delay.

B. When the amount of rain is considered to be abnormal, additional rain days will be allowed and extensions to the Contract Time(s) will be granted where the condition of the site (exterior or interior location) or access to the site as determined by the Owner, is such that Contractor can perform no Work identified on the current version of the Progress Schedule in effect at the time the delay occurred. Rainfall will be considered unusually severe only when the Days of Rain (defined as more than one-

tenth (1/10th) of an inch of rain per day) in any month exceed the number of allowed rain days per month.

C. No Contract Time extension for rain will be allowed for any month until the established number of allowed rain days for the that month have been exceeded. The allowable rain days per month for this Project are as follows:

January: 2
February: 2
March: 2
April: 0
May: 0
June: 0
July: 0
August: 0
September: 0
October: 2
November: 2
December: 2

D. Contractor must exercise due diligence in protecting the Work and the Work site from the adverse impacts of weather by:

1. Taking appropriate preventative actions before anticipated inclement weather to protect the Work and Work site from the potential adverse effects of the weather;

2. Taking corrective action during the inclement weather to protect the Work and Work site from the actual and potential adverse effects of the inclement weather; and

3. Taking correction action after the inclement weather to remedy, prevent, and/or mitigate the negative impacts of the adverse weather on the Work and the Work site.

7.7 DELAY AND TIME EXTENSIONS

A. The Owner will consider extensions to the Contract Time for the following reasons only if they affect the Critical Path of the Official Progress Schedule.

1. Acts of God (as defined in PCC 7105 (b) (2)) or of the public enemy, acts of Government, acts of Owner, fires, floods, epidemics, quarantine restrictions, sanctioned strikes, freight embargoes, unusually severe weather, or delays of Subcontractors or Suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of both Contractor and such Subcontractors or Suppliers.

2. Delays in progress due to an act of neglect by Owner only for the amount of delay time that occurs after Contractor has notified Owner in writing and the Owner has had a reasonable time to respond to the notification.

3. An Approved Change Order that extends the Contract Time.

B. Within twenty-four (24) hours from the beginning of any critical path delay to the current updated Schedule, Contractor must notify Owner in writing of the causes of delay.

C. Within ten (10) working days from the end of any critical path delay to the Schedule, Contractor must submit two (2) hard copies and electronic data files of all supporting information to validate the impact of the delay on the Contract Time.

D. The Owner will ascertain the facts and the extent of the delay and adjust the Contract Time for completing the Work when, in Owner's judgment, the facts justify an adjustment. Owner's determination is final and conclusive.

E. Delay and Contractor's entitlement for delay will be determined as follows:

1. The following definitions apply to a Delay and Time Extension:

a. ***"Excusable Delay"*** means any delay in the Work caused by conditions beyond the control and without the fault or negligence of the Contractor.

b. ***"Excusable Non-Compensable Delay"*** means any Excusable Delay not solely the responsibility of the Contractor, such as, earthquake, fire, flood, and inclement weather conditions that caused a delay of Work on the critical path of the Schedule. The financial inability of the Contractor or any Subcontractor, Sub-subcontractor or Supplier, or the default of any Subcontractor, Sub-subcontractor or Supplier is not a condition beyond the Contractor's control. An Excusable Non-Compensable Delay may entitle the Contractor to an extension of the Contract Time, but will not entitle the Contractor to any adjustment of the Contract Sum.

c. ***"Excusable Compensable Delay"*** means any Excusable Delay caused by a delay of the Work on the critical path of the Schedule for which the Owner is solely responsible and which delay is unreasonable given the circumstances and not within the contemplation of the parties. An Excusable Compensable Delay may entitle the Contractor to an extension of the Contract Time and an adjustment of the Contract Sum.

d. ***"Non-Excusable Delay"*** means any delay in the Work resulting from causes within the control of the Contractor or due to the fault

or negligence of the Contractor or its Subcontractors or Suppliers. A Non-excusable Delay shall not entitle the Contractor to an extension of the Contract Time or an adjustment of the Contract Sum.

2. Whenever the Contractor foresees any delay in the prosecution of the Work, the Contractor must notify the Owner in writing of the potential delay. Such notification must specify with detail the cause asserted by the Contractor for the potential delay and provide a description of the anticipated effect of the potential delay on the most recent updated Schedule including identification of the activity numbers of the affected activities. Failure of the Contractor to submit such a notice after recognition of any incident or event giving rise to the potential delay will constitute a waiver by the Contractor of any request for extension of the Contract Time, and no extension of the Contract Time will be granted as a consequence of such delay.

3. Within twenty-four (24) hours from the beginning of any critical path delay to the Progress Schedule, Contractor must submit written notice to the Owner of the delay. The notice must include identification of the affected activities, evidence of the cause of the delay, and within ten (10) working days of the end of the critical path delay, Contractor must submit a Time Impact Analysis per F. Time Impact Analysis.

4. Owner has no obligation to consider any request for extension to the Contract Time unless the Contractor satisfies the requirements set forth in the Contract Documents for providing notice of potential delay and submission of a Time Impact Analysis establishing the impact of the delay on the critical path of the latest Progress Schedule.

5. Owner is not responsible to the Contractor for any constructive acceleration due to Contractor’s failure to comply with the submission and justification requirements of the Contract Documents for Contract Time extension requests. The Contractor’s failure to perform in accordance with the latest Progress Schedule shall not be excused because the Contractor has submitted Contract Time extension requests, unless and until Owner approves such requests.

6. Extension to the Contract Time will not be allowed for delays on paths of activities containing Total Float Time per the latest Progress Schedule, providing such delay does not exceed the Total Float Time(s) on paths of activities on the latest Progress Schedule.

7. Any extension of Contract Time granted the Contractor pursuant to this section, does not constitute a waiver by Owner of, nor a release of the Contractor from, the Contractor’s obligation to perform the Work within the

Contract Time specified by the Contract Documents, as modified by the particular extension in question. Owner's decision to grant an extension of the Contract Time due to one circumstance set forth in one request, shall not be construed as a grant of an extension for any other circumstance or the same circumstance occurring at some other time, and shall not be viewed by the Contractor as a precedent for any other request for extension of the Contract Time.

8. If Owner orders the Contractor to suspend Work pursuant to the Contract Documents, the Contractor will not be entitled to any extension of the Contract Time, damages resulting from the suspension, unless the Contractor can establish that the suspension was Ordered without reasonable justification.

F. Time Impact Analysis

1. The time impact analysis must provide information justifying the request for extension of the Contract Time and stating the extent of the adjustment requested for the alleged delay. Time impact analysis must be in form and content acceptable to the Owner and include, but not be limited to, the following:

a. Time impact analyses must be based on analyzing the Progress Schedule in effect at the time the alleged delay or impact first occurred.

b. The Contractor must present fragmentary Critical Path Method (CPM) type network windows (fragments) in time scaled precedent format, illustrating how Contractor proposes to incorporate the alleged delay into the Progress Schedule in effect at the time the alleged delay or impact first occurred.

c. The Contractor must identify the activities that are proposed to be amended due to the alleged delay.

d. The Contractor must identify the preceding and succeeding activities in the Official Progress Schedule to which the fragment(s) is to be connected.

H. Concurrent Delays

1. If an Excusable Non-Compensable Delay and an Excusable Compensable Delay operate to concurrently delay completion of the Work, the maximum extension of the Contract Time will be the number of Calendar Days from the commencement of the first delay to the cessation of the delay which ends last. Any adjustment of the Contract Sum will be in accordance with changes in the Work, and will be based only on the

number of days of Excusable Compensable Delay, less the duration of the concurrence.

2. If a Non-Excusable Delay operates to concurrently delay completion of the Work with an Excusable Non-Compensable Delay, the maximum extension of the Contract Time will be the number of days of concurrent delay plus the non-concurrent portion of the Excusable Non-Compensable Delay. The entire delay is non-compensable.

3. If a Non-Excusable Delay operates to concurrently delay completion of the Work with an Excusable Compensable Delay the maximum extension of the Contract Time will be the number of days of concurrent delay plus the non-concurrent portion of the Excusable Compensable Delay. Any adjustment of the Contract Sum will be in accordance with changes in the Work, and will be based only on the non-concurrent portion of the Excusable Compensable Delay.

4. Where the period of concurrent delay is sixty (60) calendar days or longer, the Owner will pay 50% of labor and material cost escalations experienced as a result of the concurrent delay following Contractor's demonstration of the cost escalations to the reasonable satisfaction of Owner.

8 PAYMENTS

8.1 CONTRACT AMOUNT

The Contract Amount as stated in the Agreement, including adjustments authorized under the terms of the Contract, is the total amount payable by the Owner to the Contractor for the complete Work.

8.2 CONTRACT AMOUNT BREAKDOWN – SCHEDULE OF VALUES

The Contractor shall, before the first application for payment, submit to the Architect and the Owner a Schedule of Values document which is a dollar value amount breakdown for the entire scope the Work of the Contract divided into categories so as to facilitate certification of completed Work for payment. The Schedule of Values shall be in such form as may be agreed upon by the parties and supported by such evidence as to its correctness that may allow the Architect and/or Owner's Representative to certify progress payments corresponding to the percentage of completed Work..

8.3 PROGRESS PAYMENTS

A. The Owner shall make progress payments to the Contractor for labor and

materials incorporated into the Work as called for by the Contract Documents and approved Change Orders. Not more often than once each month and on a day of each month agreed upon between the Owner and the Contractor, the Contractor shall submit to the Owner and the Architect, through the Owner's Representative, an application for payment consisting of a Certificate of Payment, a calculation of completed Work based on the approved payment breakdown and, if required by Owner, receipts, releases, or other evidence showing the Contractor's payments for materials, labor, Subcontractors, and any such information as the Owner may require. Payment shall not be owed if the application does not conform to these requirements.

B. Payment for materials stored on site which have not been permanently incorporated into the Work is at the discretion of the Owner. Payment for materials stored off-site, whether or not specially fabricated for the Project, can be made only when payment for such materials has been previously approved by the Owner and shown on the approved payment breakdown and such payment shall be conditional upon submission by the Contractor of a Bill of Sale in a form acceptable to the Owner or other such evidence as is required by the Owner to establish the Owner's title to such material. All materials stored off-site shall be stored in a bonded warehouse at no additional expense to the Owner.

C. The Contractor shall present the application for payment, as required herein, to the Architect for approval using the Owner's previously approved Schedule of Values. The Architect will review and adjust the Certificate of Payment to such amount as he decides is properly due and deliver it to the Owner for payment.

D. The Owner will retain five (5) percent of the amount of each payment due the Contractor until after the date of Owner's Certificate of Project Completion has been accepted by the County.

E. No Certificate of Payment issued nor payment made to the Contractor nor partial or entire use of occupancy of the Work by the Owner shall be an acceptance of any Work not in accordance with the Contract Documents.

F. The Contractor shall not assign any monies due or to become due hereunder without the written consent of the Owner and of all sureties executing bonds on behalf of the Contractor in connection with this Contract.

8.4 OWNER'S FAILURE TO ISSUE PAYMENT

Should the County fail to issue a progress payment to the Contractor for properly submitted, undisputed and approved amounts owed under the Contract within 30 calendar days , then the Owner shall pay interest to the Contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure. Refer to the California Public Contract Code, Division 2, Part 2, Chapter 1, Article 8, Section 102.5 and other applicable sections. Contractor may, upon written notice to the Owner and provided the Owner does not pay the

Contractor per the terms agreed to between the Owner and Contractor, stop Work only until Contractor receives the progress payment amount owed.

8.5 PAYMENTS WITHHELD

A. The Owner may withhold payment, on account of subsequently discovered information, nullify the whole or a part of any progress payment or retention payment to such extent as may be necessary to protect the Owner from loss on account of:

1. Defective Work.

2. Third party claims or reasonable evidence indicating probable filing of third-party claims.

3. Failure of the Contractor to make payments to Subcontractors or for material, labor or equipment.

4. The Owner's doubt that the Work can be completed for the unpaid portion of the Contract Amount.

5. Damage to another contractor's work.

6. Damage to Owner's property.

7. Failure to pay fees in accordance with the Contract Documents.

8. Owner's cost of correcting deficiencies in the Work or undertaking any Work.

9. Liquidated damages or anticipated liquidated damages.

10. Any amount owed to Owner or claimed by Owner.

11. Contractor's failure to deliver as-built drawings, guarantees, operating manuals or other documents.

12 Failure by Contractor to fulfill any Contract requirement.

8.6 FINAL PAYMENT AND RETENTION PAYMENT

A. The final payment shall be the one made in response to the Contractor's one hundred percent (100%) complete application for payment which will bring the total paid to date to the Contractor to ninety-five percent (95%) of the Contract Amount. Contractor's acceptance of the final payment shall constitute a waiver of all claims by Contractor except those previously made in writing.

B. The Owner is entitled to retain five percent (5%) of the amount of each payment due Contractor, as Retention, until at least sixty (60) calendar days after the date of recording the Notice of Completion, as per California Pubic Contract Code, Division 2, Part 1, Chapter 7, Section 7107.

C. As a prerequisite to the release of retention, Contractor shall sign a Release of Liens in a form prescribed by Owner.

D. Contractor shall not be paid interest on retention.

9 INSURANCE

9.1 HOLD HARMLESS/INDEMNIFICATION

A To the full extent permitted by law, CONTRACTOR shall indemnify and save harmless the COUNTY, its officers, employees, and servants from all claims, suits, or actions of every name, kind, and description, brought for, or on account of: (A) injuries to or death of any person, including CONTRACTOR, its officers, employees and servants, or (B) damage to any property of any kind whatsoever and to whomsoever belonging, (C) any sanctions, penalties or claims of damages resulting from CONTRACTOR'S failure to comply with applicable laws, or (D) any other loss or cost resulting from the CONTRACTOR'S negligent or reckless acts or omissions or willful misconduct in connection with the performance of any work required of CONTRACTOR or payments made pursuant to this Agreement, provided that this shall not apply to injuries or damage for which the COUNTY has been found in a court of competent jurisdiction to be solely liable by reason of its own negligence or willful misconduct.

B The duty of CONTRACTOR to indemnify and save harmless as set forth herein, shall include the duty to defend as set forth in Section 2778 of the California Civil Code.

C. The obligations set forth in this section shall continue beyond the term of this Agreement as to any act or omission which occurred during or under this Agreement.

9.2 INSURANCE

A. The Contractor shall not commence Work under this Contract until all required insurance has been obtained and such insurance has been approved by the Owner. The Contractor shall furnish the Owner with Certificates of Insurance evidencing the required coverage, and there shall be a specific contractual liability endorsement extending the Contractor’s coverage to include the contractual liability assumed by the Contractor pursuant to this Contract. Certificates of Insurance shall be filed with the Owner within ten (10) calendar days after award of the Contract. These certificates shall specify or be endorsed to provide that thirty (30) calendar days notice must be given, in writing, to the Owner of any pending change in the limits of liability or of any cancellation or modification of the

policy.

B. The Contractor shall have in effect during the entire life of this Contract Workers Compensation and Employers Liability Insurance providing full statutory coverage; and in case any work is sublet, the Contractor shall require all Subcontractors similarly to provide Workers Compensation and Employers Liability Insurance to full statutory limits of the California Labor Code. In signing this Contract, the Contractor makes the following certification, required by Section 1861 of the Labor Code:

> "I (Contractor Name/Company), am aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for Workers' Compensation or to undertake self-insurance in accordance with the provisions of the Code, and I (Contractor Name/Company) will comply with such provisions before commencing the performance of the work of this Contract".

C. The Contractor shall take out and maintain during the term of this Contract such Bodily Injury Liability and Property Damage Liability Insurance as shall protect Contractor and any Subcontractor performing Work covered by this Contract, from any and all Claims for damages for bodily injury, including accidental death, as well as any and all Claims for property damage including third party property damage to include coverage on property in the care, custody and control of the Contractor, which may arise from the Contractor's operations under this Contract, whether such operations be by Contractor or by any Subcontractor or by anyone directly or indirectly employed by either of them. Such insurance shall be combined single limit bodily injury and property damage for each occurrence and shall not be less than the amount specified below. Such insurance shall include:

1. Comprehensive Commercial or General Liability Insurance
   a. $1,000,000 Bodily Injury/Property Damage Each Occurrence
   b. $2,000,000 Product/Completed Operations Aggregate
   c. $2,000,000 General Aggregate
   d. $50,000 Fire Damage Legal Liability
   e. $5,000 Medical Payments
   f. Coverage shall include but not be limited to the following supplementary coverages:
      Contractual Liability to cover liability assumed under the Agreement;
      Product and Completed Operations Liability Insurance;
      Broad Form Property Damage Liability Insurance;
      Explosion, collapse and underground hazards (deletion of the X, C, U exclusions) if such exposure exists; and
      Independent Contractors.
2. Motor Vehicle/Automobile Liability Insurance: $1,000,000 Combined Single Limit.
3. Workers' Compensation and Employer's Liability Insurance, Workers' Compensation Insurance Statutory benefits as provided by the California

statute and Employer's Liability Limits as follows:

a. $1,000,000 Bodily Injury with Accident – Each Accident
b. $1,000,000 Bodily Injury by Disease – Policy Limit
c. $1,000,000 Bodily Injury by Disease – Each Employee

D. The Owner and its officers, agents, employees and servants shall be named as additional insured on any such policies of insurance, which shall also contain a provision that the insurance afforded thereby to the Owner, its officers, agents, employees and servants shall be primary insurance to the full limits of liability of the policy, and that if the Owner or its officers, agents? and employees have other insurance against the loss covered by such a policy, such other insurance shall be excess insurance only.

E. The Owner shall purchase and maintain at Owner's expense All Risk Property Insurance or Builder's Risk Insurance, excluding Earthquake and Flood coverage, in an amount covering all work and materials in the Contract, including that of Subcontractors, in an amount equal to the Contract Amount including adjustments. Subcontractors shall be included as insureds and the Owner shall be named as a Loss Payee as its interests may appear. Said insurance shall be maintained in complete coverage throughout the duration of the Contract until the one (1) year after the Completion Date of the Project.

9.3 FAILURE TO PROVIDE INSURANCE

If Contractor fails to provide insurance as required herein, the Owner, at its option, may take out and maintain such insurance as the Owner deems in its best interest and charge the cost thereof to the Contractor, which may be at a higher cost.

10 GUARANTEES

10.1 REQUIRED GUARANTEES

A. In addition to guarantees required elsewhere in the Contract Documents, the Contractor shall guarantee all of the Work, and each Subcontractor shall guarantee his own Work, against defective material or faulty workmanship for a minimum of one (1) year after the date of Substantial Completion. All guarantees must be submitted in triplicate to the Architect on the Contractor's own letterhead in the form prescribed by Owner.

B. In addition to the requirements of paragraph 10.1.A, all standard manufacturer warranties shall be passed to the Owner which may extend the warranty period beyond one (1) year.

C. The date of guarantee and all warranties for the Work shall commence upon the Owner's agreed Substantial Completion Date, when the County achieves beneficial use and occupancy of the Project, or phase of the Project.

D. In addition to the guarantees and warranties required by the Contract Documents, the Owner has all rights and remedies provided by law including those pertaining to latent defects.

10.2 REPAIR OF GUARANTEED WORK

A. If repairs are required in connection with guaranteed Work, the Contractor shall promptly upon receipt of written notice from the Owner, and without expense to the Owner:

1. Place in satisfactory condition in every detail all of such guaranteed Work;

2. Make good all damage to the building, site, equipment, furniture, or contents which, in the opinion of the Owner, is the result of work not in accordance with the terms of the Contract Documents or disturbed in the process of correcting guaranteed Work.

B. If the Contractor disturbs any work guaranteed under another contract in fulfilling the requirements herein he shall restore such disturbed work to a condition satisfactory to the Owner and guarantee such restored work to the same extent as it was guaranteed under the Contract.

C. A new full term guarantee period shall apply to repaired work upon completion of repairs.

D. If Contractor fails to proceed to comply with the terms of the guarantee to make repairs of defective work within seven (7) calendar days of Notice from Owner, the Owner may remedy the Contractor's failure by whatever means the Owner deems expedient. The Owner may, at any time, take measures to mitigate damage or reduce undesirable effects of defective work. All costs expended by Owner pursuant to this Section shall be paid by Contractor.

END OF DOCUMENT 00 72 13

DOCUMENT 00 73 36

SAN MATEO COUNTY SUPPLEMENTARY GENERAL CONDITIONS EQUAL EMPLOYMENT OPPORTUNITY (EEO) PROGRAM FOR MINORITY EMPLOYMENT

1. STATEMENT OF INTENT

It is the intent of the Board of Supervisors of the County of San Mateo to prohibit and eliminate employment discrimination and to further the opportunities for minority persons to be gainfully employed in the performance of County building contracts. The Bidder's attention is directed to all the provisions set forth herein. The Board of Supervisors has by Ordinance No. 2174 added Title 2, Chapter 2.50 to Division II of the San Mateo County Ordinance Code prohibiting discrimination in employment and providing for an Equal Employment Opportunity Program by Contractors doing business with the County of San Mateo. The following provisions are a part of the contract documents.

2. LOWEST RESPONSIBLE BIDDER

Award of contract to the low bidder shall not be made until the requirements set forth in these Supplementary General Conditions have been complied with and reviewed by the County Compliance Officer and a satisfactory Equal Employment Opportunity Program as submitted by the low bidder has been accepted.

A. Criteria for Determining Lowest Bidder. Criteria to determine the acceptability of bids on construction contracts requiring public bidding and involving an expenditure of $6,500 or more shall include but not be limited to the following:

1. Criteria of Compliance with Federal and State Laws. Each bidder shall submit with his bid a certification that he is in compliance with the Equal Employment Opportunity Requirement of Executive Order 11246, Title VII of the Civil Rights Act of 1973, the California Fair Employment Practices Act and any other Federal or State Laws and regulations relating to Equal Employment Opportunities and the provisions of this article and the Board established guidelines implementing them. See report form entitled "Certification of Compliance with Laws Prohibiting Discrimination" bound herein after Form of Proposal.

2. Certification of Intent to Develop and Implement an Equal Employment Opportunity Program. Each bidder shall submit with his bid a certification that he will develop, implement and maintain,

during the course of work concerned, an affirmative action program in employment conducted without regard to race, religion, color, national origin, ancestry, physical or mental disability, or sex of the applicants. With this certification he shall submit any and all information which may be required by the County in connection with this program. As used in this Article, the term "minority" or "minority group" pertains to Latinos, Asians and Pacific Islanders, African Americans, American Indians, and women (regardless of her race or ethnicity). See report form entitled "Certification of Intent" bound herein after Form of Proposal.

3. Compliance by Subcontractors. The provision of this Section apply to any subcontractor engaged by the successful bidder, and each successful bidder shall notify his subcontractors of their obligations under the provisions of this Section.

3. PENALTIES FOR NON-COMPLIANCE WITH THE PROVISIONS OF THIS SECTION

A. Any bidder who fails to submit a proposed Equal Employment Opportunity Program or who is unable to make the certifications required in this Section of the Supplementary General Conditions may be disqualified from consideration for the award of the contract.

B. If, after an award is made, the Contractor is found by the County or by a Federal or State agency empowered to make such findings to be in substantial or material violation of the Fair Employment Practices Act of the State of California, the Equal Employment Opportunity Requirement of Executive Order 11246, Title VII of the Civil Rights Act of 1964, Section 503 of the Rehabilitation Act of 1973, or of the provisions of this Section, he may be found to be in material breach of his contract, and the County shall have the power to cancel the contract in whole or in part, or alternatively, to deduct for each working day during which the Contractor is found to have been in such non-compliance, two (2) percent of the total amount payable to the Contractor.

4. WAIVER OF COMPLIANCE

In the event that the requirements of this ordinance are found to work an undue hardship upon a low bidder, said bidder shall submit evidence of such hardship to the Board of Supervisors and shall petition the Board for a waiver of these requirements. This waiver shall only be granted by the Board of Supervisors and shall become an integral part of the contract.

5. DEFINITIONS

A. Equal Employment Opportunity Program. Equal Employment Opportunity Program is a set of specific and result oriented procedures to which a Contractor commits himself in order to achieve equal employment opportunity.

B. Compliance Officer. A Compliance Officer is the County official designated by the County Manager to represent him in the administration of these guidelines and in the enforcement of the provisions of Title 2, Chapter 2.50 of the County Ordinance Code.

6. CERTIFICATION OF COMPLIANCE AND INTENT

Every bidder shall submit with his bid a Certificate of Compliance with laws prohibiting discrimination and a Certification of Intent to implement an equal employment opportunity program on a form furnished by the County, as required by Title 2, Chapter 2.50 of the County Ordinance Code.

7. EQUAL EMPLOYMENT OPPORTUNITY PROGRAM

In addition to furnishing the Certification of Compliance, each Contractor will submit his Equal Employment Opportunity Program with his bid.

The EEO shall contain the following information:

A. Analysis of current work force:

1. Total number of employees

2. Numerical racial breakdown of employees by job classification

3. Information on apprentices

These figures will provide the base by which the Contractor's EEO will be evaluated. Factors to be considered both in the original statistics and in any plans for future employment will include the percentage of minority population in San Mateo County, the availability of minority construction workers and the present minority representation in the various construction trades.

B. The equal employment opportunity actions the Contractor has taken or will take to insure equal employment opportunity. These shall include:

1. Recruiting and hiring minority persons. If non-union personnel are employed this would involve employment advertising through sources which serve areas of minority population. These include local minority newspapers, referral agencies, high schools, vocational schools, and community groups. Specific information on

these sources may be obtained from the Compliance Officer. Union employees will be recruited in accordance with applicable labor agreements. The Contractor will seek to have included or will reaffirm clauses in all labor agreements prohibiting discrimination based on race, religion, color, national origin, age, ancestry, physical or mental handicap, or sex. Assistance for admission into the craft of minorities over the traditional apprenticeship age is also suggested. The Contractor will support Bay Area Construction Opportunity Program or similar groups as recruiting sources and will urge all labor organizations with which he has agreements to use BACOP.

2. Providing adequate opportunity for the upgrading or further training of all employees to insure equal opportunity in advancement and promotion. This might include a counseling service, information and assistance with night classes, or special career-directed program information.

3. Appointing an Equal Employment Opportunity Coordinator - full time or as an additional duty. He will have the responsibility of administering an active program, informing company personnel and union representatives of this company policy and advising all subcontractors of their obligation to this program.

4. Establishing or maintaining an apprenticeship or training program designed to insure hiring of additional minority employees in the journeyman or skilled classes, if possible. The Contractor is urged to support the Joint Apprenticeship Committee on this trade.

5. Selecting minority subcontractor or subcontractors who are known for their ongoing program of apprenticeship for minorities. This includes advising minority contractor associations of bids for subcontractors. Joint ventures with minority subcontractors are encouraged.

C. The EEO should state any previous experience the Contractor has had with similar plans and result of that effort. Any current equal employment opportunity plans should be described in detail and a copy attached, if printed plan is available. The Compliance Office will review the EEO submitted by each bidder in order to determine whether the program submitted complies with Title 2, Chapter 2.50 of the County Ordinance Code and these guidelines.

The EEO as submitted will be kept on file by the Compliance Officer. If the Contractor bids for other county contracts, he may refer to the EEO on file and state any changes, but will not be required to refile his program.

The Compliance Officer may request additional information from the bidder and will be available to answer questions relative to the guidelines and to advise those seeking assistance of resources known to him. He will not be responsible for the service or lack of service rendered by the resources recommended, nor will he develop an EEO for any bidder, or serve as a recruiter for any bidder.

Bidders may revise their EEO after consultation prior to award of contract. Deficiencies will be discussed and appropriate remedies suggested. If bidders withdraw their EEO for revision, their revised program must be submitted by a date established by the Compliance Officer.

The Compliance Officer will determine whether the low bidder's EEO is acceptable and will report to the appropriate county department. The EEO's of each subcontractor of the low bidder will also be evaluated by the Compliance Officer.

8. INCLUSION OF EEO AND CERTIFICATIONS

Upon award of the contract by the Board of Supervisors, the EEO and Certifications for the prime contractor and all subcontractors, which have been approved and accepted by the County, will become an integral part of the contract and subject to the provisions thereof.

9. PERFORMANCE OF CONTRACTOR

A. The Contractor will post, in conspicuous places available to employees and applicants for employment, notices to be provided by the County, stating that the Contractor is obliged to comply with the provisions of these guidelines and Title 2, Chapter 2.50 of the County Ordinance Code. These notices will also be sent to all union and employee organizations and other recruiting sources providing employees to the Contractor.

B. All announcements of job openings will include the statement: "An Equal Opportunity Employer".

C. The Contractor will make written Progress Reports on a form provided by the County to illustrate the effectiveness of his EEO at intervals established by the County.

D. The Compliance Officer will monitor the performance of the EEO until completion of the contract and will report the progress of the Contractor in living up to his EEO to the County Manager.

E. The Contractor shall permit, during Contractor's normal business hours and at Contractor's place of business, access by the County to his records

of employment, employment advertisements, application forms and other data and records pertaining to Contractor's employment practices, for the purpose of determining whether Contractor is complying with the Non-Discrimination and Equal Employment Opportunity rules of the County.

10. PERFORMANCE OF SUBCONTRACTORS

A. All subcontractors listed in a general Contractor's bid are subject to all the provisions of these guidelines and Title 2, Chapter 2.50 of the County Ordinance Code.

B. All subcontractors will file their Certifications of Compliance and Intent and their EEO with the Equal Employment Coordinator of the prime Contractor for transmittal to the County, after award of the contract has been made.

END OF DOCUMENT

DOCUMENT 00 73 73

SUPPLEMENTARY CONDITIONS

COUNTY OF SAN MATEO
EQUAL BENEFITS COMPLIANCE ORDINANCE NO. 4324, CHAPTER 2.84

2.84.010 Definitions

For the purposes of this chapter:
(a) "Contract" means a legal agreement between the County and a Contractor for public works, consulting, or other services, or for purchase of supplies, material or equipment for which the consideration is in excess of $5,000.

(b) "Contractor" means a party who enters into a Contract with the County.

(c) "Contract Awarding Authority" means the Board of Supervisors or the individual authorized by the Board of Supervisors to enter into Contracts on behalf of the County.

(d) "Domestic Partner" means any person who is registered as a domestic partner with the Secretary of State, State of California registry or the registry of the state in which the employee is a resident.

(e) "Employee Benefits" means the provision of any benefit other than pension and retirement benefits provided to spouses of employees or provided to an employee on account of the employee's having a spouse, including but not limited to bereavement leave; disability, life, and other types of insurance; family medical leave; health benefits; membership or membership discounts; moving expenses; vacation; travel benefits; and any other benefits given to employees, provided that it does not include benefits to the extent that the application of the requirements of this chapter to such benefits may be preempted by federal or state law. (Ord. 4324, 08/15/06)

2.84.020 Discrimination in the provision of benefits prohibited

(a) No Contractor on a County Contract shall discriminate in the provision of Employee Benefits between an employee with a domestic partner and an employee with a spouse, subject to the following conditions:

1. In the event that the Contractor's actual cost of providing a particular benefit for the domestic partner of an employee exceeds that of providing it for the spouse of an employee, or the Contractor's actual cost of providing a particular benefit to the spouse of an employee exceeds that of providing it for the domestic partner of an employee, the Contractor shall not be deemed to discriminate in the provision of Employee Benefits if the Contractor conditions providing such benefit upon the employee's agreement to pay the excess costs.

2. The Contractor shall not be deemed to discriminate in the provision of Employee Benefits if, despite taking reasonable measures to do so, the Contractor is unable to extend a particular employee benefit to domestic partners, so long as the Contractor provides the employee with a cash payment equal to the Contractor's cost of providing the benefit to an employee's spouse.

(b) The Board of Supervisors may waive the requirements of this Chapter when it determines that it is in the best interests of the County. The County Manager may waive the requirements of this chapter for Contracts not needing the approval of the Board of Supervisors where waiver would be in the best interests of the County for such reasons as follows:

1. Award of a Contract or amendment is necessary to respond to an emergency;
2. The Contractor is a sole source;
3. No compliant Contractors are capable of providing goods or services that respond to the County's requirements;
4. The requirements are inconsistent with a grant, subvention or agreement with a public agency;
5. The County is purchasing through a cooperative or joint purchasing agreement.

(c) Contractors should submit requests for waivers of the terms of this Chapter to the Contract Awarding Authority for that Contract, or in the case of Contracts approved by the Board, the County Manager.

(d) The Contract Awarding Authority, or in the case of Contracts approved by the Board, the County Manager, may reject an entity's bid or proposals, or terminate a Contract, if the Contract Awarding Authority determines that the entity was set up, or is being used, for the purpose of evading the intent of this Chapter.

(e) No Contract Awarding Authority shall execute a Contract with a Contractor unless such Contractor has agreed that the Contractor will not discriminate in the provision of Employee Benefits as provided for in this Chapter. (Ord. 4324, 08/15/06)

2.84.030 Application of Chapter

The requirements of this Chapter shall only apply to those portions of a Contractor's operations that occur (a) within the County; (b) on real property outside of the County if the property is owned by the County or if the County has a right to occupy the property, and if the Contractor's presence at that location is connected to a Contract with the County; and (c) elsewhere in the United States where work related to a County Contract is being performed. The requirements of this Chapter shall not apply to subcontracts or subcontractors of any contract or Contractor. (Ord. 4324, 08/15/06)

2.84.040 Powers and duties of the County Manager

The County Manager's office shall have the authority to:

(a) Adopt rules and regulations, in accordance with this Chapter and the Ordinance Code of the County of San Mateo, establishing standards and procedures for effectively carrying out this Chapter.

(b) Receive notification from employees of Contractors regarding violations of this Chapter.

(c) Determine and recommend to the Board of Supervisors for final decision the imposition of appropriate sanctions for violation of this Chapter by Contractors including, but not limited to:

1. Disqualification of the Contractor from bidding on or being awarded a County contract for a period of up to 5 years; and;
2. Contractual remedies, including, but not limited to termination of contract;
3. Liquidated damages in the amount of $2,500;

(d) Examine Contractors' benefit programs covered by this chapter;

(e) Impose other appropriate contractual and civil remedies and sanctions for violations of this chapter;

(f) Allow for remedial action after a finding of non-compliance, as specified by rule;

(g) Perform such other duties as may be required or which are necessary to implement the purposes of this Chapter. (Ord. 4324, 08/15/06)

2.84.050 Date of Application

The provisions of this Chapter shall apply to any Contract awarded or amended on or after July 01, 2001, provided that if the Contractor is then signatory to a collective bargaining agreement, this Chapter shall only apply to any Contract with that Contractor which is awarded or amended after the effective date of the next collective bargaining agreement. (Ord. 4324, 08/15/06)

END OF DOCUMENT

01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Project Information.
2. Work covered by the Contract Documents.
3. Work phases.
4. Work under separate contracts.
5. Use of premises.
6. Owner's occupancy requirements.
7. Specification formats and conventions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: County of San Mateo Grant Yard Radio Shop
1. Project Location: 725 Chestnut, Redwood City, CA, 94063

B. Owner: County of San Mateo

C. Owner's Representative:
King Leong
Capital Project Manager
555 County Center
Redwood City, CA 94603

D. Architect:
The KPA Group
Paul W. Powers,
6700 Koll Center
Parkway, Suite 125
Pleasanton CA 94566

E. The Work consists of the following:

1. Construction of a Grant Yard Radio Shop along with associated site improvements at 725 Chestnut Street, Redwood City, CA, 94063. The new Radio Shop will be a two-story structure including, but not limited to, vehicle storage, offices, restrooms, training, storage, workrooms, an elevator, stairways along with all associated HVAC, plumbing, fire protection, electrical, IT, civil site work, and landscaping. The first phase of the work shall include providing modular buildings for temporary operations, connecting to electrical power, existing sewer and water mains and relocating of existing utilities.. The new radio shop will also include an emergency generator and fuel tank. The project will also include provisions for future photovoltaic roof system, car charging stations.

2. Project is designed to comply with a minimum of a LEED Silver Equivalency Level according to the U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED) Rating System.

1.3 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

B. Concurrent Work by the Owner: The Owner **will award** separate contract(s) for, or will self- perform, the following construction operations at the Project site. Those operations will be conducted simultaneously with work under this Contract.
   1. Furniture Installation: A separate contract will be awarded for the installation of office and tenant moveable furniture. Passenger seating shall be installed by Contractor.
   2. Information Technology: Cross connections, computer installation and other coordination items.

1.4 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. General: Contractor shall have limited use of premises for construction operations as indicated on the Contract Drawings.

C. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Limits: Confine constructions operations to boundaries as indicated on site plan, within the property line.
   2. Sidewalks, Driveways and Entrances: Keep sidewalks, driveways and entrances serving premises and public use areas available to the General Public, Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

b. Schedule improvements to the sidewalk areas to minimize impacts to access by the public. All related improvements will need to be coordinated by the Contractor with the County and Contractor is responsible for all required encroachment permits and conditions thereof.

1.5 OWNER'S OCCUPANCY REQUIREMENTS

A. Owner Occupancy: Owner will vacate the premises prior to Notice to Proceed to the start of construction and during the entire construction period.

1.6 WORK RESTRICTIONS

A. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (7.6 m) of entrances, operable windows, or outdoor air intakes.

1.7 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "Master Format" numbering system.
1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

-END OF SECTION-

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01 25 13 - SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and Supplemental General Conditions and other Division 01 General Requirements, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling requests for Substitutions.

B. Pre-bid substitutions will not be considered. No Substitution request will be accepted or considered by County prior to bid.

C. Procedural requirements governing the Contractor's selection of products and product options are included under General Requirements - Product Requirements.

1.3 DEFINITIONS

A. Definitions used in this Section are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents are considered requests for "substitutions." Where phrases such as "or equal" or "or equal as approved by the Architect" occurs in the Contract Documents, do not assume that materials or equipment will be approved as equal unless the item has been specifically approved for this work by the Architect prior to Bid Opening Date, or as otherwise allowed in these Contract Documents.

The following are not considered substitutions:

1. Revisions to Contract Documents requested by the Owner or Architect.

2. Specified options of products and construction methods included in Contract Documents.

3. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS:

A. If the Contractor desires to use material or equipment other than that specified, they shall submit a request for approval of such substitution, in writing, to the Construction Manager.
Product Substitutions for all Specification Sections must be requested within the time period specified in the general conditions. Substitution Request Form: Use CSI Form 13.1A.

B. Submit Substitution Request packages using the form provided and in a quantity to be returned to the Contractor plus four (4) copies of each request for substitution for review by the Architect.

C. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

1. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.

2. Samples where applicable or requested.

3. A detailed, side-by-side comparison of the significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include but is not necessarily limited to elements such as size, weight, durability, performance and visual effect.

4. 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 will become necessary to accommodate the proposed substitution.

5. 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.

6. Cost information, including a proposal of the net change, if any, in the Contract Sum.

7. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include 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.

8. The Contractor warrants that they have investigated the proposed product and determined that it is equal to or superior in all respects to that indicated or specified.

9. The Contractor waives claim for additional costs and time associated with the proposed product, which may subsequently become apparent.

10. The Contractor shall provide a signed statement that the proposed product is in full compliance with the Contract Documents, and applicable regulatory requirements, requires no changes to specified controls and monitoring systems that may be specified in other Sections, and Certify that the Contractor will be responsible for coordination at no additional expense to the Owner

11. The Contractor shall provide information on availability of maintenance service, and source of replacement materials, and provide a sample of Manufacturer's standard form of guarantee or warranty for proposed product.

1.5 CONSTRUCTION MANAGER'S ACTION

A. Within ten (10) days of receipt of the request, the Construction Manager will notify the Contractor of acceptance or rejection of the proposed substitution. The Architect at their sole discretion will determine the acceptability of proposed products and their determination shall be final. If a decision on use of a proposed substitution cannot be made or obtained within the time allocated, use the product specified by name in the Contract Documents.

B. No consideration will be given to a substitute product unless, in the Architect's judgment, it complies with the following conditions.

1. Substitution Request is complete.

2. It is equal in quality, performance and serviceability.

3. Its use does not entail changes in details or related construction.

4. It is acceptable in regards to design and aesthetic effect.

5. There is a cost and/or time advantage to the Owner.

C. Acceptance of a product shall not relieve the Contractor from responsibility for the proper execution of the Work and any other requirements of the Contract Documents.

D. If a proposed product is not accepted, use the product originally specified or

indicated in the Contract Documents.

E. No products other than those indicated or specified in the Contract Documents shall be purchased or incorporated in the Work without the Architect's prior written acceptance.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Conditions: The Contractor's substitution request will be received and considered by the Architect when one (1) or more of the following conditions are satisfied, as determined by the Architect; otherwise requests will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract Documents are not required.

2. Proposed changes are in keeping with the general intent of the Contract Documents.

3. The request is timely, fully documented and properly submitted.

4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.

5. The Specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or Separate Contractors, and similar considerations.

8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.

9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.

10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.

B. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents, does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 3 **-** EXECUTION (not used)

-END OF SECTION-

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Advancement of Construction Technology

SUBSTITUTION REQUEST
(After the Bidding Phase)

Project: Insert project name

Substitution Request Number: For the Architect to fill in.

From: Insert your name and company name

To: Insert name of Architect, Engineer or GC

Date: Insert the current date

.

A/E Project Number: Fill in if you know the number

Re: Substitution request

Contract For: Insert your contract scope (in general)

Specification Title: Insert spec title from specification book

Description: Copy section title from specification

Section: Copy from spec book

Page: insert page Article/Paragraph: insert para

Proposed Substitution:

Manufacturer:

Address: Phone: insert plant phone number

Trade Name: Model No.:)

Installer: insert subs company Address: insert subs address Phone: insert subs phone number

History: ☐ New product ☐ 2-5 years old X☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product:

X☐ Point-by-point comparative data attached - REQUIRED BY A/E.

Reason for not providing specified item:

Similar Installation:

Project: List a completed project Architect: Insert name of Architect on completed project

Address: Insert project address Owner: Insert name of Owner on completed project

Date Installed:

Proposed substitution affects other parts of Work: X ☐ No ☐ Yes; explain

Savings to Owner for accepting substitution: ($).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐

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SUBSTITUTION

REQUEST
(Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: Insert submitters name, normally project manager for sub

Signed by: Submitter to sign

Firm: InsertSubmitters company name

Address: Insert

Telephone: Insert company phone number

Attachments: List name of attachments

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01330.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

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01 26 00 - MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing the following contract modifications:

1. Request for Information.

2. Field Order.

3. Request for Cost Proposal.

4. Cost Proposal.

5. Change Orders.

1.03 DEFINITIONS

A. Request for Information (RFI)

1. Written request submitted by Contractor to Owner via the Owner's project management system on a form supplied by Owner's Representative requesting clarification, interpretation, or additional information pertaining to Contract Documents.

2. An RFI shall not be used as a vehicle for only confirming or verifying issues.

B. Field Order (FO)

1. Owner's Representative written directives to the Contractor covering a specific aspect of work, signed by the Owner or Owner's lead agency that authorizes changes in the Work to expedite the change order process.

C. Request for Cost Proposal (RFCP)

1. Written request by the Owner's Representative to the Contractor to quote change to Contract Sum and/or Contract Time for proposed change to Contract Document.

D. Cost Proposal (CP)

1. Written request by the Contractor to the Owner's Representative to change Contract Sum and/or Contract Time for proposed change to Contract Document.

E. Change Order (CO)

1. Initiated by the Owner, Contractor, Consultant, Owner's lead agency, or the Owner's Representative and signed by the Owner and Contractor stating their agreement to a change to Contract Documents and adjustment to Sum and/or Contract Time.

1.04 REQUEST FOR INFORMATION (RFI)

A. Submit RFIs numbered in sequential order, reviewed by the Contractor with respect to Contract Documents.

1. Submit RFIs on forms designated by the Owner's Representative.

B. Owner's Representative will monitor the RFI process and responses from the Consultant. The Consultant will receive RFIs only from the Owner's Representative; Consultant will not accept RFIs directly from any other entity.

C. Owner's Representative will receive only legible, properly prepared RFI:

1. Unreadable facsimile machine RFIs, illegibly written RFIs, or RFIs with incomplete information, will be returned promptly without action.

2. RFIs may be transmitted to Owner's Representative by online project management system.

a. Owner's Representative will forward to Consultant for review and return response by the same method received from Contractor.

3. Consultant will review RFIs with respect to Contract Documents and return response in a timely manner, generally within 7 calendar days, or commensurate with RFI subject.

a. RFIs marked "URGENT" will take precedence over outstanding RFIs and be answered by Consultant as soon as possible.

D. Contractor being fully familiar with Contract Documents, shall not be relieved of responsibility to coordinate the Work to prevent adverse impact to Project schedule when submitting RFIs to Owner's Representative for clarification or interpretation of Contract Documents, or additional information.

E. If the Contractor believes the scope of work referenced in the RFI has a cost and /or time impact, he will not proceed with the work until either a Field Order or a Change Order has been issued.

1.05 FIELD ORDER (FO)

A. Field Orders may include supplementary or revised Drawings and/or Specification to describe changes to Contract Documents.

B. Field Orders will be executed on forms designated by the Owner's Representative.

C. Field Orders may be generated by the Contractor's written notice submitted on a Cost Proposal form, that an RFI response or other unforeseen condition has changed the

Contract cost and /or time, and that schedule impact will result if written directive is not provided in a timely manner.

D. Contractor shall provide an estimate of cost and/or time impact at the time of the request for a Field Order.

E. Owner's Representative will review the request for a Field Order and initiate a written Field Order for authorization by the Owner or Owner's lead agency.

F. If the Field Order is approved by the Owner or Owner's lead agency, Owner's Representative will release the signed Field Order to the Contractor. If rejected, the Contractor is so notified by the Owner's Representative.

1.06 REQUEST FOR COST PROPOSAL (RFCP)

A. Request for Cost Proposal is an informational request only, and is not an instruction or authorization to execute a change, or an order to stop Work in progress.

B. Request for Cost Proposal may include supplementary or revised Drawings and/or Specification to describe proposed changes to Contract Documents.

C. Contractor shall submit cost and/or time quotation to Owner's Representative within 15 calendar days following receipt of Request for Cost Proposal.

1.07 COST PROPOSAL (CP)

A. Contractor shall submit to the Owner's Representative a Cost Proposal for all occurrences the Contractor believes impacts Scope of Work cost and/or time.

1. A Cost Proposal shall be submitted within 7 calendar days of the occurrences.

B. Submit Cost Proposal numbered in sequential order, reviewed by the Contractor with respect to Contract Documents.

1. Submit Cost Proposals on forms designated by the Owner's Representative.

C. All Cost Proposals submitted shall have detailed breakdown for all associated work, cost and/or time.

D. Owner's Representative will solicit and monitor independent cost estimates responses from the Consultant.

E. Owner's Representative shall return Cost Proposal responses and reviews to the Contractor within 7 calendar days following receipt of Cost Proposal.

F. A processed Cost Proposals is informational back-up for a potential Change Order, and not an instruction or authorization to execute a change, or an order to stop Work in progress.

1.08 CHANGE ORDER (CO)

A. Change Orders may be initiated by the Owner, Contractor, Consultant, Owner's lead agency, or the Owner's Representative.

B. Changes to the Project Contract Sum and/or Contract Time listed or indicated in Change Orders shall include or be determined by methods described in the General Conditions.

C. Owner's Representative has responsibility for processing and administering Change Orders for the Project and will prepare each Change Order using form designated by the Owner's Representative.

D. Contractor shall provide all pricing proposals Cost Proposals for a Change Order. The Consultant shall provide independent cost estimates to Cost Proposals.

1. Cost differentials between the Contractor's Cost Proposal and the Owner's Representative may negotiate the Consultants cost estimates.

2. If no agreement is reached, the Owner's Representative may issue a time and material Change Order.

a. Use Daily Force Account Report designated by Owner's Representative.

E. The Contractor, Consultant, Owner's Representative, Owner's lead agency and Owner will sign a fully documented Change Order.

1.09 CORRELATING CHANGE ORDERS WITH OTHER CONTRACT REQUIREMENTS

A. Revise Schedule of Values and Applications for Payment to record each Change Order as a separate item of work with adjustment to Contract Sum and Contract Time.

B. Revise Construction Schedule to reflect each change in Contract Time.

C. Record modifications in Record Documents.

END OF SECTION

01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including; Application for Payment forms with Continuation Sheets, Submittals Schedule and Contractor's Construction Schedule.
   2. Submit the Schedule of Values to the Construction Manager at earliest possible date but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
   3. Sub schedules: Where the Work is separated into phases requiring separately phased payments, provide sub schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one-line item for each Specification Section.
   1. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Submit draft of AIA Document G703 Continuation Sheets.
   3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. (Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.)
   4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
   5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Construction Manager and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Progress payments shall be submitted to CM by the 25th of the month. Provide a “draft copy” of proposed % complete values for review by the Construction Manager, Architect and Owner. The period covered by each Application for Payment is one month, ending on the last day of the month.

D. Payment Application Forms: Use forms provided by Owner as form for Applications for Payment.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
   1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
   2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

F. Transmittal: Upon approval of the “draft copy” by the Construction Manager, Architect and Owner, submit a signed and notarized original copy of each Application for Payment to the Construction Manager by a method ensuring receipt

(within 24 hours). Submittal shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
2. Contractor shall submit a Construction Schedule Update (hard copy and electronic copy) in accordance with Section 01 32 16 (Construction Progress Documentation) along with the final copies of each months Application for Payment.
3. Contractor shall submit copies of the current months Photographic Documentation (electronic copy) in accordance with Section 01 32 33 (Photographic Documentation) along with the final copies of each months Application for Payment.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary, if not final).
4. Schedule of unit prices.
5. Submittals Schedule (preliminary, if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.
12. Certificates of insurance and insurance policies.

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent (100%) completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
   5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
   6. AIA Document G707-1994, "Consent of Surety to Final Payment."
   7. Evidence that claims have been settled.
   8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
   9. Final, liquidated damages settlement

statement. PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -

01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. Coordination Drawings.
   2. Project meetings.
   3. Requests for Interpretation (RFIs).
   4. Project Web site (web-based project management software).

B. See Section 01 73 00 "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

A. RFI: Request For Information from Contractor seeking interpretation or clarification of the Contract Documents.

1.3 WEB-BASED PROJECT MANAGEMENT SOFTWARE

A. Software: Primavera Submittal Exchange will be the software package utilized to manage the following processes:
   1. Requests for Information
   2. Submittals
   3. Change Management Documentation
   4. Daily Report Management
   5. Meeting Notes
   6. Document Management (including Photos)
   7. Close-Out Submittals

B. The Contractor will be required to utilize Converge for all of the above processes. The Contractor may, at their option, utilize their own software for their own management purposes, but data must still be entered into the Primavera Submittal Exchange web based software. Data entered into other management systems will not be recognized by the project team.

C. Contractor shall pay fee.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

1.5 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches (215 by 279 mm) but no larger than 30 by 42 inches (750 by 1067 mm).
3. Number of Copies: Submit electronic files for each submittal and produce hard copies as required by the Architect.
4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner, Construction Manager and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager and Architect, within three (3) days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner, but no later than fifteen (15) days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
   1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Procedures for processing field decisions and Change Orders.
      f. Procedures for RFIs.
      g. Procedures for testing and inspecting.
      h. Procedures for processing Applications for Payment.
      i. Distribution of the Contract Documents.
      j. Submittal procedures.
      k. LEED requirements.
      l. Preparation of Record Documents.
      m. Use of the premises and existing buildings.
      n. Work restrictions.
      o. Owner's occupancy requirements.

p. Responsibility for temporary facilities and controls.
q. Construction waste management and recycling.
r. Parking availability.
s. Office, work, and storage areas.
t. Equipment deliveries and priorities.
u. First aid.
v. Security.
w. Progress cleaning.
x. Working hours.

3. Notes: Construction Manager or Architect will record and distribute meeting notes.

C. Progress Meetings: Construction Manager will conduct progress meetings at **weekly** intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner, Construction Manager and Architect, each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. General Contractor's designated Project Manager and Superintendent must attend all Progress Meetings in addition to all other project related meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve notes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      1) Review schedule for next period.
   b. Review present and future needs of each entity present, including the following:
      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Deliveries.
      5) Off-site fabrication.
      6) Access.
      7) Site utilization.
      8) Temporary facilities and controls.
      9) Work hours.
      10) Hazards and risks.
      11) Progress cleaning.
      12) Quality and work standards.
      13) Status of correction of deficient items.

14) Field observations.
15) Status of RFIs.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

3. Notes: Construction Manager will conduct the meeting will record and distribute meeting notes to Owner, Architect and Contractor.
4. Reporting: Distribute notes of the meeting to each party present and to parties who should have been present.
   a. Schedule Updating: Contractor shall update the Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI via the web-based project management software.
   1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
   2. RFIs shall be submitted to the Construction Manager in the specified format.
   3. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
   1. Project name.
   2. Project number
   3. Date.
   4. Name of Contractor.
   5. Name of Architect and Construction Manager.
   6. RFI number, numbered sequentially.
   7. Specification Section number and title and related paragraphs, as appropriate.
   8. Drawing number and detail references, as appropriate.
   9. Field dimensions and conditions, as appropriate.
   10. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   11. Contractor's signature.
   12. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

C. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow fourteen (14) working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Architect's actions on submittals.
   f. Incomplete RFIs or RFIs with numerous errors.
2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to **procedures defined in the Contract Documents including Division F, Section 21.**
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten (10) days of receipt of the RFI response.

D. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log (CSI Log Form 13.2B) weekly. Include the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. RFI number including RFIs that were dropped and not submitted.
   5. RFI description.
   6. Date the RFI was submitted.
   7. Date Architect's response was received.
   8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
   9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

-END OF SECTION-

01 32 16 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions;

C. Summary of Work; and

D. Submittals.

1.2 SECTION INCLUDES

A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of this Section.

1. Development of Project Schedule (including Initial, Baseline, and Progress Schedule). Contractor shall employ computerized Critical Path Method ("CPM") scheduling ("CPM Schedule").

2. Work Plan Cash Flow of the schedule shall be:

(a) Related to the Project Schedule of Values as approved by the Owner.

(b) Represent the intended work plan cash-flow.

(c) The basis of Earned Value assessment.

3. Submit schedules and reports as specified in the General Conditions.

4. Scheduling best practices identifying technical issues and project float.

B. Time Impacts including directed scope additions, unexpected critical impacts, inclement weather, and defined liability assignments.

C. Earned Value Management including schedule health assessment, forecast completion estimation, and schedule efficiency performance indicators.

D. Monthly Schedule Reporting.

1.3 QUALIFICATIONS

A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of Primavera P6 Professional or approved equivalent software. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose.

1. Project Scheduler qualifications shall be submitted in writing at the Notice of Intent to Award.

2. The written statement shall identify the individual who will perform CPM scheduling and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.

3. Required level of experience shall include at least two (2) projects of similar nature and scope, with a minimum of five (5) years of verifiable experience. The written statement shall provide contact persons for referenced projects with current telephone and address information.

4. Project Scheduler with capability of producing schedule reports and diagrams within 24 hours of Owner's request.

B. County reserves the right to approve or reject Contractor's scheduler or consultant at any time. County reserves the right to refuse replacing of Contractor's scheduler or consultant, if County believes replacement will negatively affect the scheduling of Work under this Contract.

1.4 GENERAL

A. Project Schedule shall be based on and incorporate milestone and completion dates specified in Contract Documents.

B. Overall time of completion and time of completion for each milestone shown on Project Schedule shall adhere to times in the Contract, unless an earlier (advanced) time of completion is requested by Contractor and agreed to by County. Any such agreement shall be formalized by a Change Order.

1. County is not required to accept an early completion schedule, i.e., one that shows an earlier completion date than the Contract Time.

2. Contractor shall not be entitled to extra compensation in event agreement is reached on an earlier completion schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in its early completion schedule but within the Contract Time.

3. A schedule showing the work completed in less than the Contract Time, and that has been accepted by County, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the work and the Completion Date. Project Float is a resource available to both County and the Contractor.

C. Ownership Project Float: Neither the County nor Contractor owns Project Float. The Project owns the Project Float. As such, liability for delay of the Completion Date rests with the party whose actions, last in time, actually cause delay to the Completion Date.

1. Float defined as the amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any of the activities in the schedule. Float is not for the exclusive use of or benefit of either the Owner or the Contractor, but its use shall be determined solely by the Owner.

2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. For example, if Party A uses some, but not all of the Project Float and Party B later uses remainder of the Project Float as well as additional time beyond the Project Float, Party B shall be liable for the time that represents a delay to the Completion Date.

4. Party A would not be responsible for the time since it did not consume the entire Project Float and additional Project Float remained; therefore, the Completion Date was unaffected by Party A.

D. The Project Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. The Contractor is responsible for developing the based on the critical path method (CPM), logical activity duration derivation, using standard scheduling best practices, and logical sequence of execution.

E. Failure of the Project Schedule to include any element of the Work, or if there are any inaccuracies, will not relieve Contractor from the responsibility of accomplishing the Work in accordance with the Contract. County's acceptance of schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests and shall not, in any manner, impose a duty of care upon County, or act to relieve Contractor of its responsibility for means and methods of construction.

F. Recommended scheduling software is the latest version of Primavera P6 or an approved equivalent. Contractor shall transmit contract file to County on USB flash drive or project management system at times requested by County.

G. Transmit each item under the form approved by County.

1. Identify Project with County Contract number and name of Contractor as well as the data date.

2. Provide space for Contractor's approval stamp and County's review stamps.

3. Submittals received from sources other than Contractor will be returned to the Contractor without County's review.

1.5 INITIAL SCHEDULE (90-day)

A. At the Notice to Proceed, Contractor shall immediately commence development of Initial and Baseline Schedules to ensure compliance with Project Schedule submittal requirements.

B. Within fourteen (14) calendar days of the Notice to Proceed and before request for first progress payment, the Contractor shall prepare and submit to the Owner an Initial Schedule conforming to, and containing, the milestones required by the Contract Documents.

C. The Initial Schedule is the basis for the subsequent Baseline Schedule.

D. Indicate detailed plan for the Work to be completed in first ninety (90) days of the Contract; details of planned mobilization of equipment; sequence of early operations; procurement of materials and equipment. Show Work beyond ninety (90) calendar days in summary form.

E. Initial Schedule shall be time scaled.

F. County and Contractor shall meet to review and discuss the Initial Schedule within seven (7) calendar days after it has been submitted to County.

1. County's review and comment on the schedule shall be limited to Contract conformance (with sequencing, coordination, and milestone requirements).

2. Contractor shall make corrections to schedule necessary to comply with Contract requirements and shall adjust schedule to incorporate any missing information requested by County. Contractor shall resubmit Initial Schedule if requested by County.

3. Prescheduling Conference: Conduct conference at Project site to review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

(a) Review software limitations and content and format for reports.

(b) Verify availability of qualified personnel needed to develop and update schedule.

(c) Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.

(d) Review delivery dates for Owner-furnished products.

(e) Review schedule for work of Owner's separate contracts.

(f) Review time required for review of submittals and resubmittals.

(g) Review requirements for tests and inspections by independent testing and inspecting agencies.

(h) Review time required for completion and startup procedures.

(i) Review time required for Project closeout and Owner startup procedures, including commissioning activities.

(j) Review and finalize list of construction activities to be included in schedule.

(k) Review submittal requirements and procedures.

(l) Review procedures for updating schedule.

1.6 BASELINE SCHEDULE

A. Contractor shall, within thirty (30) calendar days from the Notice to Proceed date, submit a detailed proposed Baseline Schedule presenting an orderly and realistic plan for completion of the Work in conformance with requirements as specified herein.

B. The Baseline Schedule shall include or comply with following requirements:

1. No activity on schedule shall have duration longer than fifteen (15) work days, with exception of submittal, approval, fabrication and procurement activities, unless otherwise approved by County.

(a) Activity durations shall be total number of actual work days required to perform that activity.

(b) It is recommended activity durations are derived using one of the following best practices methods:

1) Analogous

2) Parametric

3) PERT Method

2. Constraints: Should be limited to ‘start on or after’ or ‘finish on or before’.

3. Phasing: Arrange list of activities on schedule by phase.

4. Work under More Than One Contract: Include a separate activity for each contract.

5. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

6. Products Ordered in Advance: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.

7. Owner-Furnished Products: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.

8. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

   (a) Submittals.

   (b) Purchases.

   (c) Mockups.

   (d) Fabrication.

   (e) Sample testing.

   (f) Deliveries.

   (g) Installation.

   (h) Tests and inspections.

   (i) Adjusting.

   (j) Curing.

   (k) Building flush-out.

   (l) Startup and placement into final use and operation.

   (m) Commissioning.

9. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    (a) Structural completion.

    (b) Permanent space enclosure.

    (c) Completion of mechanical installation.

    (d) Completion of electrical installation.

    (e) Substantial Completion.

10. County furnished materials and equipment, if any, identified as separate activities.

11. Activities for maintaining Project Record Documents.

12. Dependencies (or relationships) between activities.

    (a) Relationships shall consist of finish-start, finish-finish, and start-start only.

    (b) Open-end activities should be seen on the Notice to Proceed (NTP) and Final Completion milestones only.

    (c) Finish-start relationships with positive lag are not allowed.

    (d) Negative lag is not allowed.

13. Processing/approval of submittals and shop drawings for all material and equipment required per the Contract. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.

    (a) Include time for submittals, re-submittals and reviews by County. Coordinate with accepted schedule for submission of Shop Drawings, samples, and other submittals.

    (b) Contractor shall be responsible for all impacts resulting from re-submittal of Shop Drawings and submittals.

14. Procurement of major equipment, through receipt and inspection at jobsite, identified as separate activity.

    (a) Include time for fabrication and delivery of manufactured products for the Work.

(b) Show dependencies between procurement and construction.

15. Activity description; what Work is to be accomplished avoiding duplicates.

16. The Work Plan Cash Flow will provide the cash flow used as the basis for subsequent earned value metric calculation. The total cost of performing each activity shall be total of labor, material, and equipment, as well as overhead and profit of Contractor. Sum of cost for all activities shall equal total Contract value and be correlated with the Schedule of Values.

    (a) The intent is to identify the monthly cash-flow for the duration of the project.

17. Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.

18. Identify the activities which constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to (10) days.

19. Twenty (20) working days for developing punch list(s), completion of punch-list items, and final clean-up for the Work or any designated portion thereof. No other activities shall be scheduled during this period.

20. Interface with, and coordinate, the work of other contractors, County, and agencies such as, but not limited to, utility companies.

21. Show detailed Subcontractor Work activities. In addition, furnish copies of Subcontractor schedules upon which the Project Schedule was built.

    (a) Also furnish for each Subcontractor, as determined by County, submitted on Subcontractor letterhead, a statement certifying that Subcontractor concurs with Contractor's Baseline Schedule and that Subcontractor's related schedules have been incorporated, including activity duration, cost and resource loading.

    (b) Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.

    (c) In addition to Contractor's schedule, obtain from electrical, mechanical, and plumbing Subcontractors, and other Subcontractors as required by County, productivity calculations common to their trades, such as units per person

day, feet of pipe per day per person, feet of wiring per day per person, and similar information.

(d) Furnish schedule for Contractor/Subcontractor schedule meetings which shall be held prior to submission of Baseline Schedule to County. County shall be permitted to attend scheduling meetings as an observer.

22. Activity durations shall be in Work days.

23. Submit with the schedule a list of anticipated non-Work days, such as weekends and holidays. The Project Schedule shall exclude in its Work day calendar all non-Work days on which Contractor anticipates critical Work will not be performed.

24. The anticipated days lost due to weather shall be included as a single Adverse Weather Allowance activity with a duration defined in table below prorated for the length of the project and based on NOAA historical data. The duration shall be in working days and be the predecessor to the Substantial Completion milestone on the critical path. Adverse weather day impacts will be managed as prescribed in section 1.12F.

Month	Adverse Weather Allowance (days)
January	6
February	7
March	6
April	4
May	1
June	0
July	0
August	0
September	0
October	2
November	4
December	8

C. Baseline Schedule Review Meeting: Contractor shall, within fourteen (14) calendar days from the Notice to Proceed date, meet with County to review the Baseline Schedule submittal.

1. Contractor shall have its Project Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by County, in attendance. The meeting will take place over a continuous one (1) day period.

2. County's review will be limited to submittal's conformance to Contract requirements including, but not limited to, coordination requirements. However, review may also include:

   (a) Clarifications of Contract Requirements.

   (b) Directions to include activities and information missing from submittal.

   (c) Requests to Contractor to clarify its schedule.

3. Within seven (7) calendar days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by County at the Meeting.

1.7 BASELINE SCHEDULE REVISIONS

A. Adjustments to Baseline Schedule: Contractor shall have adjusted the Baseline Schedule submittal to address all review comments from Baseline Schedule review meeting and resubmit network diagrams and reports for County's review.

1. County, within fourteen (14) calendar days from date that Contractor submitted the revised schedule, will either:

   (a) Accept schedule as submitted, or

   (b) Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for County to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.

2. When schedule is accepted, it shall be considered the "Baseline Schedule" which will then be immediately updated to reflect the current status of the work.

3. County reserves right to require Contractor to adjust, add to, or clarify any portion of schedule which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.

B. Acceptance of Contractor's schedule by County will be based solely upon schedule's compliance with Contract requirements.

1. By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.

2. Upon submittal of schedule update, updated schedule shall be considered "current" Project Schedule.

3. Submission of Contractor's schedule to County shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply with requirements of Contract Documents, including adverse effects such as delays resulting from ill-timed Work.

C. Submittal of Baseline Schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the Schedule meets requirements of Contract Documents and that Work shall be executed in sequence indicated on the schedule.

D. Contractor shall distribute Baseline Schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterheads to Contractor and transmitted to County for the record.

1.8 PROGRESS SCHEDULE (MONTHLY SCHEDULE UPDATE)

A. Following acceptance of Contractor's Baseline Schedule, Contractor shall monitor progress of Work and adjust schedule on at least a monthly basis to reflect actual progress and any anticipated changes to planned activities.

1. Each schedule update submitted shall be complete, including all information requested for the Baseline Schedule submittal.

2. Each update shall continue to show all work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed. The "as-built" activities shall be reviewed and accepted prior to the update schedule review.

B. A meeting will be held on approximately the twenty-fifth (25th) of each month to review the schedule update submittal and progress payment application.

1. At this meeting, at a minimum, the following items will be reviewed: Percent (%) complete of each activity; Time Impact Evaluations for Change Orders and Time Extension Request; actual and anticipated activity sequence changes; actual and anticipated duration changes; and actual and anticipated Contractor delays.

2. These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, these meetings shall be attended by Contractor's General Superintendent and Scheduler.

3. Contractor shall plan on the meeting taking no less than four (4) hours.

C. Within five (5) working days after monthly schedule update meeting, Contractor shall submit the Progress Schedule.

D. Within five (5) work days of receipt of above noted revised submittals, County will either accept or reject Progress Schedule.

E. Neither updating, changing or revising of any report, curve, schedule, or narrative submitted to County by Contractor under this Contract, nor County's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying in any way the Completion Date or milestone dates or of modifying or limiting in any way Contractor's obligations

1.9 PROGRESS SCHEDULE REVIEW AND REVISIONS

A. County, within seven (7) days from date that Contractor submitted the schedule update, will either:

1. Accept schedule as submitted, or

2. Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for County to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.

B. Updating the Project Schedule to reflect actual progress shall not be considered revisions to the Schedule.

C. To reflect revisions to the Schedule, the Contractor shall provide County with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram which compares the original sequence to the revised sequence of work. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.

D. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by County. County may request further information and justification for schedule revisions and Contractor shall, within three (3) working days, provide County with a complete written narrative response to County's request.

E. If the Contractor's revision is still not accepted by County, and the Contractor disagrees with County's position, the Contractor has seven (7) calendar days from receipt of County's letter rejecting the revision to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of County's written rejection of a schedule revision shall be contractually interpreted as acceptance of County's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding County's position.

F. At County's discretion, the Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

1.10 RECOVERY SCHEDULE

A. A Recovery Schedule will be submitted when a delay of fourteen (14) calendar days or more to the Final Completion milestone is identified.

B. The Recovery Schedule is herein defined as the Contractor plan to reconcile current delay days to complete the project on the contract completion date.

1.11 COMPLETION SCHEDULE

A. If schedule performance, estimated through earned value analysis, is forecasting a trending delay of greater than 21 days over 3 or more months, the Contractor and PMCM will meet to discuss remediation through a Completion Schedule.

B. The Completion Schedule is herein defined as the Contractor plan to establish a project completion date when the current Final Completion date is deemed no longer achievable. When this happens, the Contractor will submit a schedule to complete that demonstrates a new probable project completion (for example, using cash flow analysis).

1.12 PROJECT DELAYS

A. Time Allowances

0. Time is of the essence. Contract Time may only be changed by Change Order, and all time limits stated in the Contract Documents are to mean that time is of the essence.

B. Excusable Delay and Inexcusable Delay Defined

0. In the event the Contractor requests an extension of Contract Time for unavoidable delay, such request shall be submitted in accordance with the provisions in the Contract Documents governing Claims and Disputes (Division F, Section 33 and 34). When requesting time, requests must be submitted with full justification and documentation.

If the Contractor fails to submit justification, it waives its right to a time extension at a later date. Such justification must be based on the official Construction Schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the Scope of Work. Any Claim for delay must include the following information as support, without limitation.

1. Excusable Delay. Subject to the provisions on Notice of Delay below, Contract Time may be adjusted in an amount equal to the time lost due to:

   (a) Changes in the Work ordered by County ("Changes");

   (b) Acts or neglect by County, Architect/Engineer, any County Representative, utility owners or other contractors performing other work, not permitted or provided for in the Contract Documents, provided that Contractor has performed its responsibilities under the Contract Documents (including but not limited to pre-bid investigations) ("Acts or Neglect"); or

   (c) Fires, floods, epidemics, **pandemics,** quarantines, abnormal weather conditions beyond the parameters otherwise set forth in this Article, earthquakes, civil or labor disturbances, **acts of war or terrorism**, or acts of God (together, "force majeure events"), provided damages resulting therefrom are not the result of Contractor's failure to protect the Work as required by Contract Documents ("Force Majeure").

   (d) Work delayed which is out of the control of the Contractor may be an Excusable Delay.

2. Inexcusable Delay. Contract Time shall not be extended for any period of time where Contractor (and/or any Subcontractor) is delayed or prevented from completing any part of the Work due to a cause that is within Contractor's risk or responsibility under the Contract Documents. Delays attributable to or within the control of a Subcontractor, or its subcontractors, or supplier, are deemed delays within the control of Contractor.

   (a) Work delayed which is in the control of the Contractor is an Inexcusable Delay.

3. Float. Float shall be treated as a Project resource. Contractor shall not be entitled to a time extension for impacts that consume float, but do not impact the critical path.

C. Notice of Delay

0. Within seven (7) calendar days of the beginning of any delay (excepting adverse weather delays), Contractor shall notify County in writing, by submitting a Notice of Delay that shall describe the anticipated delays resulting from the delay event in question. If Contractor requests an extension of time, Contractor shall submit a Time Impact Evaluation (TIE) within 10 calendar days of the Notice of Delay. County will determine all claims and adjustments in the Contract Time. No claim for an adjustment in the Contract Time will be valid and such claim will be waived if not submitted in accordance with the requirements of this subparagraph. In cases of substantial compliance with the seven-day notice requirement here (but not to exceed twenty-one calendar days from the beginning of the delay event), County may in its sole discretion recognize a claim for delay accompanied with the proper TIE, provided Contractor also shows good faith and a manifest lack of prejudice to County from the late notice. Contractor will follow the guidelines set forth in section 1.13 and include description of activities impacted by the delay, including the activity ID.

D. Compensable Time Extensions

1. Subject to other applicable provisions of the Contract Documents, Contractor may be entitled to adjustment in Contract Sum in addition to Contract Time only when all of the following conditions are met:

   (a) The Owner is the sole cause of the delay to the current critical path;

   (b) The delay is unreasonable under the circumstances involved;

   (c) The delay was not within the contemplation of Owner and Contractor; and

   (d) Contractor complies with the claims procedure of the Contract Documents.

   (e) Excusable delay caused solely by Changes in the Work ordered by County, as provided above, and/or

   (f) Excusable delay caused solely by Acts or Neglect by County or other person, as provided above.

E. Non-Compensable Time Extensions

1. Subject to other applicable provisions of the Contract Documents, Contractor may be entitled to adjustment in Contract Time only, without adjustment in Contract Sum, for

(a) Periods of excusable delay caused solely by weather (beyond the adverse weather day allowance shown herein) or Force Majeure events as provided above in this Article, or

(b) Periods of concurrent delay, where delay results from two or more causes, one of which is compensable (resulting from Changes or Acts or Neglect as set forth above in this Article), and the other of which is non-compensable or inexcusable, such as: acts or neglect of Contractor, Subcontractors or others for whom Contractor is responsible; other acts, omissions and conditions which would not entitle Contractor to adjustment in Contract Time; adverse weather; and/or actions of Force Majeure as provided above in this Article.

F. Adverse Weather

0. The Contract Adverse Weather Time has been determined with consideration given to the average climate weather conditions prevailing in the County in which the Project is located. (1.06B.24)

1. Contractor shall provide proof that adverse weather actually caused delays to work on the critical path. The proof shall contain the activity ID and name of impacted critical activity. Contractor shall give written notice of intent to claim an adverse weather day within one day of the adverse weather day occurring (1.06B.24).

2. In order to qualify as an adverse weather delay with respect to the foregoing parameters: daily rainfall must exceed 0.1 inch at the NOAA station located closest to the Project site, as measured and reported by NOAA. Notwithstanding these allowances, Contractor shall at all times employ all available mitigation measures to enable Work to continue, Contractor shall take reasonable steps to mitigate potential weather delays, such as dewatering the Site, lime treatment, and covering Work and material that could be affected adversely by weather. Failure to do so shall be cause for County to not grant a time extension due to adverse weather, where Contractor could have avoided or mitigated the potential delay by exercising reasonable care.

3. Contractor shall include the foregoing precipitation parameters as a monthly activity in its progress schedule. As Work on the critical path is affected by precipitation, Contractor shall notify County and request that the days be moved to the affected activities. Any adverse weather days remaining shall be considered Project float available to either County or Contractor.

4. Adverse weather delay for precipitation shall be recognized for the actual period of time Contractor proves it was delayed by precipitation

exceeding the specified parameters. For example, and not by way of limitation, if precipitation exceeding the specified parameters does not in fact delay Contractor's progress on the critical path, then no time extension shall be recognized; and conversely, if Contractor proves to County's satisfaction that precipitation exceeding the specified parameters causes delay to Contractor for a period longer than the number of precipitation days incurred (e.g., if it rains or snows during grading work), then Contractor shall be entitled to a time extension equal to the actual period of such delay. Note: Time extension is mitigated in the weather day allowance activity (see section 1.06B24),

5. During unfavorable weather, wet ground, or other unsuitable construction conditions, Contractor shall employ best practices to protect the Work, manage the construction site and rainwater during inclement weather. Persons performing the Work shall examine surfaces to receive their Work and shall report in writing to Contractor, with copy to County representative and the Architect conditions detrimental to the Work. Failure to examine and report discrepancies makes the Contractor responsible, at no increase in Contract Sum, for correction, County may require. Commencement of Work constitutes acceptance of surface.

G. Liquidated Damages

1. Time is of the essence. Execution of Contract Documents by Contractor shall constitute its acknowledgement that County will actually sustain damages in the form of Contract administration expenses (such as Project management and consultant expenses) in the amount fixed in the Contract Documents for each and every Day during which completion of Work required is delayed beyond expiration of time fixed for completion plus extensions of time allowed pursuant to provisions hereof.

2. Contractor and County agree that because of the nature of the Project, it would be impractical or extremely difficult to fix the amount of such actual damages incurred by County because of a delay in completion of all or any part of the Work. Contractor and County agree that specified measures of liquidated damages shall be presumed to be the amount of such damages actually sustained by County, and that because of the nature of the Project, it would be impracticable or extremely difficult to fix the actual damages.

3. Liquidated damages for delay shall cover administrative, overhead, interest on bonds, and general loss of public use damages suffered by County as a result of delay. Liquidated damages shall not cover the cost of completion of the Work, damages resulting from Defective Work, lost revenues or costs of substitute facilities, or damages

suffered by others who then seek to recover their damages from County (for example, delay claims of other contractors, subcontractors, tenants, or other third-parties), and defense costs thereof. County may deduct from any money due or to become due to Contractor subsequent to time for completion of entire Work and extensions of time allowed pursuant to provisions hereof, a sum representing then-accrued liquidated damages.

3. Contractor shall not be charged for liquidated damages because of any delays in completion of Work on the critical path which are not the fault or negligence of Contractor or its Subcontractors, including acts of God as defined in Public Contract Code Section 7105, acts of enemy, epidemics, and quarantine restrictions. Contractor shall, within ten (10) days of beginning of any delay, notify Owner in writing of causes of delay including documentation and facts explaining the delay. Owner shall review the facts and extent of any delay and shall grant extension(s) of time for completing Work when, in its judgment, the findings of fact justify an extension. Extension(s) of time shall apply only to that portion of Work affected by delay and shall not apply to other portions of Work not so affected. An extension of time may only be granted if Contractor has timely submitted the notice and supporting documentation required by all relating Contract Documents as required herein.

1.13 TIME IMPACT EVALUATION ("TIE") FOR CHANGE ORDERS, AND OTHER DELAYS

A. Owner Directed Added Work

1. When Contractor is directed to proceed with changed Work, the Contractor shall prepare and submit within seven (7) calendar days from the Notice to Proceed a TIE which includes both a written narrative and a delay fragnet integrated into the contemporaneous schedule depicting how the changed Work affects other schedule activities. The schedule diagram shall show how the Contractor proposes to incorporate the changed Work in the schedule and how it impacts the current schedule-update critical path. The Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable County to evaluate the impact of changed Work to the scheduled critical path.

2. Contractor shall be responsible for all costs associated with the preparation of TIEs, and the process of incorporating them into the current schedule update.

3. Once agreement has been reached on a TIE, the Contract Time will be adjusted accordingly (via Change Order Request and Change Order). If agreement is not reached on a TIE, the Contract Time may be extended in an amount County allows, and the Contractor may submit a claim for additional time claimed by contractor.

B. Contract Added Work Claim

1. If the schedule final completion date is extended due to added work scope, the Contractor is required to provide a time and cost impact within fourteen (14) calendar days and prior to proceeding with added work, unless approved by Owner.

2. If the Contractor believes critical work has been delayed due to circumstances beyond their control, a TIE shall be submitted as described above.

3. The TIE will be reviewed with fourteen (14) calendar days and assessed as excusable / compensable, excusable / non-compensable, or non-excusable / non-compensable.

4. Delay Fragnet

(a) The duration of the activity relating to the changes in the Work and the resources (manpower, equipment, material, etc.) required to perform the activities within the stated duration.

(b) Specific logical ties to the Contract Schedule for the proposed changes and/or delay showing the activity/activities in the Construction Schedule that are affected by the change and/or delay. (A portion of any delay of seven (7) days or more must be provided.)

(c) A revised Construction Schedule must be submitted showing the delay and impact on the Final Completion date.

1.14 TIME EXTENSIONS

A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current Progress Schedule update. Notice of time impacts shall be given in accord with the General Conditions.

B. Where an event for which County is responsible impacts the projected Final Completion date, the Contractor shall provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment, and material the Contractor

would expend to mitigate County-caused time impact. The Contractor shall submit its mitigation plan to County within fourteen (14) calendar days from the date of discovery of the impact. The Contractor is responsible for the cost to prepare the mitigation plan.

C. Failure to request time, provide A, or provide the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.

D. No time will be granted under this Contract for cumulative effect of changes.

E. County will not be obligated to consider any time extension request unless the Contractor complies with the requirements of Contract Documents.

F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.

G. If the Contractor does not submit a TIE within the required seven (7) calendar days for any issue, it is mutually agreed that the Contractor does not require a time extension for said issue.

H. To avoid possible delay risks, the Contractor is aware that governmental agencies, including, without limitation, the County, gas companies, electrical utility companies, water districts, and other agencies may have to approve Contractor-prepared drawings or approve a proposed installation. Accordingly, Contractor shall include in its schedule and bid, time for possible review of its drawings and for reasonable delays and damages that may be caused by such agencies. Thus, Contractor is not entitled to make a claim for damages or delays arising from the required review of Contractor's drawings by third parties.

1.15 SCHEDULE REPORTS

A. Submit the following reports with the Baseline Schedule and each monthly update.

B. Required Reports:

1. Two activity listing reports: one sorted by activity number and one by total Project Float. These reports shall also include each activity's early/late and actual start and finish dates, original and remaining duration, Project Float, responsibility code, and the logic relationship of activities.

2. Report showing the longest critical path.

3. Work Plan Cash Flow Report including the following: percentage of Work accomplished, earned value- to date, previous payments, and amount earned for current update period.

4. Schedule plots presenting time-scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.

5. Upon request, the Contractor may be required to submit a Planned versus Actual labor histogram calculated by early start.

6. 3-week look-ahead schedule. The 3-week look ahead shall be derived from the update schedule with referenced correlating activities.

7. Actual dates achieved on activities for the past period. This report should be submitted to the County prior to the overall update submittal for field verification.

8. Schedule update narrative describing items such as current critical path, issues, schedule revisions, and other.

9. All reports noted above shall be clearly dated (including data date) and titled.

C. Other Reports:

In addition to above reports, County may request, from month to month, any of the following reports.

1. Activities by early start.

2. Activities by late start.

3. Activities grouped by Subcontractors or selected trades.

D. Furnish County with report files on media as described previously in this document.

1.16 PROGRESS SCHEDULE NARRATIVE

A. In addition to report submittal requirements for Project Schedule identified in the previous Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each schedule as specified herein. Status reporting shall be in form specified below.

B. Contractor shall prepare monthly written narrative reports of status of Project for submission to County. Written status reports shall include:

1. Status of major Project components (percent (%) complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.

2. Progress made on critical activities indicated on Project Schedule.

3. Explanations for any lack of work on critical path activities planned to be performed during last month.

4. Explanations for any schedule changes, including changes to logic or to activity durations.

5. List of critical activities scheduled to be performed next month.

6. Status of major material and equipment procurement.

7. Any delays encountered during reporting period.

8. Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by County at no additional cost.

9. Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.

1.17 LOOKAHEAD SCHEDULE REPORT

By the end of the business day on the day prior to the Weekly Progress Meeting, the Contractor shall provide a time-scaled three (3) week Look-ahead Schedule that is based on, and correlated by activity number to, the current accepted schedule (i.e., Initial, Baseline or Progress Schedule). Look-ahead Schedule shall reflect ALL schedule activities that were planned to take place during this period based on the current schedule. Schedule shall include at least the following: area/building, activity ID, activity description, responsible contractor/subcontractor, as well as planned start date, duration and completion date. Activities noted to be on the critical path per the current schedule shall be highlighted accordingly. Contractor may include multiple activities that relate to a single activity ID if this provides clarity to sequencing, etc.

1.18 DAILY CONSTRUCTION REPORTS

On a daily basis (prior to the end-of-business on the day of the work being reported), Contractor shall submit via the Project Management Software a Daily Construction Report to County for each workday, including weekends and holidays. Contractor shall develop the Daily Construction Reports on a computer-generated database capable of sorting daily Work, manpower, and man-hours by Contractor, Subcontractor, area, sub-area, and Change Order Work. Obtain County's written

approval of Daily Construction Report data base format prior to implementation. Include in report:

A. Project name and Project number.

B. Contractor's name and address.

C. Weather, temperature, and any unusual site conditions. Contractor shall note on this report any Notices issued that day relating to these conditions.

D. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work of Subcontractors. Descriptions shall be referenced to scheduled activities and include all related schedule activity IDs (as well as CORs, CDs, etc).

E. Worker quantities for its own Work force and for Subcontractors of any tier.

F. Equipment, other than hand tools, utilized by Contractor and Subcontractors.

G. Material deliveries.

H. High and low temperatures and general weather conditions.

I. Accidents.

J. Meetings and significant decisions.

K. Unusual events (refer to special reports).

L. Stoppages, delays, shortages, and losses.

M. Meter readings and similar recordings.

N. Emergency procedures.

O. Orders and requests of authorities having jurisdiction.

P. Change Orders received and implemented.

Q. Construction Change Directives received and implemented.

R. Services connected and disconnected.

S. Equipment or system tests and startups.

T. Partial Completions and occupancies.

U. Updates to any and all Activity IDs projected to have activity based on the current accepted Project Schedule.

PART 2 -PRODUCTS – Not used

PART 3 -EXECUTION - Not used

- END OF SECTION –

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01 32 16 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions;

C. Summary of Work; and

D. Submittals.

1.2 SECTION INCLUDES

A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of this Section.

1. Development of Project Schedule (including Initial, Baseline, and Progress Schedule). Contractor shall employ computerized Critical Path Method ("CPM") scheduling ("CPM Schedule").

2. Work Plan Cash Flow of the schedule shall be:

(a) Related to the Project Schedule of Values as approved by the Owner.

(b) Represent the intended work plan cash-flow.

(c) The basis of Earned Value assessment.

3. Submit schedules and reports as specified in the General Conditions.

4. Scheduling best practices identifying technical issues and project float.

5. Schedule shall be in Gant Chart format.

B. Time Impacts including directed scope additions, unexpected critical impacts, inclement weather, and defined liability assignments.

C. Earned Value Management including schedule health assessment, forecast completion estimation, and schedule efficiency performance indicators.

D. Monthly Schedule Reporting.

1.3 QUALIFICATIONS

A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of MS Project or approved equivalent software. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose.

1. Project Scheduler qualifications shall be submitted in writing at the Notice of Intent to Award.

2. The written statement shall identify the individual who will perform CPM scheduling and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.

3. Required level of experience shall include at least two (2) projects of similar nature and scope, with a minimum of five (5) years of verifiable experience. The written statement shall provide contact persons for referenced projects with current telephone and address information.

4. Project Scheduler with capability of producing schedule reports and diagrams within 24 hours of Owner's request.

B. County reserves the right to approve or reject Contractor's scheduler or consultant at any time. County reserves the right to refuse replacing of Contractor's scheduler or consultant, if County believes replacement will negatively affect the scheduling of Work under this Contract.

1.4 GENERAL

A. Project Schedule shall be based on and incorporate milestone and completion dates specified in Contract Documents.

B. Overall time of completion and time of completion for each milestone shown on Project Schedule shall adhere to times in the Contract, unless an earlier (advanced) time of completion is requested by Contractor and agreed to by County. Any such agreement shall be formalized by a Change Order.

1. County is not required to accept an early completion schedule, i.e., one that shows an earlier completion date than the Contract Time.

2. Contractor shall not be entitled to extra compensation in event agreement is reached on an earlier completion schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in its early completion schedule but within the Contract Time.

3. A schedule showing the work completed in less than the Contract Time, and that has been accepted by County, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the work and the Completion Date. Project Float is a resource available to both County and the Contractor.

C. Ownership Project Float: Neither the County nor Contractor owns Project Float. The Project owns the Project Float. As such, liability for delay of the Completion Date rests with the party whose actions, last in time, actually cause delay to the Completion Date.

1. Float defined as the amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any of the activities in the schedule. Float is not for the exclusive use of or benefit of either the Owner or the Contractor, but its use shall be determined solely by the Owner.

2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. For example, if Party A uses some, but not all of the Project Float and Party B later uses remainder of the Project Float as well as additional time beyond the Project Float, Party B shall be liable for the time that represents a delay to the Completion Date.

4. Party A would not be responsible for the time since it did not consume the entire Project Float and additional Project Float remained; therefore, the Completion Date was unaffected by Party A.

D. The Project Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. The Contractor is responsible for developing the based on the critical path method (CPM), logical activity duration derivation, using standard scheduling best practices, and logical sequence of execution.

E. Failure of the Project Schedule to include any element of the Work, or if there are any inaccuracies, will not relieve Contractor from the responsibility of accomplishing the Work in accordance with the Contract. County's acceptance of schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests and shall not, in any manner, impose a duty of care upon County, or act to relieve Contractor of its responsibility for means and methods of construction.

F. Recommended scheduling software is the latest version of Primavera P6 or an approved equivalent. Contractor shall transmit contract file to County on USB flash drive or project management system at times requested by County.

G. Transmit each item under the form approved by County.

1. Identify Project with County Contract number and name of Contractor as well as the data date.

2. Provide space for Contractor's approval stamp and County's review stamps.

3. Submittals received from sources other than Contractor will be returned to the Contractor without County's review.

1.5 INITIAL SCHEDULE (90-day)

A. At the Notice to Proceed, Contractor shall immediately commence development of Initial and Baseline Schedules to ensure compliance with Project Schedule submittal requirements.

B. Within fourteen (14) calendar days of the Notice to Proceed and before request for first progress payment, the Contractor shall prepare and submit to the Owner an Initial Schedule conforming to, and containing, the milestones required by the Contract Documents.

C. The Initial Schedule is the basis for the subsequent Baseline Schedule.

D. Indicate detailed plan for the Work to be completed in first ninety (90) days of the Contract; details of planned mobilization of equipment; sequence of early operations; procurement of materials and equipment. Show Work beyond ninety (90) calendar days in summary form.

E. Initial Schedule shall be time scaled.

F. County and Contractor shall meet to review and discuss the Initial Schedule within seven (7) calendar days after it has been submitted to County.

1. County's review and comment on the schedule shall be limited to Contract conformance (with sequencing, coordination, and milestone requirements).

2. Contractor shall make corrections to schedule necessary to comply with Contract requirements and shall adjust schedule to incorporate any missing information requested by County. Contractor shall resubmit Initial Schedule if requested by County.

3. Prescheduling Conference: Conduct conference at Project site to review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

(a) Review software limitations and content and format for reports.

(b) Verify availability of qualified personnel needed to develop and update schedule.

(c) Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.

(d) Review delivery dates for Owner-furnished products.

(e) Review schedule for work of Owner's separate contracts.

(f) Review time required for review of submittals and resubmittals.

(g) Review requirements for tests and inspections by independent testing and inspecting agencies.

(h) Review time required for completion and startup procedures.

(i) Review time required for Project closeout and Owner startup procedures, including commissioning activities.

(j) Review and finalize list of construction activities to be included in schedule.

(k) Review submittal requirements and procedures.

(l) Review procedures for updating schedule.

1.6 BASELINE SCHEDULE

A. Contractor shall, within thirty (30) calendar days from the Notice to Proceed date, submit a detailed proposed Baseline Schedule presenting an orderly and realistic plan for completion of the Work in conformance with requirements as specified herein.

B. The Baseline Schedule shall include or comply with following requirements:

1. No activity on schedule shall have duration longer than fifteen (15) work days, with exception of submittal, approval, fabrication and procurement activities, unless otherwise approved by County.

(a) Activity durations shall be total number of actual work days required to perform that activity.

(b) It is recommended activity durations are derived using one of the following best practices methods:

1) Analogous

2) Parametric

3) PERT Method

2. Constraints: Should be limited to ‘start on or after’ or ‘finish on or before’.

3. Phasing: Arrange list of activities on schedule by phase.

4. Work under More Than One Contract: Include a separate activity for each contract.

5. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

6. Products Ordered in Advance: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.

7. Owner-Furnished Products: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.

8. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

(a) Submittals.

(b) Purchases.

(c) Mockups.

(d) Fabrication.

(e) Sample testing.

(f) Deliveries.

(g) Installation.

(h) Tests and inspections.

(i) Adjusting.

(j) Curing.

(k) Building flush-out.

(l) Startup and placement into final use and operation.

(m) Commissioning.

9. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

   (a) Structural completion.

   (b) Permanent space enclosure.

   (c) Completion of mechanical installation.

   (d) Completion of electrical installation.

   (e) Substantial Completion.

10. County furnished materials and equipment, if any, identified as separate activities.

11. Activities for maintaining Project Record Documents.

12. Dependencies (or relationships) between activities.

   (a) Relationships shall consist of finish-start, finish-finish, and start-start only.

   (b) Open-end activities should be seen on the Notice to Proceed (NTP) and Final Completion milestones only.

   (c) Finish-start relationships with positive lag are not allowed.

   (d) Negative lag is not allowed.

13. Processing/approval of submittals and shop drawings for all material and equipment required per the Contract. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.

   (a) Include time for submittals, re-submittals and reviews by County. Coordinate with accepted schedule for submission of Shop Drawings, samples, and other submittals.

   (b) Contractor shall be responsible for all impacts resulting from re-submittal of Shop Drawings and submittals.

14. Procurement of major equipment, through receipt and inspection at jobsite, identified as separate activity.

(a) Include time for fabrication and delivery of manufactured products for the Work.

(b) Show dependencies between procurement and construction.

15. Activity description; what Work is to be accomplished avoiding duplicates.

16. The Work Plan Cash Flow will provide the cash flow used as the basis for subsequent earned value metric calculation. The total cost of performing each activity shall be total of labor, material, and equipment, as well as overhead and profit of Contractor. Sum of cost for all activities shall equal total Contract value and be correlated with the Schedule of Values.

    (a) The intent is to identify the monthly cash-flow for the duration of the project.

17. Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.

18. Identify the activities which constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to (10) days.

19. Twenty (20) working days for developing punch list(s), completion of punch-list items, and final clean-up for the Work or any designated portion thereof. No other activities shall be scheduled during this period.

20. Interface with, and coordinate, the work of other contractors, County, and agencies such as, but not limited to, utility companies.

21. Show detailed Subcontractor Work activities. In addition, furnish copies of Subcontractor schedules upon which the Project Schedule was built.

    (a) Also furnish for each Subcontractor, as determined by County, submitted on Subcontractor letterhead, a statement certifying that Subcontractor concurs with Contractor's Baseline Schedule and that Subcontractor's related schedules have been incorporated, including activity duration, cost and resource loading.

    (b) Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.

    (c) In addition to Contractor's schedule, obtain from electrical, mechanical, and plumbing Subcontractors, and other

Subcontractors as required by County, productivity calculations common to their trades, such as units per person day, feet of pipe per day per person, feet of wiring per day per person, and similar information.

(d) Furnish schedule for Contractor/Subcontractor schedule meetings which shall be held prior to submission of Baseline Schedule to County. County shall be permitted to attend scheduling meetings as an observer.

22. Activity durations shall be in Work days.

23. Submit with the schedule a list of anticipated non-Work days, such as weekends and holidays. The Project Schedule shall exclude in its Work day calendar all non-Work days on which Contractor anticipates critical Work will not be performed.

24. The anticipated days lost due to weather shall be included as a single Adverse Weather Allowance activity with a duration defined in table below prorated for the length of the project and based on NOAA historical data. The duration shall be in working days and be the predecessor to the Substantial Completion milestone on the critical path. Adverse weather day impacts will be managed as prescribed in section 1.12F.

Month	Adverse Weather Allowance (days)
January	6
February	7
March	6
April	4
May	1
June	0
July	0
August	0
September	0
October	2
November	4
December	8

C. Baseline Schedule Review Meeting: Contractor shall, within fourteen (14) calendar days from the Notice to Proceed date, meet with County to review the Baseline Schedule submittal.

1. Contractor shall have its Project Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by County, in attendance. The meeting will take place over a continuous one (1) day period.

2. County's review will be limited to submittal's conformance to Contract requirements including, but not limited to, coordination requirements. However, review may also include:

   (a) Clarifications of Contract Requirements.

   (b) Directions to include activities and information missing from submittal.

   (c) Requests to Contractor to clarify its schedule.

3. Within seven (7) calendar days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by County at the Meeting.

1.7 BASELINE SCHEDULE REVISIONS

A. Adjustments to Baseline Schedule: Contractor shall have adjusted the Baseline Schedule submittal to address all review comments from Baseline Schedule review meeting and resubmit network diagrams and reports for County's review.

   1. County, within fourteen (14) calendar days from date that Contractor submitted the revised schedule, will either:

      (a) Accept schedule as submitted, or

      (b) Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for County to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.

   2. When schedule is accepted, it shall be considered the "Baseline Schedule" which will then be immediately updated to reflect the current status of the work.

   3. County reserves right to require Contractor to adjust, add to, or clarify any portion of schedule which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.

B. Acceptance of Contractor's schedule by County will be based solely upon schedule's compliance with Contract requirements.

1. By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.

2. Upon submittal of schedule update, updated schedule shall be considered "current" Project Schedule.

3. Submission of Contractor's schedule to County shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply with requirements of Contract Documents, including adverse effects such as delays resulting from ill-timed Work.

C. Submittal of Baseline Schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the Schedule meets requirements of Contract Documents and that Work shall be executed in sequence indicated on the schedule.

D. Contractor shall distribute Baseline Schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterheads to Contractor and transmitted to County for the record.

1.8 PROGRESS SCHEDULE (MONTHLY SCHEDULE UPDATE)

A. Following acceptance of Contractor's Baseline Schedule, Contractor shall monitor progress of Work and adjust schedule on at least a monthly basis to reflect actual progress and any anticipated changes to planned activities.

1. Each schedule update submitted shall be complete, including all information requested for the Baseline Schedule submittal.

2. Each update shall continue to show all work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed. The "as-built" activities shall be reviewed and accepted prior to the update schedule review.

B. A meeting will be held on approximately the twenty-fifth (25th) of each month to review the schedule update submittal and progress payment application.

1. At this meeting, at a minimum, the following items will be reviewed: Percent (%) complete of each activity; Time Impact Evaluations for Change Orders and Time Extension Request; actual and anticipated activity sequence changes; actual and anticipated duration changes; and actual and anticipated Contractor delays.

2. These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, these meetings shall be attended by Contractor's General Superintendent and Scheduler.

3. Contractor shall plan on the meeting taking no less than four (4) hours.

C. Within five (5) working days after monthly schedule update meeting, Contractor shall submit the Progress Schedule.

D. Within five (5) work days of receipt of above noted revised submittals, County will either accept or reject Progress Schedule.

E. Neither updating, changing or revising of any report, curve, schedule, or narrative submitted to County by Contractor under this Contract, nor County's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying in any way the Completion Date or milestone dates or of modifying or limiting in any way Contractor's obligations

1.9 PROGRESS SCHEDULE REVIEW AND REVISIONS

A. County, within seven (7) days from date that Contractor submitted the schedule update, will either:

1. Accept schedule as submitted, or

2. Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for County to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.

B. Updating the Project Schedule to reflect actual progress shall not be considered revisions to the Schedule.

C. To reflect revisions to the Schedule, the Contractor shall provide County with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram which compares the original sequence to the revised sequence of work. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.

D. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by County. County may request further information and justification for schedule revisions and Contractor shall, within three (3) working days, provide County with a complete written narrative response to County's request.

E. If the Contractor's revision is still not accepted by County, and the Contractor disagrees with County's position, the Contractor has seven (7) calendar days from receipt of County's letter rejecting the revision to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of County's written rejection of a schedule revision shall be contractually interpreted as acceptance of County's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding County's position.

F. At County's discretion, the Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

1.10 RECOVERY SCHEDULE

A. A Recovery Schedule will be submitted when a delay of fourteen (14) calendar days or more to the Final Completion milestone is identified.

B. The Recovery Schedule is herein defined as the Contractor plan to reconcile current delay days to complete the project on the contract completion date.

1.11 COMPLETION SCHEDULE

A. If schedule performance, estimated through earned value analysis, is forecasting a trending delay of greater than 21 days over 3 or more months, the Contractor and PMCM will meet to discuss remediation through a Completion Schedule.

B. The Completion Schedule is herein defined as the Contractor plan to establish a project completion date when the current Final Completion date is deemed no longer achievable. When this happens, the Contractor will submit a schedule to complete that demonstrates a new probable project completion (for example, using cash flow analysis).

1.12 PROJECT DELAYS

A. Time Allowances

0. Time is of the essence. Contract Time may only be changed by Change Order, and all time limits stated in the Contract Documents are to mean that time is of the essence.

B. Excusable Delay and Inexcusable Delay Defined

0. In the event the Contractor requests an extension of Contract Time for unavoidable delay, such request shall be submitted in accordance with the provisions in the Contract Documents governing Claims and Disputes (Division F, Section 33 and 34). When requesting time, requests must be submitted with full justification and documentation.

If the Contractor fails to submit justification, it waives its right to a time extension at a later date. Such justification must be based on the official Construction Schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the Scope of Work. Any Claim for delay must include the following information as support, without limitation.

1. Excusable Delay. Subject to the provisions on Notice of Delay below, Contract Time may be adjusted in an amount equal to the time lost due to:

   (a) Changes in the Work ordered by County ("Changes");

   (b) Acts or neglect by County, Architect/Engineer, any County Representative, utility owners or other contractors performing other work, not permitted or provided for in the Contract Documents, provided that Contractor has performed its responsibilities under the Contract Documents (including but not limited to pre-bid investigations) ("Acts or Neglect"); or

   (c) Fires, floods, abnormal weather conditions beyond the parameters otherwise set forth in this Article, earthquakes, civil or labor disturbances, **acts of war or terrorism**, or acts of God (together, "force majeure events"), provided damages resulting therefrom are not the result of Contractor's failure to protect the Work as required by Contract Documents ("Force Majeure").

   (d) Work delayed which is out of the control of the Contractor may be an Excusable Delay.

2. Inexcusable Delay. Contract Time shall not be extended for any period of time where Contractor (and/or any Subcontractor) is delayed or prevented from completing any part of the Work due to a cause that is within Contractor's risk or responsibility under the Contract Documents. Delays attributable to or within the control of a Subcontractor, or its subcontractors, or supplier, are deemed delays within the control of Contractor.

   (a) Work delayed which is in the control of the Contractor is an Inexcusable Delay.

   (b) Epidemic, pandemic &quarantines: this project is consider an "essential work" project by San Mateo County.

3. Float. Float shall be treated as a Project resource. Contractor shall not be entitled to a time extension for impacts that consume float, but do not impact the critical path.

C. Notice of Delay

0. Within seven (7) calendar days of the beginning of any delay (excepting adverse weather delays), Contractor shall notify County in writing, by submitting a Notice of Delay that shall describe the anticipated delays resulting from the delay event in question. If Contractor requests an extension of time, Contractor shall submit a Time Impact Evaluation (TIE) within 10 calendar days of the Notice of Delay. County will determine all claims and adjustments in the Contract Time. No claim for an adjustment in the Contract Time will be valid and such claim will be waived if not submitted in accordance with the requirements of this subparagraph. In cases of substantial compliance with the seven- day notice requirement here (but not to exceed twenty-one calendar days from the beginning of the delay event), County may in its sole discretion recognize a claim for delay accompanied with the proper TIE, provided Contractor also shows good faith and a manifest lack of prejudice to County from the late notice. Contractor will follow the guidelines set forth in section 1.13 and include description of activities impacted by the delay, including the activity ID.

D. Compensable Time Extensions

1. Subject to other applicable provisions of the Contract Documents, Contractor may be entitled to adjustment in Contract Sum in addition to Contract Time only when all of the following conditions are met:

   (a) The Owner is the sole cause of the delay to the current critical path;

   (b) The delay is unreasonable under the circumstances involved;

   (c) The delay was not within the contemplation of Owner and Contractor; and

   (d) Contractor complies with the claims procedure of the Contract Documents.

   (e) Excusable delay caused solely by Changes in the Work ordered by County, as provided above, and/or

   (f) Excusable delay caused solely by Acts or Neglect by County or other person, as provided above.

E. Non-Compensable Time Extensions

1. Subject to other applicable provisions of the Contract Documents, Contractor may be entitled to adjustment in Contract Time only, without adjustment in Contract Sum, for

(a) Periods of excusable delay caused solely by weather (beyond the adverse weather day allowance shown herein) or Force Majeure events as provided above in this Article, or

(b) Periods of concurrent delay, where delay results from two or more causes, one of which is compensable (resulting from Changes or Acts or Neglect as set forth above in this Article), and the other of which is non-compensable or inexcusable, such as: acts or neglect of Contractor, Subcontractors or others for whom Contractor is responsible; other acts, omissions and conditions which would not entitle Contractor to adjustment in Contract Time; adverse weather; and/or actions of Force Majeure as provided above in this Article.

F. Adverse Weather

0. The Contract Adverse Weather Time has been determined with consideration given to the average climate weather conditions prevailing in the County in which the Project is located. (1.06B.24)

1. Contractor shall provide proof that adverse weather actually caused delays to work on the critical path. The proof shall contain the activity ID and name of impacted critical activity. Contractor shall give written notice of intent to claim an adverse weather day within one day of the adverse weather day occurring (1.06B.24).

2. In order to qualify as an adverse weather delay with respect to the foregoing parameters: daily rainfall must exceed 0.1 inch at the NOAA station located closest to the Project site, as measured and reported by NOAA. Notwithstanding these allowances, Contractor shall at all times employ all available mitigation measures to enable Work to continue, Contractor shall take reasonable steps to mitigate potential weather delays, such as dewatering the Site, lime treatment, and covering Work and material that could be affected adversely by weather. Failure to do so shall be cause for County to not grant a time extension due to adverse weather, where Contractor could have avoided or mitigated the potential delay by exercising reasonable care.

3. Contractor shall include the foregoing precipitation parameters as a monthly activity in its progress schedule. As Work on the critical path is affected by precipitation, Contractor shall notify County and request that the days be moved to the affected activities. Any adverse weather days remaining shall be considered Project float available to either County or Contractor.

4. Adverse weather delay for precipitation shall be recognized for the actual period of time Contractor proves it was delayed by precipitation

exceeding the specified parameters. For example, and not by way of limitation, if precipitation exceeding the specified parameters does not in fact delay Contractor's progress on the critical path, then no time extension shall be recognized; and conversely, if Contractor proves to County's satisfaction that precipitation exceeding the specified parameters causes delay to Contractor for a period longer than the number of precipitation days incurred (e.g., if it rains or snows during grading work), then Contractor shall be entitled to a time extension equal to the actual period of such delay. Note: Time extension is mitigated in the weather day allowance activity (see section 1.06B24),

5. During unfavorable weather, wet ground, or other unsuitable construction conditions, Contractor shall employ best practices to protect the Work, manage the construction site and rainwater during inclement weather. Persons performing the Work shall examine surfaces to receive their Work and shall report in writing to Contractor, with copy to County representative and the Architect conditions detrimental to the Work. Failure to examine and report discrepancies makes the Contractor responsible, at no increase in Contract Sum, for correction, County may require. Commencement of Work constitutes acceptance of surface.

G. Liquidated Damages

1. Time is of the essence. Execution of Contract Documents by Contractor shall constitute its acknowledgement that County will actually sustain damages in the form of Contract administration expenses (such as Project management and consultant expenses) in the amount fixed in the Contract Documents for each and every Day during which completion of Work required is delayed beyond expiration of time fixed for completion plus extensions of time allowed pursuant to provisions hereof.

2. Contractor and County agree that because of the nature of the Project, it would be impractical or extremely difficult to fix the amount of such actual damages incurred by County because of a delay in completion of all or any part of the Work. Contractor and County agree that specified measures of liquidated damages shall be presumed to be the amount of such damages actually sustained by County, and that because of the nature of the Project, it would be impracticable or extremely difficult to fix the actual damages.

3. Liquidated damages for delay shall cover administrative, overhead, interest on bonds, and general loss of public use damages suffered by County as a result of delay. Liquidated damages shall not cover the cost of completion of the Work, damages resulting from Defective Work, lost revenues or costs of substitute facilities, or damages

suffered by others who then seek to recover their damages from County (for example, delay claims of other contractors, subcontractors, tenants, or other third-parties), and defense costs thereof. County may deduct from any money due or to become due to Contractor subsequent to time for completion of entire Work and extensions of time allowed pursuant to provisions hereof, a sum representing then-accrued liquidated damages.

3. Contractor shall not be charged for liquidated damages because of any delays in completion of Work on the critical path which are not the fault or negligence of Contractor or its Subcontractors, including acts of God as defined in Public Contract Code Section 7105, acts of enemy, epidemics, and quarantine restrictions. Contractor shall, within ten (10) days of beginning of any delay, notify Owner in writing of causes of delay including documentation and facts explaining the delay. Owner shall review the facts and extent of any delay and shall grant extension(s) of time for completing Work when, in its judgment, the findings of fact justify an extension. Extension(s) of time shall apply only to that portion of Work affected by delay and shall not apply to other portions of Work not so affected. An extension of time may only be granted if Contractor has timely submitted the notice and supporting documentation required by all relating Contract Documents as required herein.

1.13 TIME IMPACT EVALUATION ("TIE") FOR CHANGE ORDERS, AND OTHER DELAYS

A. Owner Directed Added Work

1. When Contractor is directed to proceed with changed Work, the Contractor shall prepare and submit within seven (7) calendar days from the Notice to Proceed a TIE which includes both a written narrative and a delay fragnet integrated into the contemporaneous schedule depicting how the changed Work affects other schedule activities. The schedule diagram shall show how the Contractor proposes to incorporate the changed Work in the schedule and how it impacts the current schedule-update critical path. The Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable County to evaluate the impact of changed Work to the scheduled critical path.

2. Contractor shall be responsible for all costs associated with the preparation of TIEs, and the process of incorporating them into the current schedule update.

3. Once agreement has been reached on a TIE, the Contract Time will be adjusted accordingly (via Change Order Request and Change Order). If agreement is not reached on a TIE, the Contract Time may be extended in an amount County allows, and the Contractor may submit a claim for additional time claimed by contractor.

B. Contract Added Work Claim

1. If the schedule final completion date is extended due to added work scope, the Contractor is required to provide a time and cost impact within fourteen (14) calendar days and prior to proceeding with added work, unless approved by Owner.

2. If the Contractor believes critical work has been delayed due to circumstances beyond their control, a TIE shall be submitted as described above.

3. The TIE will be reviewed with fourteen (14) calendar days and assessed as excusable / compensable, excusable / non-compensable, or non-excusable / non-compensable.

4. Delay Fragnet

(a) The duration of the activity relating to the changes in the Work and the resources (manpower, equipment, material, etc.) required to perform the activities within the stated duration.

(b) Specific logical ties to the Contract Schedule for the proposed changes and/or delay showing the activity/activities in the Construction Schedule that are affected by the change and/or delay. (A portion of any delay of seven (7) days or more must be provided.)

(c) A revised Construction Schedule must be submitted showing the delay and impact on the Final Completion date.

1.14 TIME EXTENSIONS

A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current Progress Schedule update. Notice of time impacts shall be given in accord with the General Conditions.

B. Where an event for which County is responsible impacts the projected Final Completion date, the Contractor shall provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment, and material the Contractor

would expend to mitigate County-caused time impact. The Contractor shall submit its mitigation plan to County within fourteen (14) calendar days from the date of discovery of the impact. The Contractor is responsible for the cost to prepare the mitigation plan.

C. Failure to request time, provide A, or provide the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.

D. No time will be granted under this Contract for cumulative effect of changes.

E. County will not be obligated to consider any time extension request unless the Contractor complies with the requirements of Contract Documents.

F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.

G. If the Contractor does not submit a TIE within the required seven (7) calendar days for any issue, it is mutually agreed that the Contractor does not require a time extension for said issue.

H. To avoid possible delay risks, the Contractor is aware that governmental agencies, including, without limitation, the County, gas companies, electrical utility companies, water districts, and other agencies may have to approve Contractor-prepared drawings or approve a proposed installation. Accordingly, Contractor shall include in its schedule and bid, time for possible review of its drawings and for reasonable delays and damages that may be caused by such agencies. Thus, Contractor is not entitled to make a claim for damages or delays arising from the required review of Contractor's drawings by third parties.

1.15 SCHEDULE REPORTS

A. Submit the following reports with the Baseline Schedule and each monthly update.

B. Required Reports:

1. Two activity listing reports: one sorted by activity number and one by total Project Float. These reports shall also include each activity's early/late and actual start and finish dates, original and remaining duration, Project Float, responsibility code, and the logic relationship of activities.

2. Report showing the longest critical path.

3. Work Plan Cash Flow Report including the following: percentage of Work accomplished, earned value- to date, previous payments, and amount earned for current update period.

4. Schedule plots presenting time-scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.

5. Upon request, the Contractor may be required to submit a Planned versus Actual labor histogram calculated by early start.

6. 3-week look-ahead schedule. The 3-week look ahead shall be derived from the update schedule with referenced correlating activities.

7. Actual dates achieved on activities for the past period. This report should be submitted to the County prior to the overall update submittal for field verification.

8. Schedule update narrative describing items such as current critical path, issues, schedule revisions, and other.

9. All reports noted above shall be clearly dated (including data date) and titled.

C. Other Reports:

In addition to above reports, County may request, from month to month, any of the following reports.

1. Activities by early start.

2. Activities by late start.

3. Activities grouped by Subcontractors or selected trades.

D. Furnish County with report files on media as described previously in this document.

1.16 PROGRESS SCHEDULE NARRATIVE

A. In addition to report submittal requirements for Project Schedule identified in the previous Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each schedule as specified herein. Status reporting shall be in form specified below.

B. Contractor shall prepare monthly written narrative reports of status of Project for submission to County. Written status reports shall include:

1. Status of major Project components (percent (%) complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.

2. Progress made on critical activities indicated on Project Schedule.

3. Explanations for any lack of work on critical path activities planned to be performed during last month.

4. Explanations for any schedule changes, including changes to logic or to activity durations.

5. List of critical activities scheduled to be performed next month.

6. Status of major material and equipment procurement.

7. Any delays encountered during reporting period.

8. Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by County at no additional cost.

9. Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.

1.17 LOOKAHEAD SCHEDULE REPORT

By the end of the business day on the day prior to the Weekly Progress Meeting, the Contractor shall provide a time-scaled three (3) week Look-ahead Schedule that is based on, and correlated by activity number to, the current accepted schedule (i.e., Initial, Baseline or Progress Schedule). Look-ahead Schedule shall reflect ALL schedule activities that were planned to take place during this period based on the current schedule. Schedule shall include at least the following: area/building, activity ID, activity description, responsible contractor/subcontractor, as well as planned start date, duration and completion date. Activities noted to be on the critical path per the current schedule shall be highlighted accordingly. Contractor may include multiple activities that relate to a single activity ID if this provides clarity to sequencing, etc.

1.18 DAILY CONSTRUCTION REPORTS

On a daily basis (prior to the end-of-business on the day of the work being reported), Contractor shall submit via the Project Management Software a Daily Construction Report to County for each workday, including weekends and holidays. Contractor shall develop the Daily Construction Reports on a computer-generated database capable of sorting daily Work, manpower, and man-hours by Contractor, Subcontractor, area, sub-area, and Change Order Work. Obtain County's written

approval of Daily Construction Report data base format prior to implementation. Include in report:

A. Project name and Project number.

B. Contractor's name and address.

C. Weather, temperature, and any unusual site conditions. Contractor shall note on this report any Notices issued that day relating to these conditions.

D. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work of Subcontractors. Descriptions shall be referenced to scheduled activities and include all related schedule activity IDs (as well as CORs, CDs, etc).

E. Worker quantities for its own Work force and for Subcontractors of any tier.

F. Equipment, other than hand tools, utilized by Contractor and Subcontractors.

G. Material deliveries.

H. High and low temperatures and general weather conditions.

I. Accidents.

J. Meetings and significant decisions.

K. Unusual events (refer to special reports).

L. Stoppages, delays, shortages, and losses.

M. Meter readings and similar recordings.

N. Emergency procedures.

O. Orders and requests of authorities having jurisdiction.

P. Change Orders received and implemented.

Q. Construction Change Directives received and implemented.

R. Services connected and disconnected.

S. Equipment or system tests and startups.

T. Partial Completions and occupancies.

U. Updates to any and all Activity IDs projected to have activity based on the current accepted Project Schedule.

PART 2 -PRODUCTS – Not used

PART 3 -EXECUTION - Not used

- END OF SECTION –

01 32 19 - SUBMITTAL SCHEDULES / DAILY REPORTS / FIELD REPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Submittals Schedule.
   2. Daily construction reports.
   3. Field condition reports.

B. See Section 01 29 00 "Payment Procedures" for submitting the Schedule of Values.

C. See Section 01 32 33 "Photographic Documentation" for submitting construction photographs.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

C. Major Area: A story of construction, a separate building, or a similar significant construction element.

1.3 SUBMITTALS

A. Submittals Schedule: Submit via the web-based project management software. Arrange the following information in a tabular format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for Architect's final release or approval.

B. Daily Construction Reports: Submit PDF file via the web-based project management software prior to close-of-business on the day covered by the report.

C. Field Condition Reports: Submit PDF file via the web-based project management software at time of discovery of differing conditions.

1.4 COORDINATION

A. Coordinate preparation and processing of reports with performance of construction activities and with scheduling and reporting of separate contractors.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
   1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
   2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site and quantities relating to labor force.
   2. Equipment at Project site.
   3. Material deliveries.
   4. High and low temperatures and general weather conditions.
   5. Accidents.
   6. Stoppages, delays, shortages, and losses.
   7. Meter readings and similar recordings.
   8. Orders and requests of authorities having jurisdiction.
   9. Services connected and disconnected.
   10. Equipment or system tests and startups.
   11. Progress on any schedule activity, including all related activity IDs.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation [**on CSI Form 13.2A**]. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION – (Not Used)

- END OF SECTION-

01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1. 1 SUMMARY

A. This Section describes the requirements for furnishing photographs depicting work progress.

1. 2 DESCRIPTION

A. Furnish photographs of the site construction throughout the progress of the Work.

B. Furnish photographs of existing conditions along project site boundaries and street improvements on Chestnut Street.

C. Take photographs on cutoff date for each Application for Payment.

D. In addition, take photographs at beginning and completion of the following elements:

1. Site clearing.
2. Excavation
3. Utility Trenching & Placement
4. Foundations
5. Structural Framing
6. Steel Erections
7. Enclosure of Building
    a. Interior
    b. Exterior
8. Landscaping
9. Substantial Completion
10. Final Completion
11. As requested by Owner.

1. 3 PRINTS

A. NOT USED

1. 4 Electronic Files

A. Upload photos to web-based project management software, indexed in folders by date and in chronological order.

B. All photos to be in a JPEG format.

C. Make photos available to Construction Manager at any time in electronic format.

D. Provide a progress photo from 2 agreed upon vantages with each payment application.

1. 5 TECHNIQUE

A. Factual presentation, with correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

1. 6 VIEWS

A. Take ten (10) photographs at each specified time, until Date of Substantial Completion. Consult with Construction Manager at each time for instructions on views required.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

-END OF SECTION-

01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections:
1. Section 01 32 16 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
2. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
3. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

C. See Section 01 77 00 "Closeout Procedures" for submitting warranties.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal. Contractor is to notify the Architect and Construction Manager when new materials for review have been posted to the designated web-based project management software. Time will begin upon successful download of that information. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.
    1. Initial Review: Allow fourteen (14) calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
    2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
    3. Resubmittal Review: Allow fourteen (14) calendar days for review of each re- submittal.

C. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
    1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
        a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
        b. Contractor shall execute a data licensing agreement in the form of AIA Document
        C106, Digital Data Licensing Agreement as well as any further waivers required by the Architect.

D. Submittals are to be submitted electronically via the web-based project management software.
    1. The following submittals are to be submitted electronically:
        a. Product Data
        b. Shop Drawings
        c. Certifications
        d. Test Data
        e. Schedules
    2. Samples shall not be submitted electronically but a transmittal should be to document delivery of such samples.

E. Identification and Information: Place a permanent label or title block on each cover of submittal item for identification.
   1. Indicate name of firm or entity that prepared each submittal on label or title block.
   2. Provide a space approximately 6x8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect and Construction Manager.
   3. Include the following information for processing and recording action taken:
      a. Project name.
      b. Date.
      c. Name of Architect.
      d. Name of Construction Manager.
      e. Name of Contractor.
      f. Name of subcontractor.
      g. Name of supplier.
      h. Name of manufacturer.
      i. Submittal number or other unique identifier, including revision identifier.
         1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Re- submittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
      j. Number and title of appropriate Specification Section.
      k. Drawing number and detail references, as appropriate.
      l. Location(s) where product is to be installed, as appropriate.
      m. Other necessary identification.

F. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
   2. Name file with submittal number or other unique identifier, including revision identifier.
      a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01- LNHS). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A-LNHS).
   3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect and Construction Manager.
   4. Include the following information on an inserted cover sheet:
      a. Project name.
      b. Date.
      c. Name and address of Architect.
      d. Name of Construction Manager.
      e. Name of Contractor.
      f. Name of firm or entity that prepared submittal.
      g. Name of subcontractor.
      h. Name of supplier.
      i. Name of manufacturer.

j. Number and title of appropriate Specification Section.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Other necessary identification.

G. Options: Identify options requiring selection by the Architect.

H. Deviations: Highlight, encircle, and otherwise specifically identify deviations from the Contract Documents on submittals.

I. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect or Construction Manager observes noncompliance with provisions in the Contract Documents, initial electronic submittal may serve as final submittal.

J. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect and Construction Manager will return submittals, without review, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

K. Re-submittals: Make re-submittals in same form as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp.

L. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

M. Use for Construction: Retain complete set of paper copies of submittals on Project site. Use only final submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. At Contractor's written request, copies of Architect's CAD files of select plans will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions.
1. Only major site/floor/ceiling/roof plans, or building elevations/sections will be

provided.

2. Wall section, details, schedules will not be provided.
3. Title blocks will be removed from the file.
4. Notes and dimensions may be removed from the file.
5. Compliance of the requests for consultant files is at the discretion of the consultant.
6. The following disclaimer will be added to the file:

DISCLAIMER AND INDEMNIFICATION AGREEMENT FOR COMPUTER-BASED INFORMATION

The attached computer-based information for the **Construction of Radio Shop** are provided to **(The User**) as a courtesy for their sole convenience. The User recognizes that computer-based information is easily changeable, that changes are difficult to detect and that use or conversion of the information provided may introduce errors, inaccuracies or anomalies that the Architect and their consultants can neither predict nor control. The delivery of this electronic data does not constitute the delivery of the professional work product of the Architect shall not be responsible for any modifications made to the electronic files or any products derived from the electronic files which are not prepared by us. By accepting and utilizing this electronic data in lieu of the corresponding drawings and specifications prepared by the Architect, the User agrees that such data is an instrument of service of the Architect, who shall be deemed to be the author of the drawings and data, and shall retain all common law, statutory law and other rights, including copyrights. The User, by accepting the electronic files, agrees to assume all risk and liabilities associated with the use of the information provided by the Architect and understand the Architect makes no claim or warranty as to the suitability or usefulness of the information for any purpose. The User also agrees, to the fullest extent permitted by law, to hold harmless and indemnify the Architect from and against any and all claims, liabilities, losses, damages and costs, including but not limited to attorney's fees, arising from or in connection with the use, misuse, modification, or misinterpretation of the electronic data provided by the Architect. Use of the attached computer-based information indicates acceptance and constitutes agreement to abide by the terms and conditions of this agreement.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Post electronic submittals as PDF electronic files directly to the web-based project management software (Primavera Submittal Exchange). Notify the Architect and Construction Manager of the presence of the submittal(s) via email with identification of the specific materials posted. In web-based project management software, include link for all submittal register items associated with the submittal package. Where possible, endeavor to include all required action submittals for that specification section.
    a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Submit electronic submittals via email as PDF files.
   a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
3. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
5. Test and Inspection Reports Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
   a. PDF electronic file with transmittal as noted above.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Submittals based upon Architect's digital data drawing files will be permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Provide hard copies as required by the Architect and Construction Manager
3. Submit Shop Drawings in the following format:
   a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package. Provide transmittal listing all samples submitted along with quantities.
   2. Identification: Attach label on unexposed side of Samples that includes the following:
      a. Generic description of Sample.
      b. Product name and name of manufacturer.
      c. Sample source.
      d. Number and title of applicable Specification Section.
   3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
      a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
      b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
   4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
      a. Number of Samples: Submit one (1) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal, through Construction Manager, with options selected.
   5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for

use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three (3) sets of Samples. Architect will retain two (2) Sample sets; remainder will be returned. Mark up and retain one returned sample set as a project record sample.

1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three
(3) sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Submit product schedule in the following format:
   a. PDF electronic file.

F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 16 "Construction Progress Document."

G. Application for Payment: Comply with requirements specified in Section 01 29 00 “Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Wherever possible, including CSI numbers with description of work being completed. Also, provide DIR numbers for all subcontractors and vendors listed. Provide an updated list when any changes take place along with and explanation of what changed and why.

1. Submit subcontract list in the following format:
   a. PDF electronic file.

J. Coordination Drawings: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on

American Welding Society (AWS) forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

T. Schedule of Tests and Inspections: Comply with requirements specified in Section 01 40 00 “Quality Requirements."

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES (Including DEFERRED APPROVALS)

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally-signed PDF electronic file and three (3) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 01 77 00 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S AND CONSTRUCTION MANAGER'S ACTION

A. General: Construction Manager will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. Final Unrestricted Release: Where the submittal is marked "No Exceptions Taken," the Work covered by the submittal may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.
2. Final-but-Restricted Release: Where the submittal is marked "Reviewed with Exceptions as Noted," the Work covered by the submittal may proceed provided it complies with both Architect's notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.
3. Returned for Resubmittal: Where the submittal is marked "Revise and Resubmit," do not proceed with the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity for the product submitted. Revise or prepare a new submittal according to Architect's notations and corrections.
4. Rejected: Where the submittal is marked "Rejected," do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the Contract Documents.
5. Incomplete: Where the submittal is marked "Submit Specified Item," do not proceed with the Work covered by the submittal. Prepare additional information requested, or required by the Contract Documents, that indicates compliance with requirements.

C. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Construction Manager will forward each submittal to appropriate party.

D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

-END OF SECTION-

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01 33 23 - SHOP DRAWINGS PRODUCT DATA AND SAMPLES

PART1 GENERAL

1.01 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.02 DEFINITIONS

A. For the purposes of this contract, samples (including laboratory samples to be tested), test reports, certificates, and manufacturers' literature and data shall also be subject to the referenced requirements. The following text refers to all items collectively as SUBMITTALS.

1.03 SUBMITTAL PROCEEDURES

A. Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:

1. Satisfactory written evidence is presented to, and approved by Owner’s Representative, that manufacturer cannot make scheduled delivery of approved item or;

2. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;

3. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Owner.

B. Forward submittals in sufficient time to permit proper consideration and approval action by Owner. Time submission to assure adequate lead time for procurement of contract required items. Delays attributable to untimely and rejected submittals (including any laboratory samples to be tested) will not serve as a basis for extending contract time for completion.

C. Submittals will be reviewed for compliance with contract requirements by Architect, and action thereon will be taken by Owner’s Representative on behalf of the Owner.

D. Upon receipt of submittals, Architect will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.

E. The Owner reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant to request therefore by Owner’s Representative, adjustment in contract price and time will be made.

F. Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of the Owner and Architect. However, the Contractor shall assume

responsibility for coordinating and verifying schedules. The Owner's Representative and Architect assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.

G. Submittals must be submitted by Contractor only and shipped prepaid. Owner's Representative assumes no responsibility for checking quantities or exact numbers included in such submittals.

1. Submit samples required by Section 09 06 00, SCHEDULE FOR FINISHES, in quadruplicate. Submit other samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.

2. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of the Owner's building(s), name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, and such additional information as may be required by specifications for the particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.

a. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.

b. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Owner's building(s), name of Contractor, manufacturer, brand, and contract number as applicable and location(s) where the project takes place.

c. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.

H. In addition to complying with the applicable requirements specified in preceding Paragraph G, samples which are required to have Laboratory Tests (those preceded by symbol "LT" under the separate sections of the specification shall be tested, at the expense of Contractor, in a commercial laboratory approved by Owner's Representative.

1. Laboratory shall furnish Owner's Representative with a certificate stating that it is fully equipped and qualified to perform intended work, is fully acquainted with specification requirements and intended use of materials and is an independent establishment in no way connected with organization of Contractor or with manufacturer or supplier of materials to be tested.

2. Certificates shall also set forth a list of comparable projects upon which laboratory has performed similar functions during past five years.

3. Samples and laboratory tests shall be sent directly to approved commercial testing laboratory.

4. Contractor shall send a copy of transmittal letter to both Owner's Representative and to Architect simultaneously with submission of material to a commercial testing laboratory.

5. Laboratory test reports shall be sent directly to Owner’s Representative for appropriate action.

6. Laboratory reports shall list contract specification test requirements and a comparative list of the laboratory test results. When tests show that the material meets specification requirements, the laboratory shall so certify on test report.

7. Laboratory test reports shall also include a recommendation for approval or disapproval of tested item.

I. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.

J. Approved samples will be kept on file by the Owner’s Representative at the site until completion of contract, at which time such samples will be delivered to Contractor as Contractor's property. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of contract.

K. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.

1. For each drawing required, submit one legible print ready PDF. Drawings submitted electronically.

2. Reproducible shall be full size.

3. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.

4. A space 4-3/4 inches by 5 inches shall be reserved on each drawing to accommodate approval or disapproval stamp.

5. Submit drawings, fully formatted for printing.

6. One file of approved or disapproved shop drawings will be forwarded to Contractor.

7. When work is directly related and involves more than one trade, shop drawings shall be submitted under one cover.

L. Samples (except laboratory samples), shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to:

The KPA Group
6700 Koll Center Parkway, Suite 125
Pleasanton, California 94566

M. At the time of transmittal to the Architect, the Contractor shall also send a copy of the complete submittal directly to the Owner's Representative.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

01 35 33.21 - NOVEL CORONAVIRUS (COVID-19) SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: COVID-19 safety requirements in response to the need for work on essential construction projects that are permissible under the San Mateo County Public Health Department COVID-19 Health Officer Orders and applicable State and Federal guidelines/orders, to continue as safely as possible.

B. These COVID-19 safety requirements are not all encompassing and may need to be modified by the Contractor to individual construction tasks and updated as the COVID-19 pandemic evolves.

C. The Contractor and all its sub-tier level subcontractors and suppliers shall account in their Bid and sub-bids for all cost impacts whether affecting labor (including, but not limited to obtaining qualified workers, quantity of workers, as well as their productivity), deliveries, supervision, testing and/or procurement of materials and/or equipment and time caused by COVID-19 safety requirements found in this Section 01 11 70 and also all public health and/or governmental directives in place at the time Bids are received by the County for this Project.

D. Related Sections:

1. Section 01 33 00 – Submittal Procedures

1.2 COVID-19 EXPOSURE PREVENTION, PREPAREDNESS, AND RESPONSE PLAN

A. Contractor's Responsibility

1. The Contractor shall prepare a COVID-19 Exposure Prevention, Preparedness and Response Plan specific to this Project that describes how to prevent worker exposure to coronavirus, protective measures to be taken on the jobsite, personal protective equipment and work practice controls to be used, cleaning and disinfecting procedures, and what to do if a worker(s) shows symptoms of COVID-19 illness or tests positive for COVID-19. The Contractor should review the latest OSHA COVID-19 Workplace Safety Guidance document (https://www.osha.gov/Publications/OSHA3990.pdf) as a resource in preparation of their Site Specific Health and Safety Plan. Other reliable and current sources of COVID-19 information can be found at:

California Department of Public Health (CDPH, State)
https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Immunization/nCOV20 1 9.aspx

Centers for Disease Control and Prevention (CDC, National) http://www.cdc.gov/coronavirus/novel-coronavirus- 2019.html

2. This plan shall at a minimum address the following COVID-19 safety guidelines:

   a. COVID-19 Employee and Visitor training and check-list before entering worksite.
   b. Employee distancing and strategies to maximize distancing when possible.
   c. Limitations on gathering size.
   d. Personal Protective Equipment (PPE) requirements.
   e. Identify “choke points” and “high risk areas” such as hallways, hoists and elevators, break areas and vehicles.
   f. Stagger trades and modify work schedules to reduce worker density to maximize distancing opportunities.
   g. COVID-19 employee good personal hygiene measures.
   h. Disinfecting and cleaning requirements.
   i. Personal prevention actions requirements for all employees.
   j. Toolbox and Tailgate COVID-19 employee training.
   k. Recognizing COVID-19 Symptoms.
   l. Establish a COVID-19 Exposure Action and Notification Plan.
   m. Establish daily screening protocols for arriving workers and visitors to ensure potentially infected workers and visitors do not enter the Site.
   n. Maintain daily attendance log of all workers and visitors who enter the Site.

3. Also, as part of this Plan, the Contractor shall draft and implement a COVID-19 Code of Safe Practices that is posted in areas visible to all employees and visitors.

4. The Contractor shall be prepared at each Progress and Coordination Meeting, if requested by the Construction Manager, to provide information relevant to the application, enforcement and implementation of such COVID-19 Safe Practices.

5. All Contractor managers and supervisors **(from forepersons to project managers)** must be familiar with this Plan and be ready to answer questions from employees, subcontractors, suppliers and visitors. Managers and supervisors must set a good example by following this Plan at all times. This involves practicing good personal hygiene and jobsite safety practices to prevent the spread of the virus. Managers and supervisors must encourage this same behavior from all employees, subcontractors, suppliers and visitors.

6. The Contractor shall immediately notify the Construction Manager if anyperson under the Contractor's control on this Project has tested positive for COVID-19.

1.3 SUBMITTALS

A. The following information shall be provided in accordance with Section 01 33 00, Submittal Procedures, after the Award of Contract and before any work begins at the Site:

1. COVID-19 Exposure Prevention, Preparedness and Response Plan.
2. COVID-19 Code of Safe Practices.

B. To the extent that there are material amendments or modifications made to any of the above plans or practices during the performance of the Work, the Contractor shall provide to the Owner as soon as practicable the amendments and shall post them as part of the notification plan to all employees and visitors who enter the Site.

PART 2 – PRODUCTS (NOT

USED) PART 2 – EXECUTION

(NOT USED)

-END OF SECTION-

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01 35 44 – STORM WATER POLLUTION PREVENTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this section consists of implementing measures to prevent Storm Water Pollution during construction activities, in accordance with Federal, State, and local regulations, and in accordance with the Storm Water Pollution Prevention Plan (SWPPP) to be prepared for this project.

1.2 SUBMITTALS

A. Plans showing proposed arrangements and methods for control of erosion, sedimentation, and pollutant conveyance in storm water resulting from construction activities (Sheet G007 and G008). The contractor shall provide final arrangement, methods of control and conveyance in the Storm Water Pollution Prevention Plan that satisfies all State NPDES permit requirements.

B. Provide sufficient information for evaluation of the following:
1. Erosion protection measures and products
2. Drainage management strategies
3. Surface restoration

C. Submit schedules for inspection and monitoring of all SWPPP measures.

D. Submit manufacturer's product information and installation recommendations for silt fence, filter fabric and erosion control blanket, straw bales, and any other materials proposed for use on this project.

E. Contractor shall register on the State Water Resources Control Board (SWRCB) on- line Storm Water Multiple Application and Report Tracking System (SMARTS) database and submit the User Identification (ID) to the Owner. Owner will file a Notice of Intent (NOI) and link the Contractor User ID as a Data Entry Person for required entries (i.e., SWPPP, Annual Reports, Ad Hoc Reports) in accordance with the determined Risk Level monitoring and sampling requirements.

1.3 QUALITY ASSURANCE

A. Before commencing construction activities, such as grading, excavation or filling in any part of the site, Contractor shall plan for temporary structures to guide runoff away from the work area and to capture eroded material before it reaches natural water courses. The measures shall be in accordance with reviewed and approved SWPPP.

B. Arrange construction activities to minimize erosion to the maximum practical extent. Clearing, excavation, and grading shall be limited to those areas of the project site necessary for construction. Minimize the area exposed and unprotected.

C. Clearly mark and delineate the limits of work activities. Do not allow equipment to operate outside the limits of work or to disturb existing vegetation. Complete excavation and grading during the dry season to the maximum extent possible.

1.4 REGULATORY REQUIREMENTS

A. The Contractor shall comply with provisions of Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water and non- storm water discharges from the project site and areas outside the project limits during construction.

B. The project site is more than one acre and therefore requires compliance with the State Water Resources Control Board statewide general permit entitled "Order No. 2009-0009–DWQ (as amended by Order No. 2010-0014-DWQ), National Pollutant Discharge Elimination System General Permit No. CAS000002, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities" (Construction General Permit) that regulates discharges of storm water and non-storm water from construction activities disturbing one acre or more of land surface, or that are part of a common plan of development. The Construction General Permit is available for review at:

http://www.waterboards.ca.gov/water_issues/programs/stormwater/

This project shall conform to applicable provisions of this Permit and modifications thereto.

C. This project lies within the boundaries of the San Francisco Bay Region (2) Regional Water Quality Control Board (SFRWQCB). The SFRWQCB has issued Waste Discharge Requirements and National Pollutant Discharge Elimination System (NPDES) Permit for the discharge of stormwater runoff from the municipal separate storm sewer systems (MS4s) including construction sites (San Francisco Bay Region Municipal Regional Stormwater NPDES Permit Order No. R2-2015-0049 NPDES Permit No. CAS612008 November 19, 2015). The MS4 Regional Stormwater NPDES Permit is available to review at:

https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/Municipal/R2_2015_0049_amended.pdf

This project shall conform to applicable provisions of this Permit and modifications thereto.

D. Storm Water Pollution Prevention Plan (SWPPP)

1. The SWPPP will include a description of best management practices (BMPs) that will be implemented to reduce the pollutants in stormwater and non-stormwater discharges to assure compliance with the terms and conditions of the Construction

General Permit.

2. A Qualified Stormwater Developer (QSD) shall prepare the SWPPP and a Qualified Stormwater Practitioner shall ensure implementation of the SWPPP.

3. The SWPPP shall include the following information and forms:

   a. Site description
   b. Expected sequencing of operations and construction schedule
   c. Weather monitoring procedure
   d. Descriptions and details of erosion controls, including dust control
   e. Erosion control plans
   f. Controls for other potential onsite storm water pollutants
   g. Applicable specifications
   i. Maintenance and inspection procedures and forms
   i. Description of potential non-storm water discharges at site
   j. Notice of Intent (NOI) form
   k. Notice of Termination (NOT) form
   l. QSD/QSP Certification forms
   m. Other record keeping forms and procedures

   n. Good housekeeping practices and procedures, including vehicle wash- down areas, protection of equipment storage and maintenance areas, and sweeping of roadways related to hauling activities

4. The Owner will review the draft SWPPP. Contractor QSD will address Owner review comments and submit revised SWPPP for Owner approval. Upon Owner approval, Contractor QSD and Owner representative will sign the approved SWPPP.

5. Contractor will upload approved SWPPP onto SMARTS database for Notice of Intent (NOI) submittal.

6. When the SWRCB approves the NOI, the SWPPP will be the document in force on the project.

7. Place the SWPPP and all updates in a three-ring binder so that completed inspection forms and other records may be inserted. The Contractor shall maintain a copy of the SWPPP and all associated records and forms on site throughout the construction period.

8. The SWPPP shall be available for public inspection. The Contractor shall notify the Owner immediately upon request from the regulatory agencies to enter, inspect, sample, monitor, or otherwise access the project site or the Contractor's records pertaining to water pollution control work. The Contractor and the Owner shall provide copies of correspondence, notices of violation, enforcement actions, or proposed fines by regulatory agencies to the requesting regulatory agency.

9. Implement the SWPPP as required throughout the construction period and maintain all erosion control elements in proper working order until final acceptance of project.

10. Do not perform clearing and grubbing or earthwork until applicable BMPs have been installed.

11. Prior to construction, the Contractor and all subcontractors shall sign certifications (included in the SWPPP) that they understand the requirements of the Construction General Permit and SWPPP. All Contractor and subcontractor crews shall comply with the requirements of the Construction General Permit under the supervision of the Contractor QSP who will be responsible for implementing the SWPPP. The Contractor QSP shall ensure that emergency procedures and the SWPPP are updated as needed and available for inspection. The SWPPP (including inspection forms) and all data used to complete the NOI shall be provided to the Owner at the completion of the project.

12. SWPPP Inspections and Amendments

    a. The Contractor QSP and/or trained crew under QSP supervision will perform weekly inspections of the project site in accordance with the SWPPP. Inspections shall be documented on forms provided in the SWPPP binder.

    b. It may be necessary to revise the SWPPP during construction to make necessary improvements or to respond to unforeseen conditions noted during construction or site inspections. For that purpose, the SWPPP shall specify the mechanism whereby revisions may be proposed by the Contractor or the Owner and incorporated into the SWPPP, including review and acceptance of minor changes. The Contractor and the Owner will jointly accept and sign each revision to the SWPPP before implementation. Accepted modifications will be implemented within 7 calendar days following the date of the inspection when deficiencies or necessary corrections are first noted.

    c. Temporary erosion and pollution control measures shall be used to correct conditions that develop during construction that were not foreseen during design, that are needed prior to installation of permanent control features, or that are needed temporarily to control erosion that developed during normal construction practices but are not associated with permanent control features on the project.

    d. Provide additional temporary erosion and pollution controls made necessary by Contractor's errors or negligence at no additional cost to the Owner.

E. Notice of Intent (NOI)

1. Owner will complete NOI form on SMARTS and submit to SWRCB after accepted SWPPP has been uploaded by Contractor.

2. Annual Reports are due to the SWRCB SMARTS by September 1 of each year. Contractor shall submit Annual Reports and any Ad Hoc Reports onto SMARTS by August 15 for Owner review.

F. Notice of Termination (NOT)

G. Upon final acceptance, the Owner will file the NOT.

1.5 PROJECT CONDITIONS

A. The Contractor shall maintain records of work performed on the sediment control structures.

B. The Contractor shall not remove any erosion or sediment control measure without prior permission from the Owner.

C. The Contractor shall obtain approval from the Owner prior to making changes to erosion control plans.

1.6 SEQUENCE OF CONSTRUCTION

A. The Contractor shall be responsible for arranging and conducting an Erosion and Sediment Control meeting/briefing to inform all parties scheduled to be on-site during the project of the measures to be implemented for proper erosion and sediment control (may be included as part of the preconstruction meeting).

1. Installation of silt fences, storm drain protection, and all other forms of erosion and sediment control shall not begin until after this meeting has occurred.

B. The Contractor shall notify the Owner in writing and by telephone of the following events:

1. The required erosion and sediment control meeting/briefing.
2. Following installation of required sediment control structures.
3. Prior to removal of or modification to sediment control structures.
4. Prior to removal of all sediment control structures.

C. Silt fences, storm drain protection, and all other forms of erosion and sediment control shall be installed, inspected, and accepted by the Contractor before beginning any utility excavation.

D. Temporary silt fences shall be installed around any stockpiles and/or excavated material that cannot be backfilled during the same day in which it was excavated. Temporary silt fences shall also be placed immediately downstream of any utility trench that has not been backfilled at the end of the working day. Temporary silt fences shall be installed prior to leaving the work site for the day.

E. Silt fences and storm drain protection shall be inspected by the Contractor weekly. Repairs to these devices shall be completed prior to leaving the work site for the day.

F. The Contractor shall prevent the deposition of materials onto paved areas. The Contractor shall inspect the paved areas for deposited materials weekly and remove the materials immediately.

G. Silt fences shall be removed with permission of the Owner within 20 working days

after final acceptance of the project and/or after the establishment of permanent stabilization of all excavations and fill areas.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Before the work begins, sufficient equipment shall be available on the site to assure that the operation and adequacy of the erosion control plans can be continuously maintained.

2.2 EROSION CONTROL MEASURES

A. Erosion control measures shall consist of silt fencing or equivalent (eg. wattles, etc.), barrier protectors, straw bales, temporary soil retention blankets, excelsior drainage filters, sediment traps and berms.

B. Berms and excelsior drainage filters shall be used to form sediment traps and to control run- on and run-off into other areas, including creeks, streams, marshes, access roads, well areas, and the staging areas.

C. Erosion control measures shall be used to contain only direct precipitation in the construction zone. The contained water shall be allowed to percolate into the ground or drain slowly through the drainage filter sediment traps.

D. Earthen sediment traps or holding ponds shall not be used unless accepted by the Owner.

PART 3 - EXECUTION

3.1 GENERAL DESCRIPTION

A. Furnish, install, maintain, and operate necessary control measures and other equipment necessary to prevent erosion to the maximum extent practical, including implementation of Best Management Practices (BMPs).
   1. Temporary measures shall be to Contractor's own design and Contractor shall be solely responsible for risks related to the management of erosion control during construction.

B. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operations that will disturb the natural erosion protection.

C. Schedule work to expose areas subject to erosion for the shortest possible time, and preserve natural vegetation to the greatest extent practicable. Temporary storage and construction buildings shall be located, and construction traffic routed, to minimize erosion. Temporary fast-growing vegetation or other suitable ground cover shall be provided as necessary to control runoff.

3.2 METHODS

A. Construct berms to reduce runoff velocity as well as direct surface runoff around and away from all fuel containment, storage, and borrow areas.

B. Divert surface runoff around and away from cut and fill slopes by constructing berms or ditches at the base of disturbed slopes. Provide conveyance for the runoff in temporary pipes or protected channels to temporarysediment traps.

C. Place drainage filters around all catch basins to create sediment traps to control run- offfrom the construction area.

D. Excess water used for dust control shall be contained within the demolition areas by the erosion control measures.

3.3 MAINTENANCE OF TEMPORARY FACILITIES

A. Inspect erosion and sediment control structures weekly. Ensure erosion and sediment control structures remain effective throughout excavation and grading operations. Relocate structures as necessary.

B. Inspect control structures after each significant rainfall. Promptly repair breaches which occur.

C. The Contractor shall remove entrapped sediment from behind excelsior drainage filter after each storm.

3.4 DISPOSAL OF SEDIMENT FROM STORM WATER POLLUTION CONTROL STRUCTURES

A. Sediment excavated from temporary sediment control structures shall be disposed on the site with general fill, or with topsoil. Sediment shall be allowed to dry out as required before reuse.

B. Contractor shall place the sediment removed from traps and other structures where it will not enter a storm drain or watercourse and where it will not immediately reenter the basin.

3.5 REMOVAL OF TEMPORARY STORM WATER POLLUTION CONTROL MEASURES

A. All temporary control measures shall be removed with permission of the Owner within 20 working days after final acceptance of the Project or once grading is completed and slopes have stabilized.

SWPPP Contents

a. SWPPP Certifications and Approval
b. Risk Level
c. Table of Contents
d. Qualified SWPPP Developer
e. Legally Responsible Person
f. Amendment Log
g. SWPPP Requirements
   - Permit registration documents
   - SWPPP availability and implementation
   - SWPPP amendments
   - Retention of records
   - Required non-compliance reporting
   - Annual report
   - Changes to permit coverage
   - Notice of Termination
h. Project Information
   - Site description
   - Existing conditions
   - Existing drainage
   - Geology and groundwater
   - Project description
   - Developed condition
   - Permits and governing documents
   - Stormwater run-on from off-site areas
   - Findings of the construction site sediment and receiving water risk determination
   - Construction schedule
   - Potential construction activity and pollutant sources
   - Identification of non-stormwater discharges
   - Required site map information
i. Best Management Practices
   - Schedule for BMP implementation
   - Erosion and sediment control
   - Non-stormwater controls and waste and materials management
   - Post-construction stormwater management measures
j. BMP inspection and maintenance
   - Rain Event Action Plans
k. Training
l. Responsible parties and operators
   - Responsible parties

- Contractor list

m. Construction Monitoring Program
- Weather and rain event tracking
- Monitoring locations
- Safety and monitoring exemptions
- Visual monitoring
- Routine observations and inspections: Routine BMP inspections, Non- stormwater discharge observations
- Rain-event triggered observations and inspections: Visual observations prior to a forecasted qualifying rain event, BMP inspections during an extended storm event, Visual observations following a qualifying rain event
- Visual monitoring procedures
- Visual monitoring follow-up and reporting
- Visual monitoring locations
- Water quality sampling and analysis
- Sampling and analysis plan for non-visible pollutants in stormwater runoff discharges: Sampling scheduled, sampling locations, monitoring preparation, analytical constituents, sample collection, sample analysis, data evaluation and reporting
- Sampling and analysis plan for pH and turbidity and stormwater runoff discharges: Sampling schedule, sampling locations, monitoring preparation, field parameters, sample collection, field measurements, data evaluation and reporting
- Sampling and analysis plan for non-stormwater discharges: Sampling schedule, sampling locations, monitoring preparation, analytical constituents, sample collection, sample analysis, data evaluation and reporting
- Additional monitoring following an NEL exceedance
- Training of sampling personnel
- Sample collection and handling
- Sample documentation procedures
- Records retention

n. Attachments
- Construction General Permit
- Risk Level calculations
- Water Pollution Control Drawings
- Permit Registration Documents/Amendments
- QSD/QSP Certifications
- SWPPP Amendment Certifications
- Construction Schedule

- Construction Activities, Materials Used, and Associated Pollutants
- CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets
- BMP Inspection Form
- Training Reporting Form
- Weather forecast reports
- Monitoring records
- Field meter instructions

- END OF SECTION-

01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and control procedures that facilitate compliance with the Contract Document requirements.
   2. Requirements for Contractor to provide quality-assurance and control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
   3. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities

having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. 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 Tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction. See specific specification sections for additional experience requirements.

1.3 CONFLICTING REQUIREMENTS

A. General: If 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 as defined in the General Conditions. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. 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 requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Reports: Prepare and submit certified written reports that include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and re-inspecting.

C. Permits, Licenses, and Certificates: For 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.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Construction Manager seven (7) days in advance of dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
   5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   6. Demolish and remove mockups when directed, unless otherwise indicated.

J. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 48.

1.6 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor (contract sum adjusted through change order procedures).

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Does not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality- assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.7 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency, special inspector and/or Essential Services Inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
   1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
   2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   3. Submitting a certified written report of each test, inspection, and similar quality- control service to Architect with copy to Contractor and to authorities having jurisdiction.
   4. Submitting a final report of special tests and inspections at Substantial Completion, this includes a list of unresolved deficiencies.
   5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   6. Retesting and reinspecting corrected

work. PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the

following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with the Contract Document requirements for Section 01 73 29 "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

-END OF SECTION-

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01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 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 date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should 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, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

AA Aluminum Association, Inc. (The)
AAADM American Association of Automatic Door Manufacturers AABC Associated Air Balance Council
AAMA American Architectural Manufacturers Association
AASHTO American Association of State Highway and Transportation Officials AATCC American Association of Textile Chemists and Colorists (The)
ABAA Air Barrier Association of America
ABMA American Bearing Manufacturers Association
ACI ACI International (American Concrete Institute) ACPA American Concrete Pipe Association
AEIC Association of Edison Illuminating Companies, Inc. (The) AF&PA American Forest & Paper Association
AGA American Gas Association
AGC Associated General Contractors of America (The)
AHA American Hardboard Association (Now part of CPA) AHAM Association of Home Appliance Manufacturers
AI Asphalt Institute
AIA American Institute of Architects (The)
AISC American Institute of Steel Construction AISI American Iron and Steel Institute
AITC American Institute of Timber Construction
ALCA Associated Landscape Contractors of America
(Now PLANET - Professional Landcare Network)
ALSC American Lumber Standard Committee, Incorporated
AMCA Air Movement and Control Association International, Inc. ANSI American National Standards Institute
AOSA Association of Official Seed Analysts, Inc. APA Architectural Precast Association
APA APA - The Engineered Wood Association
APA EWS APA - The Engineered Wood Association; Engineered Wood Systems API American Petroleum Institute
ARI Air-Conditioning & Refrigeration Institute
ARMA Asphalt Roofing Manufacturers Association ASCE American Society of Civil Engineers

ASCE/SEI American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME ASME International
ASSE American Society of Sanitary Engineering
ASTM ASTM International (American Society for Testing and Materials International)
AWCI AWCI International (Association of the Wall and Ceiling Industry International)
AWCMA American Window Covering Manufacturers Association (Now WCSC)
AWI Architectural Woodwork Institute
AWPA American Wood-Preservers' Association
AWS American Welding Society
AWWA American Water Works Association
BHMA Builders Hardware Manufacturers Association
BIA Brick Industry Association (The)
BICSI BICSI
BIFMA BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
BISSC Baking Industry Sanitation Standards Committee
CCC Carpet Cushion Council
CDA Copper Development Association
CEA Canadian Electricity Association
CFFA Chemical Fabrics & Film Association, Inc.
CGA Compressed Gas Association
CIMA Cellulose Insulation Manufacturers Association
CISCA Ceilings & Interior Systems Construction Association
CISPI Cast Iron Soil Pipe Institute
CLFMI Chain Link Fence Manufacturers Institute
CRRC Cool Roof Rating Council
CPA Composite Panel Association
CPPA Corrugated Polyethylene Pipe Association
CRI Carpet & Rug Institute (The)
CRSI Concrete Reinforcing Steel Institute
CSA Canadian Standards Association
CSA CSA International (Formerly: IAS - International Approval Services)
CSI Cast Stone Institute
CSI Construction Specifications Institute (The)
CSSB Cedar Shake & Shingle Bureau
CTI Cooling Technology Institute (Formerly: Cooling Tower Institute)
DHI Door and Hardware Institute
EIA Electronic Industries Alliance

EIMA EIFS Industry Members Association
EJCDC Engineers Joint Contract Documents Committee EJMA Expansion Joint Manufacturers Association, Inc. ESD ESD Association
FIBA Federation Internationale de Basketball (The International Basketball Federation)
FIVB Federation Internationale de Volleyball (The International Volleyball Federation)
FM Approvals FM Approvals
FM Global FM Global (Formerly: FMG - FM Global)
FMRC Factory Mutual Research (Now FM Global)
FRSA Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA Fluid Sealing Association
FSC Forest Stewardship Council
GA Gypsum Association
GANA Glass Association of North America
GRI (Now GSI)
GS Green Seal
GSI Geosynthetic Institute
HI Hydraulic Institute
HI Hydronics Institute
HMMA Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA Hardwood Plywood & Veneer Association
HPW H. P. White Laboratory, Inc.
IAS International Approval Services (Now CSA International)
IBF International Badminton Federation
ICEA Insulated Cable Engineers Association, Inc. ICRI International Concrete Repair Institute, Inc.
IEC International Electrotechnical Commission
IEEE Institute of Electrical and Electronics Engineers, Inc. (The)
IESNA Illuminating Engineering Society of North America
IEST Institute of Environmental Sciences and Technology
IGCC Insulating Glass Certification Council
IGMA Insulating Glass Manufacturers Alliance
ILI Indiana Limestone Institute of America, Inc.
ISO International Organization for Standardization
ISSFA International Solid Surface Fabricators Association
ITS Intertek Testing Service NA
ITU International Telecommunication Union
KCMA Kitchen Cabinet Manufacturers Association LMA Laminating Materials Association

(Now part of CPA)
LPI Lightning Protection Institute
MBMA Metal Building Manufacturers Association
MFMA Maple Flooring Manufacturers Association, Inc.
MFMA Metal Framing Manufacturers Association, Inc.
MH Material Handling
MHIA Material Handling Industry of America
MIA Marble Institute of America
MPI Master Painters Institute
MSS Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM National Association of Architectural Metal Manufacturers
NACE NACE International
(National Association of Corrosion Engineers International)
NADCA National Air Duct Cleaners Association
NAGWS National Association for Girls and Women in Sport
NAIMA North American Insulation Manufacturers Association
NBGQA National Building Granite Quarries Association, Inc.
NCAA National Collegiate Athletic Association (The) NCMA
National Concrete Masonry Association
NCPI National Clay Pipe Institute
NCTA National Cable & Telecommunications Association
NEBB National Environmental Balancing Bureau
NECA National Electrical Contractors Association
NeLMA Northeastern Lumber Manufacturers' Association
NEMA National Electrical Manufacturers Association
NETA InterNational Electrical Testing Association
NFHS National Federation of State High School
Associations NFPA NFPA
(National Fire Protection Association)
NFRC National Fenestration Rating Council
NGA National Glass Association
NHLA National Hardwood Lumber Association
NLGA National Lumber Grades Authority
NOFMA NOFMA: The Wood Flooring Manufacturers Association
(Formerly: National Oak Flooring Manufacturers Association)
NRCA National Roofing Contractors Association
NRMCA National Ready Mixed Concrete
Association NSF NSF International
(National Sanitation Foundation International)
NSSGA National Stone, Sand & Gravel Association
NTMA National Terrazzo & Mosaic Association, Inc. (The)
NTRMA National Tile Roofing Manufacturers Association
(Now TRI)
NWWDA National Wood Window and Door Association
(Now WDMA)

OPL	Omega Point Laboratories, Inc. (Now ITS)
PCI	Precast/Prestressed Concrete Institute
PDCA	Painting & Decorating Contractors of America
PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America)
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
RIS	Redwood Inspection Service
SAE	SAE International
SDI	Steel Deck Institute
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SGCC	Safety Glazing Certification Council
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
STI	Steel Tank Institute
SWI	Steel Window Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International
TRI	Tile Roofing Institute
UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
USAV	USA Volleyball
USGBC	U.S. Green Building Council

USITT United States Institute for Theatre Technology,
Inc. WASTEC Waste Equipment Technology Association
WCLIB West Coast Lumber Inspection Bureau
WCMA Window Covering Manufacturers
Association
(Now WCSC)
WCSC Window Covering Safety Council
(Formerly: WCMA - Window Covering Manufacturers Association)
WDMA Window & Door Manufacturers Association
(Formerly: NWWDA - National Wood Window and Door Association)
WI Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WIC Woodwork Institute of
California (Now WI)
WMMPA Wood Moulding & Millwork Producers Association
WSRCA Western States Roofing Contractors Association
WWPA Western Wood Products Association

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

BOCA BOCA International,
Inc. (See ICC)
IAPMO International Association of Plumbing and Mechanical
Officials ICBO International Conference of Building Officials
(See ICC)
ICBO ES ICBO Evaluation Service, Inc.

(See ICC-ES)
ICC International Code Council ICC-ES ICC Evaluation Service, Inc.
SBCCI Southern Building Code Congress International, Inc. (See ICC)
UBC Uniform Building Code
(See ICC)

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

CE Army Corps of Engineers
CPSC Consumer Product Safety Commission DOC Department of Commerce
DOD Department of Defense
DOE Department of Energy
EPA Environmental Protection Agency

FAA Federal Aviation Administration
FCC Federal Communications Commission
FDA Food and Drug Administration
GSA General Services Administration
HUD Department of Housing and Urban Development
LBL Lawrence Berkeley National Laboratory
NCH R P National Cooperative Highway Research Program (See TRB)
NIST National Institute of Standards and Technology
OSHA Occupational Safety & Health Administration
PBS Public Building Service (See GSA)
PHS Office of Public Health and Science
RUS Rural Utilities Service (See USDA)
SD State Department
TRB Transportation Research Board
USDA Department of Agriculture
USPS Postal Service

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

ADAAG Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA)
CFR Code of Federal Regulations
DOD Department of Defense Military Specifications and Standards
DSCC Defense Supply Center Columbus (See FS)
FED-STD Federal Standard (See FS)
FS Federal Specification
FTMS Federal Test Method Standard (See FS)
MIL (See MILSPEC)
MIL-STD (See MILSPEC)
MILSPEC Military Specification and Standards
UFAS Uniform Federal Accessibility Standards

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

CALT State of California Transportation Agency
RANS State of California, Department of Consumer Affairs Bureau of Home Furnishings and
CBHF Thermal Insulation
CCR California Code of Regulations
CPUC California Public Utilities Commission TFS Texas Forest Service
Forest Resource Development

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

-END OF SECTION-

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01 43 39 - MOCKUPS

PART 1 – GENERAL

1.1 MOCKUP SUMMARY

A. Mockups will be used to review of appearance, quality of workmanship, coordination, compatibility, and relationships with adjacent materials. Unless otherwise specifically indicated mockups shall be constructed in place at location directed by Architect. Approved mock ups may remain as part of the work.

1.2 SUBMITTALS

A. General: Comply with Section 01 33 00.

B. Mockups shall not be fabricated until after acceptance of required submittals for all materials to be incorporated into the mockups. This means that the Project schedule shall take into account early submittal of these components to the Architect.

C. Samples: Prior to construction of mockups, provide samples as specified in the respective Specification Sections included as part of the mockups.

1.3 QUALITY ASSURANCE

A. Design Concept: Mockup requirements are intended to establish function, workmanship, finish, and color for conformance with the architectural design intent.

B. Purpose: To verify suitability of colors, finishes, and satisfactory integration of building materials and components indicated and required.

C. Performance: Mockups shall be constructed for the Architect's review for compliance with the Contract Documents and shall be used as a standard for the final installation.

D. Make necessary additions and modifications to mockups as directed by the Architect.

E. Modify mockups, or construct or install new components if requested by the Architect, until final acceptance is obtained.

F. Mockups shall serve as the standard for subsequent work of like kind after approval by the Architect. Be prepared, at no additional cost to the Owner, to make as many modifications as required to achieve mockups that are acceptable to the Architect and of sufficient quality to serve as the standard for the complete Project.

G. Following acceptance, mockups shall serve as a performance standard of quality and appearance of the work it represents, including the interface with adjacent materials and components as applicable.

H. Coordinate fabrication, delivery, assembly, and installation with related materials to be included in the mockups. Construction of the mockup assemblies shall be under the supervision of the same personnel who will be employed for the subsequentwork.

I. Maintain mockups in neat, clean condition until removal or final acceptance. Repair damage as required to maintain in condition suitable for review and approval.

J. Scheduling:

1. Construct mockups in a timely manner to permit review and modifications such that the work is not delayed.

2. Do not proceed with ordering of components or construction subject to mockup approval until after approvals have been obtained.

3. Provide the Architect not less than 10 working days notice of the time each component is ready for review.

4. Include line item in the construction schedule for the building section mockup, showing submittals, construction, review, and approval periods.

PART 2 – PRODUCTS

2.1 MATERIALS

A. As specified in the respective Sections of the Specifications.

PART 3 – EXECUTION

3.1 EXTERIOR BUILDING MOCKUP

A. Provide building mockup of building area indicated where directed by the Architect.

B. Purpose: Establish standards for work indicated and specified to be included in mock-ups to demonstrate quality of workmanship, materials, colors, and textures required by the Contract Documents. Include roof, roof overhang, soffits, windows, doors, glazing, sealants, siding and cladding, flashings, and other exterior materials.

1. Mockup will be used by the Architect to test color and material alternatives and to approve final colors, textures and workmanship.

2. Interior finishes will not be required to be installed on the interior side of the exterior building mockup.

-END OF SECTION-

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01 45 29 - TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SUMMARY

A. Administrative and procedural requirements for quality control services.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUMMARY

A. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, and governing authorities.

B. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

1.04 SUBMITTALS

A. Reports: The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Architect (two copies), the Owner, the Contractor (two copies), and the Project Manager/ Inspector.

B. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:

1. Date of issue

2. Project title and number

3. Name, address and telephone number of testing agency

4. Dates and locations of samples and tests or inspections

5. Names of individuals making the inspection or test

6. Designation of the Work and test method

7. Identification of product and Specification Section

8. Complete inspection or test data

9. Test results and an interpretation of test results

10. Ambient conditions at the time of sample-taking and testing

11. Comments or professional opinion as to whether inspected or tested

12. Work complies with Contract Document requirements

13. Name and signature of laboratory inspector

14. Recommendations on retesting.

1.05 QUALITY ASSURANCE

A. Referenced Standards

1. California Building Code (CBC) 2016 for administrative code application regarding testing and CBC 2019 for all other testing requirements.

1.06 RESPONSIBILITIES

A. Testing Laboratory: Owner will engage and pay for the services of an independent agency to perform inspections and tests specified.

B. Retesting: The Contractor is responsible for the cost of retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

1. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

C. The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested.

D. Coordination: The Contractor, Project Manager/Inspector, and each agency engaged to perform inspections, testing and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for communicating to the Project Manager/Inspector the scheduling times for inspections, tests, taking samples and similar activities.

E. Payment for Testing Laboratory Services:

1. Owner will pay for tests and inspections performed by Testing Laboratory, as specified in individual product Sections of the Specifications.

2. Contractor shall pay all costs for repeated observations, reinspection or retesting by Testing Laboratory due to non-conforming Work.

F. Obligation to Perform Work According to Contract Documents: Employment of Testing Laboratory shall in no way relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents and applicable Codes.

G. Limits on Testing Laboratory's Authority:

1. Testing Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

2. Testing Laboratory may not approve or accept any portion of the Work.

3. Testing Laboratory may not assume any duties of Contractor.

4. Testing Laboratory shall have no authority to stop Work.

H. Contractor's Responsibilities to Testing Laboratory: Contractor shall make the Work in all stages of progress available for personal and continuous observation by the Testing Laboratory.

1. Testing Laboratory shall have free access to any and all parts of the Work at all times with prior notification and approval of the Airport and Architect/Engineer.

2. Contractor shall provide the Testing Laboratory with reasonable facilities for Testing Laboratory to obtain such information as Testing Laboratory determines is necessary for Testing Laboratory to be kept fully informed of the progress and manner of performance of the Work and character of products, according to Testing Laboratory's duties and responsibilities.

3. Observation and inspection of the Work by Testing Laboratory shall not relieve Contractor from any obligation to fulfill the requirements of the Contract.

I. Retesting: When materials tested fall to meet requirements herein specified, they shall be promptly corrected or removed and replaced and retested in a manner required by the Owner’s Representative.

1.07 TESTS AND INSPECTIONS

A. Tests and Inspections, General: All construction work shall be subject to inspection by the Airport and all such construction or work shall remain accessible and exposed for inspection purposes until approved by the Airport.

1. The Airport will provide project personnel, including inspectors, to be available at the project site.

2. Approval as a result of an inspection shall not be construed to be an approval of a violation of the provisions of the building code or of other ordinances of the jurisdiction, including plans and specifications. Inspections presuming to give authority to violate or cancel the provisions of code, or of plans and specifications shall not be valid.

3. It shall be the duty of the contractor to cause the work to remain accessible and exposed for inspection purposes. Neither the Inspector nor the Airport shall be liable for expense entailed in the removal or replacement of any material required to allow inspection.

B. Approval Required: Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the Inspector. The Inspector, upon notification, shall make the requested inspections and shall either indicate in writing that portion of the construction is satisfactory as completed, or shall notify the Contractor that same fails to comply with plans and specifications. Any portions of Work that do not comply shall be corrected by the Contractor, and such portion shall not be covered or concealed until authorized by the Inspector.

1. There shall be a final inspection and approval of all buildings and structures when completed and ready for occupancy and use.

C. Inspection Coordination: Contractor shall provide, on a weekly basis, an anticipated Inspection Requirements Schedule, coordinated with the three-week look ahead schedule, showing the anticipated inspection needs for the following three weeks to facilitate appropriate campus coordination and interface as well as mobilization of required inspection staffing.

D. Required Inspections: Reinforcing steel, structural framework, or interior wall and/or ceiling support framing of any part of any building or structure shall not be covered or concealed without first obtaining the approval of the Inspector.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 REPAIR AND PROTECTION

A. Repair and Protection: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.

1. Protect construction exposed by or for quality control service activities and protect repaired construction.

2. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION

01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary fencing, utilities, support facilities, and security and protection facilities.

B. See Section 01 73 00 "Execution Requirements" for progress cleaning requirements.

C. See Divisions 02 through 33 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weather tight; exterior walls are insulated and weather tight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Construction Manager, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water Service: Water from Owner's existing water system is not available for use without metering and without payment of use charges. Contractor is responsible for coordination of this activity with the local municipality.

C. Electric Power Service: Temporary power will be provided by San Mateo County. If additional power is required, contractor will be responsible for all costs..

a. If using a generator, contractor to abide by all local laws and regulation including CEQA conditions of approval. See plan sheets G - 003/ 004 (also attached as supplement).

D. Internet Service/Data: Temporary hardwired service is not currently available in the immediate area of the site, but contractor may pursue engineering and installation of temporary hardwired service at their own cost. Contractor may need to pursue other options to meet the contractual temporary service requirements (satellite, etc.).

E. Temporary Fencing: Temp fencing will be in place from previous phase demolition contact. Contractor to assume temp fencing contract and maintain and/or modify as required for safety and security standard.

1.4 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel and Construction Managers.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibility.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fence with privacy screening fabric mesh; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Galvanized Steel posts will be required to be driven into the ground for support and stability or portable fencing, if appropriate, with sufficient hold down weight to prevent overturning.

2.2 TEMPORARY FACILITIES FOR PROJECT SITE

A. Field Offices for each site, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Field Offices: Provide and maintain for the duration of the Work temporary offices on site for use by the Contractor and a separate onsite trailer for use by the Owner's representatives (including Owner, Construction Manager and the Architect).
1. Offices shall be equipped with secure wireless internet capabilities to allow

for onsite users access to email and the internet.

2. Offices shall be provided with a door and lock with security bar and a window with a minimum size of 4 feet x 3 feet and security screen. Provide and maintain an electric heater and air conditioning along with adequate electric lighting for each office.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

D. Temporary Field Fencing: Provide fence size, material and privacy screen fabric mesh to encompass each site, furnish and installed, equipped for entrance of utility trucks (16- foot gates) and man gates for easy access.

E. Network Setup: The network shall have the following requirements:

1. The internet connection must be separate service and independent of the Contractor's and shall be the fastest speed available in the area with a minimum a 20-Meg upload / 20-Meg download speed. This should be accomplished via a hard-wired connection.
   a. Wired network connections must be provided at
      1) The Office, Planroom, and the Printer/Scanner.
   b. Reasonable access to power for the equipment must be provided.
2. If it is necessary to "piggyback" off of an existing hard-wired line, the line provided to the Owner's Representative shall be an unfiltered line, with no limitations set by the main line holder, such as access restrictions or DNS port blocking.
3. In the cases where a hard-wired connection is not available, the wireless connection provided must meet the same speed needs of 20-Meg upload / 20-Meg download. It shall also be of sufficient bandwidth to meet the needs of the staff.
4. In the case of sites where the internet speeds do not meet the above requirements, a cellular "hot-spot" is to be provided if resulting in a faster connection, along with a local storage device must be provided for the location to save the project data. The local storage device will be connected to the Kitchell network, and backed up during non-business hours to the Kitchell network server.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION FOR PROJECT SITE

A. General: Install temporary service or connect to existing service.
1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Electrical Power and Lighting:
1. Contractor will furnish and pay for power during the course of the work to the extent power is not in the building(s) or on the Site. Contractor shall be responsible for providing temporary facilities required on the Site to point of intended use.
2. Contractor shall furnish, wire for, install and maintain temporary electrical lights wherever it is necessary to provide illumination for the proper performance and/ or observe of the Work: a minimum of 20 foot-candles for rough work and 50 foot-candles for finish work.
3. Contractor shall be responsible for maintaining existing lighting levels in the Project vicinity should temporary outage or service interruptions occur.

C. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction. Coordination is the responsibility of the Contractor.

D. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction and modular passenger terminal.

E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Provide connection to existing sanitary sewer for temporary passenger terminal modular.

F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for

protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

H. Electric Power Service: Temporary power will be provided by San Mateo County. If additional power is required, contractor will be responsible for all costs and It is the Contractor's responsibility to coordinate with PG&E to obtain the additional electrical service, including submission of services applications, load calculation, and single line diagrams. The Contractor will also be responsible for payment of the monthly PG&E invoices for the additional power.

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.3 Temporary Controls

A. Noise Control
   1. Contractor acknowledges that adjacent facilities may remain in operation during all or a portion of the Work, and it shall take all reasonable precaution to minimize noise as required by applicable laws and the Contract Documents.
   2. Notices of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to the County a minimum of forty-eight (48) hours in advance of their performance. Contractor responsible for obtaining all permits required for construction noise outside of the times allowable within the noise ordinance.
   3. Contractor to meet the Conditions of Approval related to Noise Control as defined in the Contract Documents.

B. Noise and Vibration
   1. Equipment and impact tools shall have intake and exhaust mufflers.
   2. Contractor shall cooperate with the County to minimize and /or cease the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity.
   3. Contractor to meet the Conditions of Approval related to noise and vibration as defined in the Contract Documents.

C. Dust and Dirt
   1. Contractor shall conduct demolition and construction operations to minimize the generation of dust and dirt, and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.

2. Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.
3. Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.
4. Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.
5. Contractor to meet the Conditions of Approval related to dust and dirt as defined in the Contract Documents.
6. Contractor shall keep access routes through existing Grant Yard clean and safe at all times.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Provide incombustible construction for offices, shops, and sheds located within construction area or within thirty (30) feet of building lines. Comply with NFPA 241.
   2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
   1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.

C. Temporary Roads and Paved Areas: All areas are currently paved.

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Contractor is to provide temporary parking for construction personnel within confines of the designated construction site. If parking within the designated construction site becomes unavailable due to number of Trades, Subcontractors and Vendors, Contractor shall be responsible for coordinating with the County, or local jurisdiction for parking requirements, locations, permits, shuttle services, etc. Contractor is to review and follow all related Conditions of Approval, Laws and Regulations from the San Mateo County.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water. (refer to demolition drawings for specifics)
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

G. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on drawings or required by the County or the City. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
   1. Provide temporary, directional signs for construction personnel and visitors.
   2. Maintain and touchup signs so they are legible at all times.

H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Section 01 73 00 "Execution Requirements" for progress cleaning requirements.

I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Project site and access to project site will be in a 24/7 operational corporation yard and all construction activities shall not hinder Grant Yard activities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

D. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

F. Temporary Site Enclosure Fence: All costs associated with the install, monthly fencing rental fees and demobilization of the fencing will be the responsibility of the contractor. Furnish and install any additional site enclosure fence panels in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Temporary Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations and protection of the public. Operations include temporary offices, parking, staging areas,

actual construction site.

G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Contractor is responsible to ensure that the fencing and all gates are secured and locked prior to leaving the site on a daily basis to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather-tight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
   2. Insulate partitions to provide noise protection to occupied areas.
   3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
   4. Protect air-handling equipment.
   5. Weather strip openings.
   6. Provide walk-off mats at each entrance through temporary partition.

J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
   1. Smoking is prohibited in all construction areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
   4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. 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.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been 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 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 property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

-END OF SECTION-

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01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. See Section 01 77 00 "Closeout Procedures" for submitting warranties for Contract closeout.

C. See Divisions 02 through 48 Sections for specific requirements for warranties on products and installations specified to be warranted.

D. See Divisions 02 through 48 Sections for specific requirements for LEED.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.3 SUBMITTALS

A. Substitution Requests: Must comply with the requirements of the Contract and General Conditions.

B. Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: CSI Form 13.1A.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified material or product cannot be provided.
      b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.
      f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
      g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
      h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
      i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
      j. Cost information, including a proposal of change, if any, in the Contract Sum.
      k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
      l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
   3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fourteen (14) days of receipt of request, or seven (7) days of receipt of additional information or

documentation, whichever is later.

a. Form of Acceptance: Change Order.
b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within fourteen (14) calendar days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
   a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
   b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

D. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.6 MANUFACTURER'S LABELS AND NAME PLATES

A. Except as otherwise indicated for required labels and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on the exterior of the completed project. Visible, non-required labels and nameplates shall be removed.
   1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.
   2. Equipment Nameplates: Provide a permanent nameplate on each item of service- connected or power-operated equipment. Locate the nameplate on an easily accessible surface which is inconspicuous in occupied spaces. The name plate shall contain the following information as well as other essential operating data:
      a. Name of manufacturer.
      b. Model number.
      c. Serial number.
      d. Capacity.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 2 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:
1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in the Contract, General Conditions, and Part 2 "Comparable Products" Article for consideration of an unnamed product.

6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in the Contract, General Conditions, and Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in the Contract, General Conditions, and Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in the Contract, General Conditions, and Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in the Contract, General Conditions, and Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns and textures" or a similar phrase, select a product that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    1. Procedures within the General Conditions and Contract are followed.
    2. Evidence that the proposed product does not require extensive revisions to the contract documents that it is consistent with the contract documents and will

produce the indicated results, and that it is compatible with other portions of the Work.

3. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
4. Evidence that proposed product provides specified warranty.
5. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
6. Samples, if

requested. PART 3 -

EXECUTION (Not Used)

-END OF SECTION-

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01 73 00 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. General installation of products.
   4. Cutting and patching.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Protection of installed construction.
   8. Correction of the Work.

B. See Section 01 78 39 "Project Record Documents" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

C. Related Requirements:
   1. Division 00 General Conditions and Special Conditions
   2. Section 01 10 00 "Summary" for limits on use of Project site.
   3. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 SUBMITTALS

A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Survey reports and plots as detailed below.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their

capacity to perform asintended or that results in increased maintenance or decreased operational life or safety.

1.4 EXAMINATION

A. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

1.5 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

1.6 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish limits on use of Project site.
   3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   4. Inform installers of lines and levels to which they must comply.
   5. Check the location, level and plumb, of every major element as the Work progresses.
   6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
   7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

1.7 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
   1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

1.8 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

1.9 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

1.10 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold materials more than seven (7) days during normal weather or three

(3) days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

1.11 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Section 01 40 00 "Quality Requirements."

1.12 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

1.13 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 01 73 29 "Cutting and Patching."
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

-END OF SECTION-

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01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. See Divisions 2 through 48 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.3 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, and result in reducing their capacity to perform as intended, or that result in

increased maintenance or decreased operational life or safety.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   4. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
   5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

-END OF SECTION-

01 74 19 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY – WASTE MANAGEMENT GOALS

A. Section includes administrative and procedural requirements for salvaging, recycling and disposing of nonhazardous demolition and construction waste.

B. The Owner has established that this Project shall generate the least amount of waste possible and processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.

C. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.

D. Contract shall comply with San Mateo County Office or Sustainability Waste Reduction requirements. This project has been registered with Green Halo System and is subject to its requirements.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal of off-site waste and subsequent sale, recycling, reuse or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitability, corrosivity, toxicity or reactivity.

E. Recyclable: The ability of a product or material to be recovered at the end of its life cycleand remanufactured into a new product for reuse by others.

F. Recycle: Recovery of waste from the Project site to another site for subsequent processing in preparation for reuse

G. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of recycling. Recycling does not include burning, incinerating, or thermally destroying waste.

H. Salvage: To remove a waste material from the Project site for subsequent

sale or reuse in another facility.

I. Salvage and Reuse: Recovery of waste and subsequent incorporation into the Work

1.3 PERFORMANCE REQUIREMENTS

A. Develop and implement a waste management program resulting in an end-of-project rates for salvage/recycling of minimum 65 percent by weight or volume of the total waste generated by the project.

B. Regulations: The Contractor shall be responsible for knowing and complying with regulatory requirements, Federal, State, and Local, pertaining to legal disposal of all construction and demolition waste materials.

C. Coordination: Coordinate the recycling of materials with Owner and Subcontractors as required to conform to the Construction Waste Management Plan.

D. Site Access and Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Waste Management Meetings: Conduct on-site waste management meetings with all subcontractors. Review and discuss the waste management plan, methods, procedures and each party's roles and responsibilities.

C. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

D. Packing and Shipping

1. Shipping: Coordinate the schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
2. Packing: Arrange for the return of packing materials, such as wood pallets, where economically feasible.

E. Handling

1. Provide equipment and personnel to handle products by methods to prevent soiling or damage.
2. Promptly inspect shipments to assure products comply with requirements, quantities are correct, and products are undamaged.
3. Promptly return damaged shipments or incorrect orders to manufacturer for credit or refund.

F. Storage: Store products in accordance with manufactures recommendations and periodically inspect to assure that stored products are undamaged and are maintained under required conditions.

G. Preparation

1. Storage and Protection:
   a. Designate receiving/storage areas for incoming material to be delivered according to installation schedule and to be placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
   b. Store and handle materials in a manner as to prevent loss from weather and other damage. Keep materials covered and off the ground, and store in a dry, secure area.
   c. Prevent contact with material that may cause corrosion, discoloration, or staining.
   d. Protect all materials and installations from damage by the activities of other trades.

H. Waste Management

1. Source separated waste: Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in order to prevent contamination of materials and to maximize recyclability and salvageability of identified materials.
2. Comingled Waste: Waste may be commingled at the site and separated at a recycling facility.
3. Return: Set aside and protect missed-delivered and substandard products and materials and return to supplier for credit.
4. Reuse and Salvage: Set aside, sort, and protect separated products and materials for collection, re-use on site by contractor, and salvage by other.
5. Recycling: Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

1.5 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to the requirements in this Section, as well as the requirements indicated in the LEED for Building Design and Construction New Construction Reference Guide, version 2009, under Materials and Resources Credit 2 – Construction Waste Management. Plan shall consist of the following sections: Waste Management Goals, Responsible Parties, Waste Identification, Waste Prevention and Diversion Measures, Contamination Prevention Measures, Communication and Education Measures, Onsite Recycling Operations, and Cost/Revenue Analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan. The plan shall result in end-of-Project rates for salvage/recycling of minimum 65 percent by weight or volume of the total waste generated by the work.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site- clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates

C. The list of these materials is to include, at minimum, the following materials:
   1. Cardboard.
   2. Clean dimensional wood.
   3. Beverage containers.
   4. Land clearing debris.
   5. Concrete.
   6. Bricks.
   7. Concrete Masonry Units (CMU).
   8. Metals from banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   9. Drywall.
   10. Carpet and carpet pads.

2 PRODUCTS – NOT USED

3 EXECUTION

3.3 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: The Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.

B. Distribution: The Contractor shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner, and the Owner's Representative.

C. Instruction and Training: The Contractor shall provide on-site instruction and train workers, subcontractors and suppliers of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used.

D. Separation facilities: The Contractor shall layout and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials. Waste may be commingled at the site in a specific label area for pickup by the waste hauler and separated at a recycling facility.

E. Hazardous wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

F. Contractor shall provide a monthly summary to the LEED Consultant with the following information:

G. The amount (in tons or cubic yards) of material landfilled from the Project, the identity of the landfill, the total amount of tipping fees paid at the landfill, and the total disposal cost. Include manifests, weight tickets, receipt, and invoices.

H. For each material recycled, reused, or salvaged from the Project, the amount (in tons or cubic yards), the date (removed from the jobsite, the receiving party, the transportation cost, the amount of any money paid or received for the recycled or salvaged material, and the net total cost or savings of salvage or recycling each material). Attach manifests, weight tickets, receipts, and invoices.

3.4 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan

D. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin. Regularly inspect bins for contamination.

E. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

F. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

G. Store components off the ground and protect from the weather.

H. Remove recyclable waste from Owner's property per approved Waste Management Plan.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are

to be disposed of accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3.6 INSTALLATION

A. Install product(s) per manufacturer's recommendations to reduce damage to or waste of materials by required replacement.

3.7 TRANSPORTATION

A. Transport materials in covered trucks to prevent contamination of product or littering of surrounding areas.

3.8 GENERAL CLEANING

A. Control accumulation of waste materials and trash. Recycle or dispose of off-site at intervals approved by the Owner and in compliance with waste management procedures.

B. Cleaning materials: Use cleaning materials that are non-hazardous.

3.9 FINAL CLEANING

A. Cleaning Materials: Only non-hazardous cleaning materials shall be used in the final cleanup.

B. Recycle, salvage, and return construction and demolition waste from Project.

C. Arrange for pick-up of salvageable materials in accordance with the Waste Management Plan.

D. Disposal Operations: Promptly and legally transport and dispose of any trash. Do not burn, bury, or otherwise dispose of trash on the Project site.

-END OF SECTION-

01 74 20 - CLEANING

PART 1 – GENERAL

1.1 Section Includes

A. Cleaning throughout the construction period, and final project cleaning prior to the acceptance tour.

1.2 Related Sections

A. Section 01 50 00 - Temporary Facilities and Controls

1.3 Quality Assurance

A. Inspection: Conduct daily inspection, and more often if necessary, to verify that requirements of cleanliness are being met.

B. Codes and Standards: In addition to the requirements specified herein, comply with pertinent requirements of authorities having jurisdiction.

PART 2 – PRODUCTS

2.1 Cleaning Materials and Equipment

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.2 Compatibility

A. Use cleaning materials and equipment that are compatible with the surfaces being cleaned, as recommended by the manufacturer of the material to be cleaned.

PART 3 – EXECUTION

3.1 Progress Cleaning

A. General:
   1. Retain stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
   2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this work. Debris shall be removed from the site and disposed of in a lawful manner. Disposal receipts or dump tickets shall be furnished to Architect upon request.
   3. At least twice each month, and more often if necessary, remove scrap debris, and waste material from the job site.

4. Provide adequate storage for items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

B. Site:

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove items to the place designated for their storage. Flammable waste shall be kept in sealed metal containers until removed from the site.
2. Weekly, and more often if necessary, inspect, arrangements of materials stored on the site; restack, tidy, or otherwise service arrangements to meet the requirements specified above.
3. Maintain the site in a neat and orderly condition.

C. Structures:
1. Weekly, and more often if necessary, inspect the structures and pick up scrap, debris, and waste material. Remove items to the place designated for their storage.
2. Weekly, and more often if necessary, sweep interior spaces clean.
   a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and a handheld broom, i.e., "broom-clean".
3. As required preparatory to installation of succeeding materials, clean the structures of pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the required cleanliness.
4. Following the installation of finish floor materials, clean the finish floor daily, and more often if necessary, and while work is being performed in the space in which finish materials have been installed.
   a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material that, in the opinion of the Architect, may be injurious to the finish floor material, i.e., "vacuum-clean".

C. General: The General Conditions require general cleaning during construction. Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste, conduct final progress cleaning as described below.

D. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions. Unless otherwise specifically directed by the Architect, water and broom clean paved areas on the site and public paved areas directly adjacent to the site. Remove resultant debris

F. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
1. Remove labels that are not permanent labels.

2. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision- obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

G. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces. Sweep and mop vinyl and rubber surfaces.

H. Structures:
1. Exterior: In areas affected by the work under this contract, visually inspect exterior surfaces and remove traces of soil, waste material, smudges, and other foreign matter. Remove traces of splashed material from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure.
2. In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the County.

I. Interior: In areas affected by the work under this contract, visually inspect interior surfaces and remove traces of soil waste material, smudges, and other foreign matter. Remove traces of splashed materials from adjacent surfaces. Remove paint drippings, spots, stains, and dirt from finished surfaces. Use only the cleaning materials and equipment instructed by the manufacturer of the surface material.

J. Glass: Clean glass inside and outside.

K. Polished surfaces: On surfaces requiring the routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished. Glossy surfaces shall be cleaned and shined as intended by the manufacturer
1. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
2. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

L. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.

M. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

N. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the County's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

O. Extra Materials: Where extra materials of value remain after completion of associated Work, they become the County's property. Dispose of these materials as directed by the Owner.

P. Timing: Schedule final cleaning as accepted by the Architect to enable the County to accept a completely clean project.

Q. Cleaning During County's Occupancy
   1. Should the County occupy the work or any portion thereof prior to its completion by the Contractor and acceptance by the County, responsibilities for interim and final cleaning of the occupied spaces shall be determined by the Architect in accordance with the General Conditions of the Contract.

- End of Section -

01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection procedures.
   2. Final Completion.
   3. Warranties.
   4. Final cleaning.
   5. Repair of work.

B. See Section 01 29 00 "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.

C. See Section 01 78 39 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

D. See Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

E. See Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.

F. See Divisions 02 through 48 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
15. Successful completion of Functional Testing for equipment requiring LDD Commissioning.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
   2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit electronic versions of list (including editable file and PDF file). Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Submit list of incomplete items in the following format:
      a. MS Excel electronic file. Architect, though Construction Manager, will retune annotate copy.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
   1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8- 1/2-by-11-inch paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
        1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
r. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

-END OF SECTION-

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01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Emergency manuals.
   2. Operation manuals for systems, subsystems, and equipment.
   3. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.

B. See Divisions 02 through 48 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 SUBMITTALS

A. Manual: Submit one copy of each manual in final form at least fifteen (15) days before final inspection. At discretion of Architect, initial submittals may be as PDF files with both hard copies and PDF files of final version. Architect will return copy with comments within fifteen (15) days after final inspection.
   1. Correct or modify each manual to comply with Architect's comments. Submit three (3) copies of each corrected manual within fifteen (15) days of receipt of Architect's comments.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name, address, and telephone number of Contractor.
   6. Name and address of Architect.
   7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280- mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for type of emergency, emergency instructions, and emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for fire, gas leak, water leak, power failure, water outage, equipment failure, and chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.

B. Descriptions: Include the following:
1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross- reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:

D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions, and demonstration and training videotape if available, that detail essential maintenance procedures:

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
   1. Do not use original Project Record Documents as part of operation and maintenance manuals.

F. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

-END OF SECTION-

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01 78 36 -
WARRANTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for preparing warranties of products and installation.

B. All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:
1. General Conditions, including, without limitation, Warranty/Guarantee Information;
2. Special Conditions.

1.2 SUBMITTALS

A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.

B. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list title of Project.

C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier, and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the product or work item is specified.

D. Contractor shall separate each warranty with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible Subcontractor(s), supplier(s), and/or manufacturer(s), with name, address, and telephone number of each responsible principal(s).

1.3 PREPARATION:

A. Contractor shall obtain warranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within ten (10) days after completion of the applicable item or work. Except for items put into use with City's permission, Contractor shall leave date of beginning of time of warranty until the date of completion is determined.

B. Contractor shall verify that documents are in proper form, contain full information, and are notarized, when required.

C. Contractor shall co-execute submittals when required.

D. Contractor shall retain warranties until time specified for submittal.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

F. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

-END OF SECTION-

01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
   1. Record Drawings.
   2. Record Specifications.

B. See Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

C. See Divisions 02 through 48 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.2 SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Submit copies of Record Drawings as follows:
      a. Initial Submittal: Submit one copy of marked-up Record Prints for review. Architect will initial and date each sheet and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return prints for organizing into sets, printing, binding, and final submittal.
      b. Final Submittal: Submit one set of the marked-up Record Prints, and the following:
         1) PDF file of complete set of record drawings.
         2) Record CAD Drawing Files and Plots.

B. Record Specifications: Submit copy of Project's Specifications, including addenda and contract modifications.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints (Progress): Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
   1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, RFI numbers and similar identification, where applicable. **Clearly mark revisions made to original documents – listing reference documents is not sufficient.**

B. Record Prints (Final): Immediately before inspection for Certificate of Substantial Completion, review marked-up progress Record Prints with Architect. When authorized, prepare a full set of corrected copies of the Contract Drawings and Shop Drawings.
1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
2. Refer instances of uncertainty to Architect for resolution.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets. Provide PDF file of full set of record documents.
2. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
3. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect.
   e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. Note related Change Orders, RFIs and Record Drawings where applicable (including revisions made not just referenced document number).

2.3 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference. Miscellaneous records include, but are not limited to, the following:
1. Field records on underground construction and similar work.
2. Surveys showing locations and elevations of underground lines.
3. Invert elevations of drainage piping.
4. Surveys establishing building lines and levels.
5. Authorized measurements using unit prices or allowances.
6. Records of plant treatment.
7. Ambient and substrate condition tests.
8. Certifications received in lieu of labels on bulk products.
9. Batch mixing and bulk delivery records.
10. Testing and qualification of trade persons.
11. Documented qualification of installation firms.
12. Load and performance testing.
13. Inspections and certifications by governing authorities.
14. Final inspection and correction

procedures PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

-END OF SECTION-

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01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Demonstration and training DVD’s/digital storage device.

B. See Divisions 02 through 48 for specific requirements for demonstration and training for products in those Sections.

1.2 SUBMITTALS

A. Instruction Program: Submit two (2) copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

B. Demonstration and Training DVD’s/digital storage device: Submit two (2) copies within seven (7) days of end of each training module.

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Pre-instruction Conference: Conduct conference at Project site. Review methods and procedures related to demonstration and training.

D. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
   1. Building Energy Management System.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
   1. Basis of System Design, Operational Requirements, and Criteria: Include system and equipment descriptions, operating standards, regulatory requirements, equipment function, operating characteristics, limiting conditions, and performance curves.
   2. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
   3. Emergencies: Include instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings, trouble indications, and error messages; and required sequences for electric or electronic systems.
   4. Operations: Include startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
   5. Adjustments: Include alignments and checking, noise, vibration, economy, and efficiency adjustments.
   6. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
   7. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
   8. Repairs: Include diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish an instructor to describe Owner's operational philosophy.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

3.2 DEMONSTRATION AND TRAINING VIDEOTAPES

A. General: Engage a qualified commercial photographer to record demonstration and training videos. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
   1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Media Format: Provide high-quality Digital Videos Discs (DVD's) or digital storage device (per the preference of the Owner).

C. Narration: Describe scenes on video by audio narration by microphone while video is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

-END OF SECTION-

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01 81 13 - SUSTAINABLE CONSTRUCTION REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

A. The Design Professional has selected materials and utilized integrated design processes that achieve the Owner's objectives. Contractor is responsible to maintain and support these objectives in developing means and methods for performing work and in proposing product substitutions or changes to specified processes. Obtain approval from Owner for all changes and substitutions to materials or processes. Proposed changes must meet, or exceed, materials or processes specified.

1.02 RELATED WORK

A. All sections listed in the Table of Contents are a Condition of this Section.

1.03 DEFINITIONS

A. Recycled Content: Recycled content of materials is defined according to Federal Trade Commission Guides for the Use of Environmental Marketing Claims (16 CFR Part 260). Recycled content value of a material assembly is determined by weight. Recycled fraction of assembly is multiplied by cost of assembly to determine recycled content value.

1. "Post-Consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.

2. "Pre-Consumer" material is defined as material diverted from waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

B. Bio-based Products: Bio-based products are derived from plants and other renewable agricultural, marine, and forestry materials and provide an alternative to conventional petroleum derived products. Bio-based products include diverse categories such as lubricants, cleaning products, inks, fertilizers, and bio-plastics.

C. Low Pollutant-Emitting Materials: Materials and products which are minimally odorous, irritating, or harmful to comfort and well-being of installers and occupants.

D. Volatile Organic Compounds (VOC): Chemicals that are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects.

1.04 REFERENCE STANDARDS

A. U.S. Department of Agriculture BioPreferred program (USDA BioPreferred).

B. U.S. Environmental Protection Agency Comprehensive Procurement Guidelines (CPG).

C. U.S. Environmental Protection Agency WaterSense Program (WaterSense).

D. U.S. Environmental Protection Agency ENERGY STAR Program (ENERGY STAR).

E. U. S. Department of Energy Federal Energy Management Program (FEMP).

F. Green Electronic Council EPEAT Program (EPEAT).

1.05 SUBMITTALS

A. All submittals to be provided by contractor to Owner's Representative.

B. Sustainability Action Plan:

1. Submit documentation as required by this section; provide additional copies of typical submittals required under technical sections when sustainable construction requires copies of record submittals.

2. Within 30 days after Preconstruction Meeting provide a narrative plan for complying with requirements stipulated within this section.

3. Sustainability Action Plan must:

a. Make reference to sustainable construction submittals defined by this section.

b. Address all items listed under PERFORMANCE CRITERIA.

c. Indicate individual(s) responsible for implementing the plan.

C. Low Pollutant-Emitting Materials Tracking Spreadsheet: Within 30 days after Preconstruction Meeting provide a preliminary Low Pollutant-Emitting Materials Tracking Spreadsheet. The Low Pollutant-Emitting Materials Tracking Spreadsheet must be an electronic file and include all materials on Project in categories described under Low Pollutant-Emitting Materials.

D. Construction Indoor Air Quality (IAQ) Management Plan:

1. Not more than 30 days after Preconstruction Meeting provide a Construction IAQ Management Plan as an electronic file including descriptions of the following:

a. Instruction procedures for meeting or exceeding minimum requirements of ANSI/SMACNA 008-2008, Chapter 3, including procedures for HVAC Protection, Source Control, Pathway Interruption, Housekeeping, and Scheduling.

b. Instruction procedures for protecting absorptive materials stored on-site or installed from moisture damage.

c. Schedule of submission of photographs of on-site construction IAQ management measures such as protection of ducts and on-site stored oil installed absorptive materials.

d. Instruction procedures if air handlers must be used during construction, including a description of filtration media to be used at each return air grille.

e. Instruction procedure for replacing all air-filtration media immediately prior to occupancy after completion of construction, including a description of filtration media to be used at each air handling or air supply unit.

f. Instruction procedures and schedule for implementing building flush-out.

E. Product Submittals:

1. Recycled Content: Submit product data from manufacturer indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content (excluding MEP systems equipment and components).

2. Bio-based Content: Submit product data for products to be installed or used which are included in any of the USDA BioPreferred program's product categories. Data to include percentage of bio-based content and source of bio-based material.

3. Low Pollutant-Emitting Materials: Submit product data confirming compliance with relevant requirements for all materials on Project in categories described under Low Pollutant-Emitting Materials.

4. For applicable products and equipment, submit product documentation confirming ENERGY STAR label, FEMP certification, WaterSense, and/or EPEAT certification.

5. Refer to the Checklist LEED v4 for Core and Shell for mandatory credits – Attached at the end of this specification section.

F. Sustainable Construction Progress Reports: Concurrent with each Application for Payment, submit a Sustainable Construction Progress Report to confirm adherence with Sustainability Action Plan.

1. Include narratives of revised strategies for bringing work progress into compliance with plan and product submittal data.

2. Include updated and current Low Pollutant-Emitting Materials Tracking Spreadsheet.

3. Include construction waste tracking, in tons or cubic yards, including waste description, whether diverted or landfilled, hauler, and percent diverted for comingled quantities; and excluding land-clearing debris and soil. Provide haul receipts and documentation of diverted percentages for comingled wastes.

G. Close-out Submittals: Within 14 days after Substantial Completion provide the following:

1. Final version of Low Pollutant-Emitting Materials Tracking Spreadsheet.

2. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for filtration media installed at return air grilles during construction if permanently installed air handling units are used during construction.

3. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for final filtration media in air handling units.

4. Minimum 18 construction photographs including six photographs taken on three different occasions during construction of ANSI/SMACNA 008-2008, Chapter 3 approaches employed, along with a brief description of each approach, documenting implementation of IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.

5. Flush-out Documentation:

   a. Product data for filtration media used during flush-out.

   b. Product data for filtration media installed immediately prior to occupancy.

   c. Signed statement describing building air flush-out procedures including dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.

1.06 QUALITY ASSURANCE

A. Preconstruction Meeting: After award of Contract and prior to commencement of Work, schedule and conduct meeting with the Owner's Representative and Architect to discuss the Project Sustainable Action Plan content as it applies to submittals, project delivery, required Construction Indoor Air Quality (IAQ) Management Plan, and other Sustainable Construction Requirements. The purpose of this meeting is to develop a mutual understanding of the Sustainable Construction Requirements and coordination of contractor's management of these requirements with the Owner's Representative and the Construction Quality Manager.

B. Construction Job Conferences: Status of compliance with Sustainable Construction Requirements of these specifications will be an agenda item at regular job meetings conducted during the course of work at the site.

1.07 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. Green Seal Standard GS-11, Paints, Edition 3.2, October 26, 2015.

C. Green Seal Standard GS-36, Commercial Adhesives, July 12, 2013.

D. Green Seal Standard GS-54, Architectural Thermal Insulation Materials, Edition 1.1, June 29, 2017.

E. South Coast Air Quality Management District (SCAQMD) Rule 403, Fugitive Dust, rule and amendments in effect up to June 3, 2005.

F. South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rule and amendments in effect up to February 5, 2016.

G. South Coast Air Quality Management District (SCAQMD) Rule 1168, Adhesive and Sealant Applications, rule and amendments in effect up to date of October 6, 2017.

H. Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition (ANSI/SMACNA 008-2008), Chapter 3.

I. California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, Emission Testing method for California Specification 01350 (CDPH Standard Method V1.1-2010).

J. Federal Trade Commission Guides for the Use of Environmental Marketing Claims (16 CFR Part 260).

K. ASHRAE Standard 52.2-2017.

PART 2 PRODUCTS

2.01 PERFORMANCE CRITERIA

A. Construction waste diversion from landfill disposal must comprise at least 50 percent of total construction waste, excluding land clearing debris and soil. Alternative daily cover (ADC) does not qualify as material diverted from disposal.

B. Low Pollutant-Emitting Materials:

1. Adhesives, sealants and sealant primers applied on site within the weatherproofing membrane must comply with VOC limits of SCAQMD Rule 1168:

Flooring Adhesives and Sealants:

1) Indoor carpet adhesives: 50 g/L.

2) Wood Flooring Adhesive: 100 g/L.

3) Rubber Floor Adhesives: 60 g/L.

4) Subfloor Adhesives: 50 g/L.

5) Ceramic Tile Adhesives and Grout: 65 g/L.

6) Cove Base Adhesives: 50 g/L.

7) Multipurpose Construction Adhesives: 70 g/L.

8) Porous Material (Except Wood) Substrate: 50 g/L.

9) Wood Substrate: 30 g/L.

10) Architectural Non-Porous Sealant Primer: 250 g/L.

11) Architectural Porous Sealant Primer: 775 g/L.

12) Other Sealant Primer: 750 g/L.

13) Structural Wood Member Adhesive: 140 g/L.

14) Sheet-Applied Rubber Lining Operations: 850 g/L.

15) Top and Trim Adhesive: 250 g/L.

16) Architectural Sealant: 250 g/L.

17) Other Sealant: 420 g/L.

Non-Flooring Adhesives and Sealants:

1) Drywall and Panel Adhesives: 50 g/L.

2) Multipurpose Construction Adhesives: 70 g/L.

3) Structural Glazing Adhesives: 100 g/L.

4) Metal-to-Metal Substrate Adhesives: 30 g/L.

5) Plastic Foam Substrate Adhesive: 50 g/L.

6) Porous Material (Except Wood) Substrate Adhesive: 50 g/L.

7) Wood Substrate Adhesive: 30 g/L.

8) Fiberglass Substrate Adhesive: 80 g/L.

9) Architectural Non-Porous Sealant Primer: 250 g/L.

10) Architectural Porous Sealant Primer: 775 g/L.

11) Other Sealant Primer: 750 g/L.

12) PVC Welding Adhesives: 510 g/L.

13) CPVC Welding Adhesives: 490 g/L.

14) ABS Welding Adhesives: 325 g/L.

15) Plastic Cement Welding Adhesives: 250 g/L.

16) Adhesive Primer for Plastic: 550 g/L.

17) Contact Adhesive: 80 g/L.

18) Special Purpose Contact Adhesive: 250 g/L.

19) Structural Wood Member Adhesive: 140 g/L.

20) Sheet Applied Rubber Lining Operations: 850 g/L.

21) Top and Trim Adhesive: 250 g/L.

22) Architectural Sealants: 250 g/L.

23) Other Sealants: 420 g/L.

2. Aerosol adhesives applied on site within the weatherproofing membrane must comply with the following Green Seal GS-36.

   a. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent VOCs by weight

   b. Aerosol Adhesive, General-Purpose Web Spray: 55 percent VOCs by weight

   c. Special-Purpose Aerosol Adhesive (All Types): 70 percent VOCs by weight

3. Paints and coatings applied on-site within the weatherproofing membrane must comply with the following criteria:

   a. VOC content limits for paints and coatings established in Green Seal Standard GS-11.

   b. VOC content limit for anti-corrosive and anti-rust paints applied to interior ferrous metal substrates of 250 g/L established by CARB.

   c. Clear wood finishes, floor coatings, stains, primers, sealers, and shellacs applied to interior elements must not exceed VOC content limits established in SCAQMD Rule 1113.

   d. Comply with the following VOC content limits:

      1) Anti-Corrosive/Antirust Paints: 250 g/L.

      2) Clear Wood Finish, Lacquer: 550 g/L.

      3) Clear Wood Finish, Sanding Sealer: 350 g/L.

      4) Clear Wood Finish, Varnish: 350 g/L.

      5) Floor Coating: 100 g/L.

      6) Interior Flat Paint, Coating or Primer: 50 g/L.

      7) Interior Non-Flat Paint, Coating or Primer: 150 g/L.

      8) Sealers and Undercoaters: 200 g/L.

      9) Shellac, Clear: 730 g/L.

      10) Shellac, Pigmented: 550 g/L.

11) Stain: 250 g/L.

12) Clear Brushing Lacquer: 680 g/L.

13) Concrete Curing Compounds: 350 g/L.

14) Japans/Faux Finishing Coatings: 350 g/L.

15) Magnesite Cement Coatings: 450 g/L.

16) Pigmented Lacquer: 550 g/L.

17) Waterproofing Sealers: 250 g/L.

18) Wood Preservatives: 350 g/L.

19) Low-Solids Coatings: 120 g/L.

4. Carpet installed in building interior must comply with one of the following:

   a. Maximum VOC concentrations specified in CDPH Standard Method V1.1-2010, using office scenario at the 14-day time point.

5. Each non-carpet flooring element installed in building interior which is not inherently non-emitting (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) must comply with one of the following:

   a. Meet requirements of the FloorScore standard as shown with testing by an independent third-party.

   b. Maximum VOC concentrations specified in CDPH Standard Method V1.1-2010, using office scenario at 14-day time point.

6. Composite wood and agri-fiber products used within the weatherproofing membrane must contain no added urea-formaldehyde resins.

7. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agri-fiber assemblies must not contain added urea-formaldehyde.

C. Recycled Content:

1. Any products being installed or used that are listed on EPA Comprehensive Procurement Guidelines designated product list must meet or exceed the EPA's recycled content recommendations. The EPA Comprehensive Procurement Guidelines categories include:

   a. Building insulation

   b. Cement and concrete

   c. Consolidated and reprocessed latex paint

   d. Floor tiles

e. Flowable fill

f. Laminated paperboard

g. Modular threshold ramps

h. Non-pressure pipe

i. Patio blocks

j. Roofing materials

k. Restroom dividers/partitions

l. Structural fiberboard

m. Nylon carpet and nylon carpet backing

n. Compost and fertilizer made from recovered organic materials

o. Hydraulic mulch

p. Lawn edging

q. Plastic lumber landscaping timbers and posts

r. Park benches and picnic tables

s. Plastic fencing

t. Bike racks

D. Bio-based Content:

1. Materials and equipment being installed or used that are listed on the USDA Bio-Preferred program product category list must meet or exceed USDA's minimum bio-based content threshold. Refer to individual specification sections for detailed requirements applicable to that section.

   USDA Bio-Preferred program categories include:

   a. Adhesive and Mastic Removers

   b. Carpets

   c. Cleaners

   d. Composite Panels

   e. Corrosion Preventatives

   f. Erosion Control Materials

   g. Dust Suppressants

h. Fertilizers

i. Floor Cleaners and Protectors

j. Floor Coverings (Non-Carpet)

k. Glass Cleaners

l. Hydraulic Fluids

m. Industrial Cleaners

n. Interior Paints and Coatings

o. Mulch and Compost Materials

p. Multipurpose Cleaners

q. Multipurpose Lubricants

r. Packaging Films

s. Paint Removers

t. Plastic Insulating Foam

u. Pneumatic Equipment Lubricants

v. Roof Coatings

w. Wastewater Systems Coatings

x. Water Tank Coatings

y. Wood and Concrete Sealers

z. Wood and Concrete Stains

E. Materials, products, and equipment being installed which fall into a category covered by the WaterSense program must be WaterSense-labeled or meet or exceed WaterSense program performance requirements, unless disallowed for infection control reasons.

1. WaterSense categories include:

a. Bathroom Faucets

b. Commercial Toilets

c. Irrigation Controllers

d. Spray Sprinkler Bodies

e. Urinals

F. Materials, products, and equipment being installed which fall into any of the following product categories must be Energy Star-labeled.

1. Applicable Energy Star product categories as of 09/14/2017 include:

a. Appliances:

b. Air Purifiers and Cleaners

c. Dehumidifiers

Electronics and Information Technology:

a. Audio/Video Equipment

b. Computers

c. Data Center Storage

d. Digital Media Player

e. Enterprise Servers

f. Imaging Equipment

g. Monitors

h. Professional Displays

i. Set-Top and Cable Boxes

j. Telephones

k. Televisions

l. Uninterruptible Power Supplies

m. Voice over Internet Protocol (VoIP) Phones

Heating and Cooling Equipment:

a. Boilers

b. Water Heaters

c. Light Commercial Heating and Cooling Equipment

Other:

a. Decorative Light Strings

b. Electric Vehicle Supply Equipment

c. Light Bulbs

d. Light Fixtures

e. Roof Products

f. Water Coolers

g. Windows, Doors, and Skylights

G. Materials, products, and equipment being installed which fall into any of the following categories must be FEMP-designated. FEMP-designated product categories as of 09/14/2017 include:

1. Boilers (Commercial)

2. Electric Chillers, Air-Cooled (Commercial)

3. Electric Chillers, Water-Cooled (Commercial)

4. Exterior Lighting

5. Fluorescent Ballasts

6. Fluorescent Lamps, General Service

7. Industrial Lighting (High/Low Bay)

8. Light Emitting Diode (LED) Luminaires

H. Electronic products and equipment being installed which fall into any of the following categories shall be EPEAT registered. Electronic products and equipment covered by EPEAT program as of 09/14/2017 include:

1. Displays

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Construction Indoor Air Quality Management:

1. During construction, meet or exceed recommended control measures of ANSI/SMACNA 008-2008, Chapter 3.

2. Protect stored on-site and installed absorptive materials from moisture damage.

3. If permanently installed air handlers are used during construction, filtration media with a minimum efficiency reporting value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE Standard 52.2-2017 (with errata but without addenda). Replace all filtration media immediately prior to occupancy.

4. Perform building flush-out as follows:

a. After construction ends, prior to occupancy and with interior finishes installed, perform a building flush-out by supplying a total volume of 14,000 cubic feet of outdoor air per square feet of floor area while maintaining an internal temperature of at least 60 degrees Fahrenheit and a relative humidity no higher than 60 percent. OR

b. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3,500 cubic feet of outdoor air per square foot of floor area to the space. Once a space is occupied, it must be ventilated at a minimum rate of 0.30 cfm per square foot of outside air or design minimum outside air rate determined until a total of 14,000 cubic feet /square foot of outside air has been delivered to the space. During each day of flush-out period, ventilation must begin a minimum of three hours prior to occupancy and continue during occupancy.

5. Provide construction dust control to comply with SCAQMD Rule 403.

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Project Name: Grant Yard Radio Shop
Date: 04/17/2020

Y	?	N			
			Credit	Integrative Process	1

6	0	0	Location and Transportation		16
		0	Credit	LEED for Neighborhood Development Location	16
		1	Credit	Sensitive Land Protection	1
		0	Credit	High Priority Site	2
2			Credit	Surrounding Density and Diverse Uses	5
1			Credit	Access to Quality Transit	5
		0	Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

7	0	0	Sustainable Sites		10
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
2			Credit	Site Development - Protect or Restore Habitat	2
		0	Credit	Open Space	1
1			Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
1			Credit	Light Pollution Reduction	1

7	0	0	Water Efficiency		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
2			Credit	Outdoor Water Use Reduction	2
4			Credit	Indoor Water Use Reduction	6
		0	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

15	0	0	Energy and Atmosphere		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
5			Credit	Enhanced Commissioning	6
6			Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
2			Credit	Demand Response	2
		0	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
		0	Credit	Green Power and Carbon Offsets	2

5	0	0	Materials and Resources		13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
		0	Credit	Building Life-Cycle Impact Reduction	5
			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1			Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

9	0	0	Indoor Environmental Quality		16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
2			Credit	Enhanced Indoor Air Quality Strategies	2
2			Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
1			Credit	Indoor Air Quality Assessment	2
1			Credit	Thermal Comfort	1
1			Credit	Interior Lighting	2
		0	Credit	Daylight	3
		0	Credit	Quality Views	1
1			Credit	Acoustic Performance	1

1	0	0	Innovation		6
		0	Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

0	0	0	Regional Priority		4
		0	Credit	Regional Priority: Specific Credit	1
		0	Credit	Regional Priority: Specific Credit	1
		0	Credit	Regional Priority: Specific Credit	1
		0	Credit	Regional Priority: Specific Credit	1

50	0	0	TOTALS	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

END OF SECTION

01 91 00 - GENERAL COMMISSIONING REQUIRMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to County are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
   4. Verify that the County's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

1.2 RELATED REQUIREMENTS

A. Section 01 77 00 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

PART 2 – PRODUCTS

2.1 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of County.

B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
   1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
   2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.

3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to County; such equipment, tools, and instruments are to become the property of County.

D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of County.

PART 3 – EXECUTION

3.1 COMMISSIONING PLAN

A. Commissioning Authority has prepared the Commissioning Plan.
1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:
1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.2 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority.

3.3 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
   1. No sampling of identical or near-identical items is allowed.
   2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
   3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
      a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
      b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
      c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
      d. Serial number of installed unit.
      e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
      f. Sensor and actuator calibration information.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
   1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
   2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
   3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
   4. If any Checklist line item is not relevant, record reasons on the form.
   5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.

6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
7. Submit completed Checklists to Commissioning Authority within two days of completion.

C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
4. When asked to review the proposed Checklists, do so in a timely manner.

D. Commissioning Authority Witnessing: Required for:
1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
2. A sampling of non-primary equipment, as allowed by the commissioning plan.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to County.
1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.4 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to County; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the

Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.

3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
4. Contractor shall bear the cost of County and Commissioning Authority personnel time witnessing re-testing.
5. Contractor shall bear the cost of County and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:
   1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
   2. Examples of Functional Testing:
      a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
      b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
      c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
      d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.5 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this

piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:
   1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
   2. Verify that sensors with shielded cable are grounded only at one end.
   3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
   4. Tolerances for critical applications may be tighter.

D. Sensors Without Transmitters - Standard Application:
   1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
   2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument- measured value.
   3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.
   1. Disconnect sensor.
   2. Connect a signal generator in place of sensor.
   3. Connect ammeter in series between transmitter and building automation system control panel.
   4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
   5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
   6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
   7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
   8. Reconnect sensor.
   9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
   10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument- measured value.
   11. If not, replace sensor and repeat.
   12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:

1. Watthour, Voltage, Amperage: 1 percent of design.
2. Pressure, Air, Water, Gas: 3 percent of design.
3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
4. Relative Humidity: 4 percent of design.
5. Barometric Pressure: 0.1 inch of Hg.
6. Flow Rate, Air: 10 percent of design.
7. Flow Rate, Water: 4 percent of design.
8. AHU Wet Bulb and Dew Point: 2.0 degrees F.

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

3.6 TEST PROCEDURES – GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
2. Sampling is not allowed for:
a. Major equipment.

b. Life-safety-critical equipment.
c. Prefunctional Checklist execution.

3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
7. If YY percent of the units in the second sample fail, test all remaining identical units.
8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority’s request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
2. Other points will be monitored by the Commissioning Authority using dataloggers.
3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.

4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
5. Graphical output is desirable and is required for all output if the system can produce it.
6. Monitoring may be used to augment manual testing.

3.7 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 77 00 - Closeout Submittals for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to County.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to County.

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ROCKRIDGE GEOTECHNICAL

Prepared for **The KPA Group**

GEOTECHNICAL INVESTIGATION
PROPOSED GRANT ROAD RADIO SHOP
752 CHESTNUT STREET
REDWOOD CITY, CALIFORNIA

May 17, 2020
Project No. 20-1835

270 Grand Avenue
Oakland, CA 94610

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ROCKRIDGE GEOTECHNICAL

May 17, 2020
Project No. 20-1835

Mr. Paul Powers
The KPA Group
6700 Koll Center Parkway, Suite 125
Pleasanton, CA 94566

Subject: Final Report
Geotechnical Investigation
Proposed Grant Yard Radio Shop
752 Chestnut Street
Redwood City, California

Dear Mr. Powers:

We are pleased to present our final geotechnical report, dated May 17, 2020, for the proposed County of San Mateo Grant Yard radio shop at 752 Chestnut Street in Redwood City. This report was prepared in accordance with our in our agreement with The KPA Group dated March 3, 2020.

The project site is in the southwestern corner of the County of San Mateo Grant Corporation Yard. It is currently occupied by the existing one-story Road Department, Agricultural/Weight and Measures building and asphalt and concrete pavement. The site is bordered by an existing open bay vehicle storage building to the north, an apartment complex to the south, Chestnut Street to the west, and a paved area to the east that is used for parking and storage.

Plans are to demolish the existing building and construct a new Radio Shop building that will be a two-story, at-grade building with plan dimensions of approximately 91 by 98 feet. The new building will be a pre-engineered (Type II-B) building with space for vehicle and other storage, a shop, a break room on the ground floor and offices on the second floor. Other proposed site improvements include new landscaping, irrigation, and new pavements.

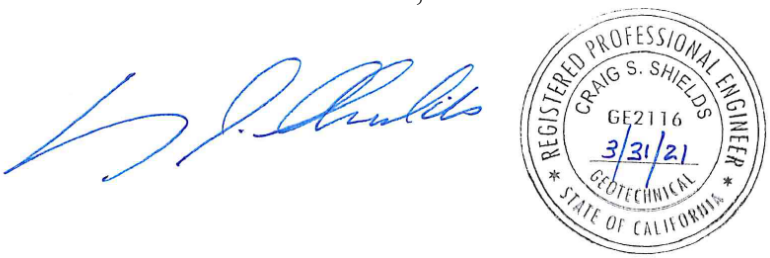
From a geotechnical standpoint, we conclude the proposed radio shop building can be constructed as planned, provided the recommendations presented in this report are incorporated into the project plans and specifications and implemented during construction. The primary geotechnical concern for the project is the presence of highly to very highly expansive near-surface soil. We conclude the native alluvium underlying

the site has adequate strength to support the proposed building on shallow foundations without excessive settlement under static and seismic loads. We estimate total settlement of the proposed two-story structure supported on spread footings will be less than about 1/2 inch and differential settlement will be less than about 1/4 inch over a horizontal distance of 30 feet. As discussed herein, the building may experience up to an additional 1/2 inch of seismically induced settlement due to post-liquefaction reconsolidation following a major earthquake.

The recommendations contained in our report are based on a limited subsurface exploration. Consequently, variations between expected and actual subsurface conditions may be found in localized areas during construction. Therefore, we should be engaged to observe grading and shoring, underpinning, and foundation installation during which time we may make changes in our recommendations, if deemed necessary.

We appreciate the opportunity to provide our services to you on this project. If you have any questions, please call.

Sincerely yours,
ROCKRIDGE GEOTECHNICAL, INC.



Craig S. Shields, P.E., G.E.
Principal Geotechnical Engineer

Enclosure

ROCKRIDGE GEOTECHNICAL

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ROCKRIDGE GEOTECHNICAL

GEOTECHNICAL INVESTIGATION
PROPOSED GRANT YARD RADIO SHOP
752 CHESTNUT STREET
Redwood City, California

1.0 INTRODUCTION

This report presents the results of the geotechnical investigation performed by Rockridge Geotechnical, Inc. for the proposed County of San Mateo Grant Yard radio shop at 752 Chestnut Street in Redwood City. The project site is on the eastern side of Chestnut Street, east of its intersection with Hilton Street, as shown on the Site Location Map, Figure 1.

The project site is in the southwestern portion of the County of San Mateo Grant Corporation Yard. It is currently occupied by the existing one-story Road Department, Agricultural/Weight and Measures building and asphalt and concrete pavement. The site is bordered by an existing open-bay vehicle storage building to the north, an apartment complex to the south, Chestnut Street to the west, and a paved area to the east that is used for parking and storage.

Plans are to demolish the existing building and construct a new Radio Shop building that will be a two-story, at-grade building with plan dimensions of approximately 91 by 98 feet. The new building will be a pre-engineered (Type II-B) building with space for vehicle and other storage, a shop, a break room on the ground floor and offices on the second floor. Other proposed site improvements include new landscaping, irrigation, and new pavements.

2.0 SCOPE OF SERVICES

Our scope of services, as outlined in our agreement with The KPA Group dated March 3, 2020, consisted of evaluating the subsurface conditions at the site by performing two cone penetration tests (CPTs), advancing two hand-auger borings, and performing laboratory testing and engineering analyses to develop conclusions and recommendations regarding:

- site seismicity and seismic hazards, including the potential for liquefaction and liquefaction-induced ground failure
- the most appropriate foundation type for the proposed building

- design criteria for the recommended foundation type, including vertical and lateral capacities
- estimates of foundation settlement
- subgrade preparation for slab-on-grade floors and concrete flatwork
- site grading and excavation, including criteria for fill quality and compaction
- flexible (asphalt concrete) and rigid (Portland cement concrete) pavement sections
- 2019 California Building Code (CBC) site class and design spectral response acceleration parameters.

3.0 FIELD INVESTIGATION

Our subsurface investigation consisted of performing two cone penetrations tests (CPTs) and advancing two hand-auger borings. Prior to performing the CPTs, we filed the required notification with the San Mateo County Environmental Health Services Division (SMCEH). We also contacted Underground Service Alert (USA) to notify them of our work, as required by law. Details of the field exploration are described in the remainder of this section.

3.1 Cone Penetration Tests

Two CPTs, designated as CPT-1 and CPT-2 were performed on May 6, 2020 by Middle Earth Geo Testing, Inc. of Orange, California, at the approximate locations shown on Figure 2, Site Plan. The CPTs were each advanced to a depth of approximately 50.5 feet below the ground surface (bgs) with a 30-ton truck-mounted rig hydraulically pushing a 1.7-inch-diameter cone-tipped probe with a projected area of 15 square centimeters into the ground. The cone-tipped probe measured tip resistance and the friction sleeve behind the cone tip measured frictional resistance. Electrical strain gauges within the cone continuously measured soil parameters for the entire depth advanced. Soil data, including tip resistance, frictional resistance, and pore water pressure, were recorded by a computer while the test was conducted. Accumulated data were processed by a computer to provide engineering information such as the soil behavior types, approximate strength characteristics, and the liquefaction potential of the soil encountered. The CPT logs, showing tip resistance, friction ratio, and pore water pressure by depth, as well as correlated soil behavior type (Robertson, 2010), are presented in Appendix A on Figures A-1 and

A-2. Upon completion, the CPT holes were backfilled with neat cement grout in accordance with SMCEH requirements.

3.2 Hand-Auger Borings

To obtain samples of the near-surface soil, we advanced two borings, designated as HA-1 and HA-2, at the approximate location shown on Figure 2. The borings were advanced to a depth of approximately five feet bgs using a three-inch-diameter hand auger. Our field geologist logged the soil encountered and collected samples at depths of about 1, 3 and 4-1/2 feet bgs for visual classification and laboratory testing. The logs of the hand-auger borings are presented in Appendix A on Figures A-3 and A-4. The soil encountered in the borings was classified in accordance with the classification chart shown on Figure A-5 in Appendix A.

3.3 Laboratory Testing

Geotechnical laboratory tests were performed on selected soil samples to assess their engineering properties and physical characteristics. Soil samples were tested by B. Hillebrandt Soils Testing, Inc. of Alamo, California to measure moisture content, plasticity (Atterberg limits), and fines content. In addition, a soil sample obtained from HA-1 at 3 feet bgs was tested by Project X Corrosion Engineering of Murrieta, California to evaluate corrosivity of the near-surface soil. The results of the laboratory tests are presented on the boring logs in Appendix A and in Appendix B.

4.0 SUBSURFACE CONDITIONS

As presented on the Regional Geologic Map (Figure 3), the site is mapped in Holocene-age alluvial deposits (Qha) (Graymer et al. 2006). The CPTs and borings indicate the site is blanketed by about 1-1/2 feet of fill consisting of medium dense to dense sand with varying clay, silt and gravel content. Below the fill is native alluvium that consists of stiff to very stiff clay that extends to a depth of about 24 feet bgs. Atterberg limit testing indicates the clayey sand fill

is highly expansive[1] with a PI of 28 and the underlying native clay is very highly expansive with a PI of 41. At a depth of approximately 24 feet bgs, a 10- to 13-foot-thick layer of granular soil consisting of sand/silty sand was encountered. The layer is mostly dense to very dense except for the upper approximately one foot, which is medium dense. The sand/silty sand layer is underlain by stiff to very stiff clay with occasional thin (i.e., less than two feet thick) layers of medium dense to dense sand/silty sand that extends to the maximum depth explored (50.5 feet bgs).

Groundwater was estimated at depths of 10 and 12.8 feet bgs in CPT-2 and CPT-1, respectively, by performing pore pressure dissipation tests with the CPT probe. To further evaluate the groundwater level at the site, we reviewed information on the State of California Water Resources Control Board GeoTracker website (http://geotracker.waterboards.ca.gov/). From the GeoTracker website, we obtained groundwater information from four monitoring wells installed in the northern portion of the Grant Corporation Yard. The data from the monitoring wells indicate the depth to groundwater in the four wells ranged from 6.4 to 9.9 feet bgs between March 12, 2003 and March 13, 2009. Based on the available groundwater data, we estimate the historic high groundwater depth at the site is about six feet bgs.

5.0 SEISMIC CONSIDERATIONS

The San Francisco Bay Area is one of the most seismically active regions in the world. The results of our evaluation regarding seismic considerations for the project site are presented in the following sections.

5.1 Regional Seismicity and Faulting

The site is located in the Coast Ranges geomorphic province of California that is characterized by northwest-southeast trending valleys and ridges. These topographic features are controlled by folds and faults that resulted from the collision of the Farallon and North American plates and subsequent strike-slip faulting along the San Andreas fault system. The San Andreas Fault is

[1] Expansive soil undergoes large volume changes with changes in moisture content (i.e. it shrinks when dried and swells when wetted.

more than 600 miles long from Point Arena in the north to the Gulf of California in the south. The Coast Ranges province is bounded on the east by the Great Valley and on the west by the Pacific Ocean.

The closest active faults in the area are the Monte Vista, San Andreas, San Gregorio and Hayward faults. These and other faults in the region are shown on Figure 4. Numerous damaging earthquakes have occurred along these faults in recorded time. For these and other active faults within a 50-kilometer radius of the site, the distance from the site and estimated characteristic moment magnitude[2] [Petersen et al. (2014) & Thompson et al. (2016)] are summarized in Table 1. These references are based on the Third Uniform California Earthquake Rupture Forecast (UCERF3), prepared by Field et al. (2013).

[2] Moment magnitude (M_w) is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

TABLE 1
Regional Faults and Seismicity

Fault Segment	Approximate Distance from Site (km)	Direction from Site	Mean Characteristic Moment Magnitude
Monte Vista - Shannon	5.6	Southwest	7.14
Total North San Andreas (SAO+SAN+SAP+SAS)	7.3	Southwest	8.04
North San Andreas (Peninsula, SAP)	7.3	Southwest	7.38
San Gregorio (North)	21	West	7.44
Total Hayward + Rodgers Creek (RC+HN+HS+HE)	23	Northeast	7.58
Hayward (South, HS)	23	Northeast	7.00
Butano	24	Southwest	6.93
Total Calaveras (CN+CC+CS+CE)	33	East	7.43
Calaveras (North, CN)	33	East	6.86
Hayward (North, HN)	33	North	6.90
Zayante-Vergeles (2011 CFM)	34	Southwest	7.48
Calaveras (Central, CC)	36	East	6.85
Hayward (Extension, HE)	38	East	6.18
Las Positas	38	East	6.50
North San Andreas (Santa Cruz Mts, SAS)	39	Southeast	7.15
Mount Diablo Thrust North CFM	42	Northeast	6.72
Mount Diablo Thrust South	42	Northeast	6.50
Mount Diablo Thrust	44	Northeast	6.67
Sargent	45	Southeast	6.71
Zayante-Vergeles	49	Southeast	7.00

Since 1800, four major earthquakes have been recorded on the San Andreas Fault. In 1836, an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale occurred east of Monterey Bay on the San Andreas Fault (Toppozada and Borchardt 1998). The estimated Moment magnitude, M_w, for this earthquake is about 6.25. In 1838, an earthquake

occurred with an estimated intensity of about VIII-IX (MM), corresponding to an M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas Fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum intensity of XI (MM), an M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The Loma Prieta Earthquake of October 17, 1989 had an M_w of 6.9 and occurred about 58 kilometers south of the site.

In 1868, an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward Fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably an M_w of about 6.5) was reported on the Calaveras Fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake ($M_w = 6.2$).

As a part of the UCERF3 project, researchers estimated that the probability of at least one $M_w \geq 6.7$ earthquake occurring in the greater San Francisco Bay Area during a 30-year period (starting in 2014) is 72 percent. The highest probabilities are assigned to sections of the Hayward (South), Calaveras (Central), and the North San Andreas (Santa Cruz Mountains) faults. The respective probabilities are approximately 25, 21 , and 17 percent.

5.2 Geologic Hazards

Because the project site is in a seismically active region, we evaluated the potential for earthquake-induced geologic hazards including ground shaking, ground surface rupture, liquefaction,[3] lateral spreading,[4] and cyclic densification[5]. We used the results of our CPTs to evaluate the potential of these phenomena occurring at the project site.

5.2.1 Ground Shaking

The seismicity of the site is governed by the activity of the San Andreas and Hayward faults, although ground shaking from future earthquakes on other faults will also be felt at the site. The ground shaking intensity felt at the project site will depend upon the characteristics of the generating fault, distance to the earthquake epicenter, and magnitude and duration of the earthquake. We judge that strong to very strong ground shaking could occur at the site during a large earthquake on one of the nearby faults.

5.2.2 Liquefaction and Liquefaction-Induced Settlement

When a saturated, cohesionless soil liquefies, it experiences a temporary loss of shear strength created by a transient rise in excess pore pressure generated by strong ground motion. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits. Flow failure, lateral spreading, differential settlement, loss of bearing strength, ground fissures and sand boils are evidence of excess pore pressure generation and liquefaction.

The site is within a liquefaction hazard zone, as shown on Figure 5 from the map titled *Earthquake Zones of Required Investigation, Palo Alto Quadrangle, California Geological*

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[3] Liquefaction is a phenomenon where loose, saturated, cohesionless soil experiences temporary reduction in strength during cyclic loading such as that produced by earthquakes.

[4] Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. Upon reaching mobilization, the surficial blocks are transported downslope or in the direction of a free face by earthquake and gravitational forces.

[5] Cyclic densification is a phenomenon in which non-saturated, cohesionless soil is compacted by earthquake vibrations, causing ground-surface settlement.

Survey, prepared by the California Geological Survey (CGS), dated October 18, 2006. Special Publication 117 by CGS (2008) recommends subsurface investigation in mapped liquefaction potential areas be performed using rotary-wash borings and/or cone penetration tests.

Our liquefaction analyses were performed using the software CLiq v3.0 (GeoLogismiki, 2019) and the methodology developed by Boulanger & Idriss (2014). CLiq uses measured field CPT data and assesses liquefaction potential given a user-defined earthquake magnitude and peak ground acceleration (PGA). Our analyses were performed assuming a high groundwater depth of five feet bgs. In accordance with the 2019 CBC, we used peak ground accelerations of 0.80 times gravity (g) in our liquefaction evaluation; this peak ground acceleration is consistent with the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration adjusted for site effects (PGA_M). We also used a Moment magnitude 8.04 earthquake, which is consistent with the mean characteristic Moment magnitude for the San Andreas Fault 1906 event, as presented in Table 1.

The results of the liquefaction analysis indicate that there are occasional thin (i.e., less than two feet thick) layers/zone of potentially liquefiable soil underlying the site. We estimate total ground surface settlement associated with liquefaction (referred to as post-liquefaction reconsolidation) following a major earthquake on a nearby fault will be 1/2 inch or less, with differential settlements less than 1/4 inch over a horizontal distance of 30 feet.

Ishihara (1985) presented empirical relationship that provides criteria that can be used to evaluate whether liquefaction-induced ground failure, such as sand boils, would be expected to occur under a given level of shaking for a liquefiable layer of given thickness overlain by a resistant, or protective, surficial layer. Our analysis indicates the non-liquefiable soil overlying the potentially liquefiable soil layers is sufficiently thick and the uppermost potentially liquefiable layers are sufficiently thin such that the potential for surface manifestations of liquefaction, such as sand boils, are very low.

Considering the relatively flat site grades, as well as the depth, thickness, and discontinuous nature of the potentially liquefiable layers, we conclude the risk of lateral spreading at the site is nil.

5.2.3 Cyclic Densification

Cyclic densification (also referred to as differential compaction) of non-saturated sand (sand above groundwater table) can occur during an earthquake, resulting in settlement of the ground surface and overlying improvements. The CPTs and hand-auger borings indicate that the soil above the groundwater table at the site is sufficiently cohesive and/or dense to resist cyclic densification. Therefore, we conclude the potential for cyclic densification at the site is very low.

5.2.4 Ground Surface Rupture

Historically, ground surface displacements closely follow the trace of geologically young faults. The site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act, and no known active or potentially active faults exist on the site. We therefore conclude the risk of fault offset at the site from a known active fault is very low. In a seismically active area, the remote possibility exists for future faulting in areas where no faults previously existed; however, we conclude the risk of surface faulting and consequent secondary ground failure from previously unknown faults is also very low.

6.0 DISCUSSION AND CONCLUSIONS

From a geotechnical standpoint, we conclude the proposed radio shop building can be constructed as planned, provided the recommendations presented in this report are incorporated into the project plans and specifications and implemented during construction. The primary geotechnical concern for the project is the presence of highly to very highly expansive near-surface soil. Our conclusions for this and other geotechnical aspects of the project are presented in this section.

6.1 Foundation and Settlement

The primary geotechnical concern for design of the foundations for the proposed structure is the presence of highly to very highly expansive near-surface soil. Expansive near-surface soil is subject to volume changes during long-term and seasonal fluctuations in moisture content. These volume changes can cause cracking of foundations and floor slabs. Therefore, the foundation and floor slab should be designed and constructed to mitigate the effects of the expansive soil. In general, these effects can be mitigated by moisture conditioning the expansive soil, providing select, non-expansive fill below interior and exterior slabs, and either supporting foundations below the zone of severe moisture change or providing a stiff, shallow foundation that can limit deformation of the superstructure as the underlying soil shrinks and swells.

We conclude the native alluvium underlying the site has adequate strength to support the proposed building on shallow foundations without excessive settlement under static and seismic loads. We estimate total settlement of the proposed two-story structure supported on spread footings will be less than about 1/2 inch and differential settlement will be less than about 1/4 inch over a horizontal distance of 30 feet. As discussed above, the building may experience up to an additional 1/2 inch of seismically induced settlement due to post-liquefaction reconsolidation following a major earthquake.

To reduce the potential for differential movement of the slab-on-grade floor for the building, we conclude the floor slab should be underlain by at least 18 inches of non-expansive material consisting of either imported select fill or lime- or cement-treated on-site soil.

6.2 Construction Considerations

If site grading is performed during the rainy season, the near-surface clay will likely be wet and will have to be dried before compaction can be achieved. Heavy rubber-tired equipment, such as scrapers and vibratory rollers, could cause excessive deflection (pumping) of the wet clay and therefore should be avoided. If the project schedule or weather conditions do not permit sufficient time for drying of the soil by aeration, the subgrade can be treated with lime prior to compaction. The appropriate amount of lime should be determined during construction based on

visual examination and, if necessary, laboratory testing of the soil to be treated. It is also important that the moisture content of subgrade soil is sufficiently high to reduce the expansion potential. If the grading work is performed during the dry season, moisture-conditioning may be required.

7.0 RECOMMENDATIONS

In accordance with our scope of services, the remainder of this report presents our recommendations for site preparation and grading, foundation support, pavement design, seismic design, and other geotechnical aspects of the project.

7.1 Site Preparation, Grading, and Fill Placement

Site demolition should include removal of vegetation and all existing pavements, foundations, and underground utilities. Any vegetation and the upper few inches of organic topsoil should be stripped in areas to receive improvements (i.e. building, pavement, or flatwork). Tree roots with a diameter greater than 1/2 inch within three feet of the building subgrade should be removed. In general, abandoned underground utilities should be removed to the property line or service connections and properly capped or plugged with concrete. Where existing utility lines are outside of the building footprint and will not interfere with the proposed construction, they may be abandoned in-place provided the lines are filled with lean concrete or cement grout to the property line. Voids resulting from demolition activities and removal of existing utilities should be properly backfilled with engineered fill following the recommendations provided in Table 2.

The upper 18 inches of soil beneath the slab-on-grade floor should consist of select fill or lime-treated onsite soil. The soil subgrade beneath proposed improvements or areas for new fill should be scarified to a depth of at least eight inches, moisture-conditioned to at least four percent above optimum moisture content, and compacted to between 87 and 92 percent relative compaction[6]. On-site soil may be used as general fill, provided the material is free of organic

[6] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557 laboratory compaction procedure.

matter, contain no rocks or lumps larger than three inches in greatest dimension, and be approved by the Geotechnical Engineer. If material to be used as fill is imported to the site, it should meet the requirements for select fill provided below in Section 7.1.1. A summary of the compaction requirements for the various types of fill that may be used at the site is presented in Table 2.

TABLE 2
Summary of Compaction Requirements

Location	Required Relative Compaction (percent)	Moisture Requirement
General fill – expansive clay	87 – 92	4+% above optimum
General fill – lime-treated clay	90+	Above optimum
General fill – select fill placed below foundation level	95+	Above optimum
General fill – select fill above foundation level	90+	Above optimum
Utility trench backfill – expansive clay	87 – 92	4+% above optimum
Utility trench backfill – low-plasticity	90+	Above optimum
Utility trench - clean sand or gravel	95+	Near optimum
Exterior slabs – expansive clay	87 – 92	4+% above optimum
Exterior slabs – low-plasticity	90+	Above optimum
Exterior slabs – select fill and AB	90+	Above optimum
Pavement subgrade –expansive clay	92+	4+% above optimum
Pavement subgrade – low-plasticity	95+	Above optimum
Pavement - aggregate base	95+	Near optimum

*Low-plasticity soil is defined as soil with a PI less than 15.
*Granular soil includes sand and gravel with less than 10 percent fines content.

If grading work is performed during the rainy season, the contractor may find the subgrade material too wet to compact to the recommended relative compaction and will have to be scarified and aerated to lower its moisture content so the specified compaction can be achieved. Material to be dried by aeration should be scarified to a depth of at least 12 inches; the scarified

soil should be turned at least twice a day to promote uniform drying. Once the moisture content of the aerated soil has been reduced to acceptable levels, the soil should be compacted in accordance with our recommendations. Aeration typically is the least costly method used to stabilize the subgrade soil; however, it generally requires the most time to complete. Other soil stabilization alternatives include overexcavating and placing drier material or lime treatment.

It is also important that the moisture content of subgrade soil is sufficiently high to reduce the expansion potential. If the grading work is performed during the dry season, moisture-conditioning may be required.

7.1.1 Select Fill

Select fill should consist of imported soil or on-site soil that is free of organic matter, contain no rocks or lumps larger than three inches in greatest dimension, have a liquid limit less than 40 and plasticity index less than 15, and be approved by the Geotechnical Engineer. Select fill should be placed in lifts not exceeding eight inches in loose thickness, moisture-conditioned to near optimum moisture content, and compacted in accordance with the compaction requirements presented in Table 2. Samples of proposed select fill material should be submitted to the Geotechnical Engineer at least three business days prior to use at the site.

Prior to importing fill to the site, the grading contractor should provide analytical test results or other suitable environmental documentation indicating the imported fill is free of hazardous materials at least three days before use at the site. If this data is not provided, a minimum of two weeks will be required to perform any necessary analytical testing.

7.1.2 Lime-Treated Soil

Lime treatment of fine-grained soils generally includes site preparation, application of lime, mixing, compaction, and curing of the lime treated soil. Field quality control measures should include checking the depth of lime treatment, degree of pulverization, lime spread rate measurement, moisture content and density measurements, and mixing efficiency.

The lime treatment process should be designed by a contractor specializing in its use and who is experienced in the application of lime in similar soil conditions. Based on our experience with lime treatment, we judge that the specialty contractor should be able to treat the highly to very highly expansive on-site material to produce a non-expansive fill for the building pad subgrades and, if desired, for exterior flatwork and pavement subgrades. For planning purposes, we recommend assuming the lime treatment will consist of five percent of Quicklime by dry weight of soil. An average dry unit weight of 110 pounds per cubic foot (pcf) should be assumed for design purposes. The specialty contractor should confirm the appropriate amount lime required to achieve low expansion potential (defined by plasticity index (PI) less than 15) and prepare a treatment specification for our review prior to construction.

Prior to lime treatment, we recommend the site be graded to a level pad elevation in accordance with our previous recommendations and all below-grade obstructions be removed. The soil treated with lime should be mixed and compacted in one lift. The lime should be thoroughly blended with the soil and allowed to set for 24 hours prior to remixing and compaction. The lime-treated soil should be moisture-conditioned to above optimum moisture content and compacted to at least 90 percent relative compaction. It should be noted that disposal of lime-treated soil is typically expensive because of the high pH of the treated soil. In addition, lime-treated soil should be completely removed from landscape areas.

7.1.3 Exterior Concrete Flatwork

We recommend that exterior flatwork and sidewalks be underlain by a minimum of eight inches of non-expansive material consisting of select fill or lime-treated on-site soil. Non-expansive soil should extend at least 12 inches beyond the slab edges, except where constrained by property lines. Select fill and the soil subgrade beneath exterior slabs-on-grade should be moisture-conditioned and compacted in accordance with the requirements provided above in Table 2.

Even with eight inches of non-expansive soil, exterior slabs may experience some cracking due to shrinking and swelling of the underlying expansive soil. Thickening the slab edges and adding additional reinforcement will control this cracking to some degree. Where slabs are

adjacent to landscaped areas, thickening the concrete edge will help control water infiltration beneath the slabs. In addition, where slabs provide access to buildings, it would be prudent to dowel the entrance to the building to permit rotation of the slab as the exterior ground shrinks and swells and to prevent a vertical offset at the entries.

7.1.4 Utility Trench Backfill

Excavations for utility trenches can be readily made with a backhoe. All trenches should conform to the current CAL-OSHA requirements. To provide uniform support, pipes or conduits should be bedded on a minimum of four inches of sand or fine gravel. After the pipes and conduits are tested, inspected (if required) and approved, they should be covered to a depth of six inches with sand or fine gravel, which should be mechanically tamped. Backfill for utility trenches and other excavations is also considered fill, and should be placed and compacted as according to the recommendations previously presented. If imported clean sand or gravel (defined as soil with less than 10 percent fines) is used as backfill, it should be compacted to at least 95 percent relative compaction. Jetting of trench backfill should not be permitted. Special care should be taken when backfilling utility trenches in pavement areas. Poor compaction may cause excessive settlements, resulting in damage to the pavement section.

Where utility trenches enter the building pad, an impermeable plug consisting of lean concrete or sand-cement slurry, at least three feet in length, should be installed. Furthermore, where sand- or gravel-backfilled trenches cross planter areas and pass below asphalt or concrete pavements, a similar plug should be placed at the edge of the pavement. The purpose of these recommendations is to reduce the potential for water to become trapped in trenches beneath the building or pavements. This trapped water can cause heaving of soils beneath slabs and softening of subgrade soil beneath pavements.

Foundations for the proposed building should be bottomed below an imaginary line extending up at a 1.5:1 (horizontal to vertical) inclination from the base of utility trenches. Alternatively, the portion of the utility trench (excluding bedding) that is below the 1.5:1 line can be backfilled with controlled low-strength material (CLSM) with a 28-day unconfined compressive strength of

at least 50 pounds per square inch (psi) or Class 2 aggregate base compacted to at least 95 percent relative compaction.

7.1.5 Drainage and Landscaping

Positive surface drainage should be provided around the building to direct surface water away from the foundations. To reduce the potential for water ponding adjacent to the building, we recommend the ground surface within a horizontal distance of five feet from the building slope down away from the buildings with a surface gradient of at least two percent in unpaved areas and one percent in paved areas. In addition, roof downspouts should be discharged into controlled drainage facilities to keep the water away from the foundations. The use of water-intensive landscaping around the perimeter of the building should be avoided to reduce the amount of water introduced to the expansive clay subgrade.

Care should be taken to minimize the potential for subsurface water to collect beneath flatwork and pavements. Where landscape beds and tree wells are immediately adjacent to pavements and flatwork that are not designed as permeable systems, we recommend vertical cutoff barriers be incorporated into the design to prevent irrigation water from saturating the subgrade and aggregate base. These barriers may consist of either flexible impermeable membranes or deepened concrete curbs.

Prior experience and industry literature indicate that some species of high water-demand7 trees can induce ground-surface settlement by drawing water from the expansive clay, causing it to shrink. Where these types of trees are planted near buildings, the ground-surface settlement may result in damage to structure. This problem usually occurs 10 or more years after planting, as the trees reach mature height. To reduce the risk of tree-induced, building settlement, we recommend trees of the following genera are not planted within 25 feet of the proposed buildings unless adequate deep irrigation is provided at the tree locations: Eucalyptus, Populus, Quercus, Crataegus, Salix, Sorbus (simple-leafed), Ulmus, Cupressus, Chamaecyparis, and

[7] "Water-demand" refers to the ability of the tree to withdraw large amounts of water from the soil subgrade, rather than soil suction exerted by the root system.

Cupressocyparis. Because this is a limited list and does not include all genera that may induce ground-surface settlement, a tree specialist should be consulted prior to selection of trees to be planted at the site.

7.2 Spread Footings

We conclude the proposed building may be supported on spread footings bottomed on stiff native clay. The perimeter wall should be supported on a continuous footing or individual spread footings connected with a grade beam. The perimeter footings and grade beam should be bottomed at least two feet below the lowest adjacent exterior soil subgrade. Interior footings should be bottomed at least 18 inches below the building pad subgrade (i.e., bottom of capillary break).

Continuous footings should be at least 16 inches wide and isolated spread footings should be at least 24 inches wide. Footings to be constructed near underground utilities should be bottomed below an imaginary line extending up at an inclination of 1.5:1 (horizontal:vertical) from the bottom of the utility trench. Footings may be designed using an allowable bearing pressure of 3,000 pounds per square foot (psf) for dead-plus-live loads; this value may be increased by one-third for total loads, including wind or seismic forces.

Lateral loads may be resisted by a combination of friction along the base of the footings and passive resistance against the vertical faces of the footings. To compute lateral resistance, we recommend using a uniform pressure of 1,500 psf for transient load conditions and an equivalent fluid weight of 260 pounds per cubic foot (pcf) for sustained load conditions; the upper foot of soil should be ignored unless confined by a slab or pavement. Frictional resistance should be computed using a base friction coefficient of 0.30. The passive pressure and frictional resistance values include a factor of safety of at least 1.5 and may be used in combination without reduction.

Footing excavations should be free of standing water, debris, and disturbed materials prior to placing concrete. The bottoms and sides of the footing excavations should be moistened following excavation and maintained in a moist condition until concrete is placed. If the

foundation soil dries during construction, the footing will eventually heave, which may result in cracking and distress. We recommend rat slabs consisting of at least two inches of controlled low-strength material (CLSM) or structural concrete be placed in the bottoms of the footing excavations to protect them from drying out, softening from ponding water and/or disturbance from foot traffic during construction. We should check footing excavations prior to placement of the rat slabs. The CLSM used to construct the rat slabs should have a minimum 28-day compressive strength of 50 psi and should be poured within two days of footing excavation.

7.3 Concrete Slab-on-Grade Floor

The concrete slab-on-grade floor for the radio shop should be at least five inches thick and should be underlain by at least 18 inches of select fill or lime-treated soil, measured below the bottom of the capillary break layer described below. The soil subgrade beneath the floor slab should be prepared in accordance with the recommendations presented in Section 7.1.

If water vapor transmission through the floor slab is undesirable, we recommend installing a capillary moisture break and a water vapor retarder beneath the floor. A capillary moisture break consists of at least four inches of clean, free-draining gravel or crushed rock. The vapor retarder should meet the requirements for Class A vapor retarders stated in ASTM E1745. The vapor retarder should be placed in accordance with the requirements of ASTM E1643. These requirements include overlapping seams by six inches, taping seams, and sealing penetrations in the vapor retarder. The particle size of the capillary break material should meet the gradation requirements presented in Table 3.

TABLE 3
Gradation Requirements for Capillary Moisture Break

Sieve Size	Percentage Passing Sieve
1 inch	90 – 100
3/4 inch	30 – 100
1/2 inch	5 – 25
3/8 inch	0 – 6

The slab should be properly cured to minimize the potential for shrinkage cracking. Concrete mixes with high water/cement (w/c) ratios result in excess water in the concrete, which increases the cure time and results in excessive vapor transmission through the slab. Where a vapor retarder is used, concrete for the slab should have a w/c ratio less than 0.45 and water should not be added in the field. If necessary, workability should be increased by adding plasticizers. Before floor coverings, if any, are placed, the contractor should check that the concrete surface and the moisture emission levels (if emission testing is required) meet the manufacturer's requirements.

7.4 Soil Corrosivity

Corrosivity tests were performed by Project X Corrosion Engineering of Murrieta, California on a soil sample obtained from Boring HA-1 at a depth of 3 feet begs. The corrosivity test results are presented in Appendix B of this report. The resistivity test results (871 ohm-cm) indicate the near-surface soil is "highly corrosive" to buried metallic structures. Accordingly, all buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric-coated steel or iron may need to be protected against corrosion depending upon the critical nature of the structure. If it is necessary to have metal in contact with soil, a corrosion engineer should be consulted to provide recommendations for corrosion protection.

The chloride ion concentration (11.9 mg/kg) is sufficiently low, such that chlorides do not pose a threat to buried metallic structures and reinforcing steel in concrete structures below ground. The results of the pH test (9.14) indicate the near-surface soil should not have an adverse effect

on buried concrete but may be detrimental to buried metal. The results also indicate the sulfate ion concentration (49.5 mg/kg) is sufficiently low such that sulfates do not to pose a threat to buried concrete.

7.5 Seismic Design

The proposed building will be designed using the 2019 CBC. The latitude and longitude of the site are 37.4838° and -122.2202°, respectively. For design in accordance with 2019 CBC (ASCE 7-16), we recommend the following:

- Site Class D
- S_S = 1.693, S_1 = 0.688

The 2019 CBC is based on the guidelines contained within ASCE 7-16 which stipulates that where S_1 is greater than 0.2 times gravity (g) for Site Class D, a ground motion hazard analysis is needed unless the seismic response coefficient (C_s) value will be calculated as outlined in Section 11.4.8, Exception 2. Assuming the C_s value will be calculated as outlined in Section 11.4.8, Exception 2, we recommend the following seismic design parameters:

- F_a = 1.0, F_v = 1.7
- S_{MS} = 1.693g, S_{M1} = 1.170g
- S_{DS} = 1.120g, S_{D1} = 0.780g
- Seismic Design Category D for Risk Categories I, II, and III.

Depending on the structural design methodology and fundamental period of the proposed building, it may be advantageous to perform a ground-motion hazard analysis (the project structural engineer should confirm). We can perform a ground-motion hazard analysis upon request.

7.6 Pavement Design

Design recommendations for asphalt concrete and Portland cement concrete pavements and concrete pavers are presented in the following sections.

7.6.1 Flexible (Asphalt Concrete) Pavement Design

The State of California flexible pavement design method was used to develop the recommended asphalt concrete pavement sections. For pavement design, we assumed a resistance value (R-value) of 5, which is appropriate for the highly expansive soil blanketing the site. Recommended pavement sections for traffic indices ranging from 4.5 to 7.0 are presented in Table 4.

TABLE 4
AC Pavement Sections

TI	Asphaltic Concrete (inches)	Class 2 Aggregate Base R = 78 (inches)
4.5	2.5	9.5
5.0	3.0	10.0
5.5	3.0	12.0
6.0	3.5	13.0
6.5	4.0	13.5
7.0	4.0	15.5

The upper six inches of the subgrade should be moisture-conditioned and compacted in accordance with requirements presented in Table 2 in Section 7.1. The aggregate base should be moisture-conditioned to near optimum and compacted to at least 95 percent relative compaction.

If pavements slope down away from irrigated landscaped areas, curbs adjacent to those areas should extend through the aggregate base and at least three inches into the underlying soil to reduce the potential for irrigation water to infiltrate into the pavement section. If drip irrigation is used in the landscaping adjacent to the pavement, however, the deepened curb is not required.

7.6.2 Rigid (Portland Cement Concrete) Pavement

Concrete pavement design is based on a maximum single-axle load of 20,000 pounds and a maximum tandem axle load of 32,000 pounds and light truck traffic (i.e., a few trucks per week). The recommended rigid pavement section for these axle loads is 6-1/2 inches of Portland cement concrete over six inches of Class 2 aggregate base. Where fire truck traffic is expected, the pavement section should consist of seven inches of Portland cement concrete over six inches of Class 2 aggregate base.

The modulus of rupture of the concrete should be at least 500 psi at 28 days. Contraction joints should be constructed at 15-foot spacing. Where the outer edge of a concrete pavement meets asphalt concrete pavement, the concrete slab should be thickened by 50 percent at a taper not to exceed a slope of 1 in 10. For areas that will receive weekly garbage truck traffic, we recommend the slab be reinforced with a minimum of No. 4 bars at 16-inch spacing in both directions. Recommendations for subgrade preparation and aggregate base compaction for concrete pavement are the same as those described above for asphalt concrete pavement.

8.0 GEOTECHNICAL SERVICES DURING CONSTRUCTION

During construction, our field engineer should provide on-site observation and testing during site preparation, placement and compaction of fill, and installation of foundations. These observations will allow us to compare actual with anticipated soil conditions and to verify that the contractor's work conforms to the geotechnical aspects of the plans and specifications.

9.0 LIMITATIONS

This geotechnical investigation has been conducted in accordance with the standard of care commonly used as state-of-practice in the profession. No other warranties are either expressed or implied. The conclusions and recommendations made in this report are based on the assumption that the subsurface conditions do not deviate appreciably from those disclosed in the exploratory CPTs and hand-auger borings. If any such deviations are encountered, we should be notified to revise our conclusions and recommendations, as necessary.

REFERENCES

2019 California Building Code

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FIGURES

Base map: Google Maps, 2020.

SMC RADIO SHOP BUILDING
752 CHESTNUT STREET
Redwood City, California

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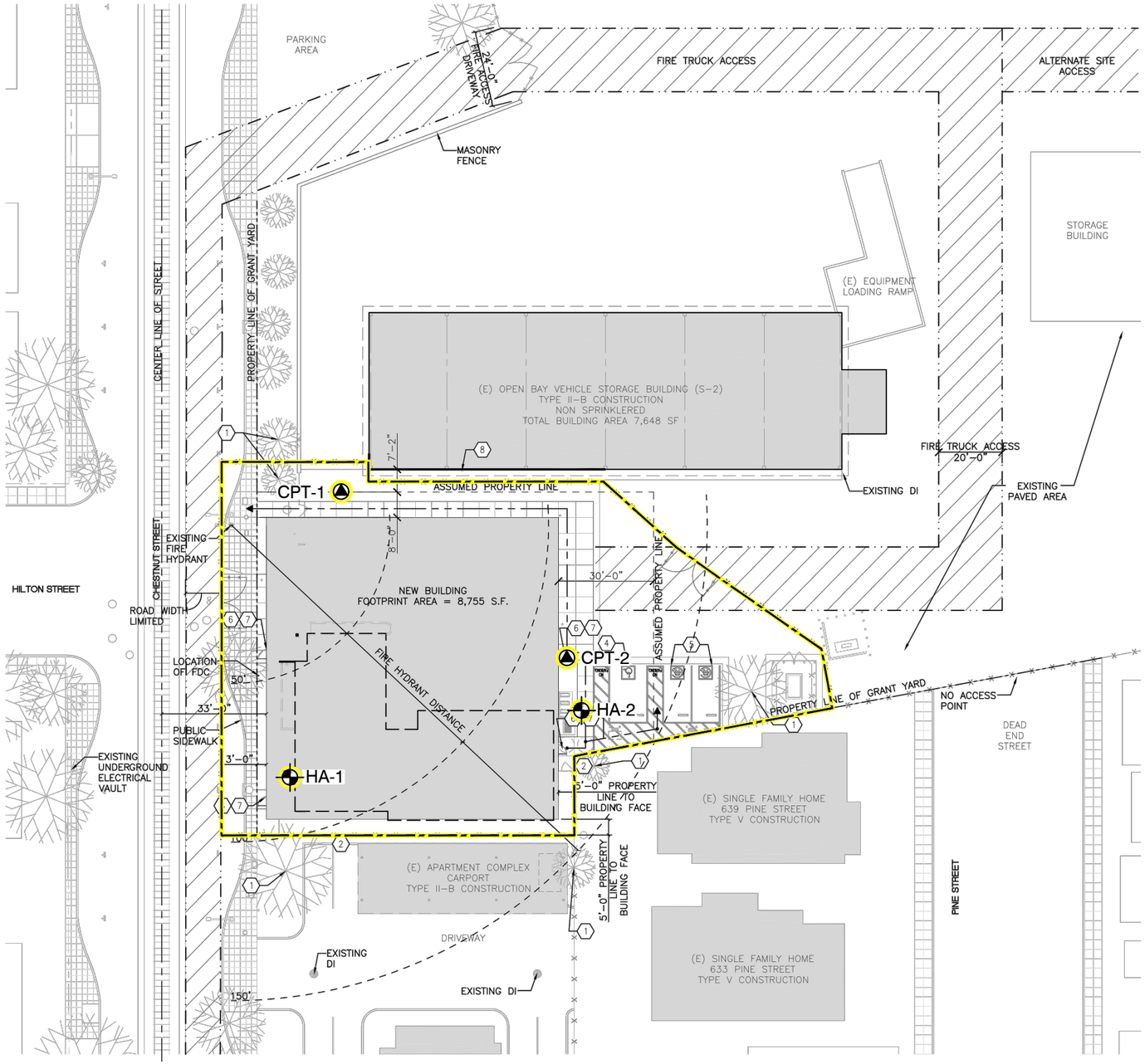
SITE LOCATION MAP

Date 05/06/20	Project No. 20-1835	Figure 1



EXPLANATION

CPT-1 — Approximate location of cone penetration test by Rockridge Geotechnical Inc., May 6, 2020

HA-1 — Approximate location of hand auger boring by Rockridge Geotechnical Inc., May 6, 2020

Project limits

0 40 Feet

Approximate scale

Reference: Base map from a drawing titled "Site Restrictions Plan", by KPA Engineers Architects, dated March 2020.

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Redwood City, California

SITE PLAN

Date 05/12/20	Project No. 20-1835	Figure 2

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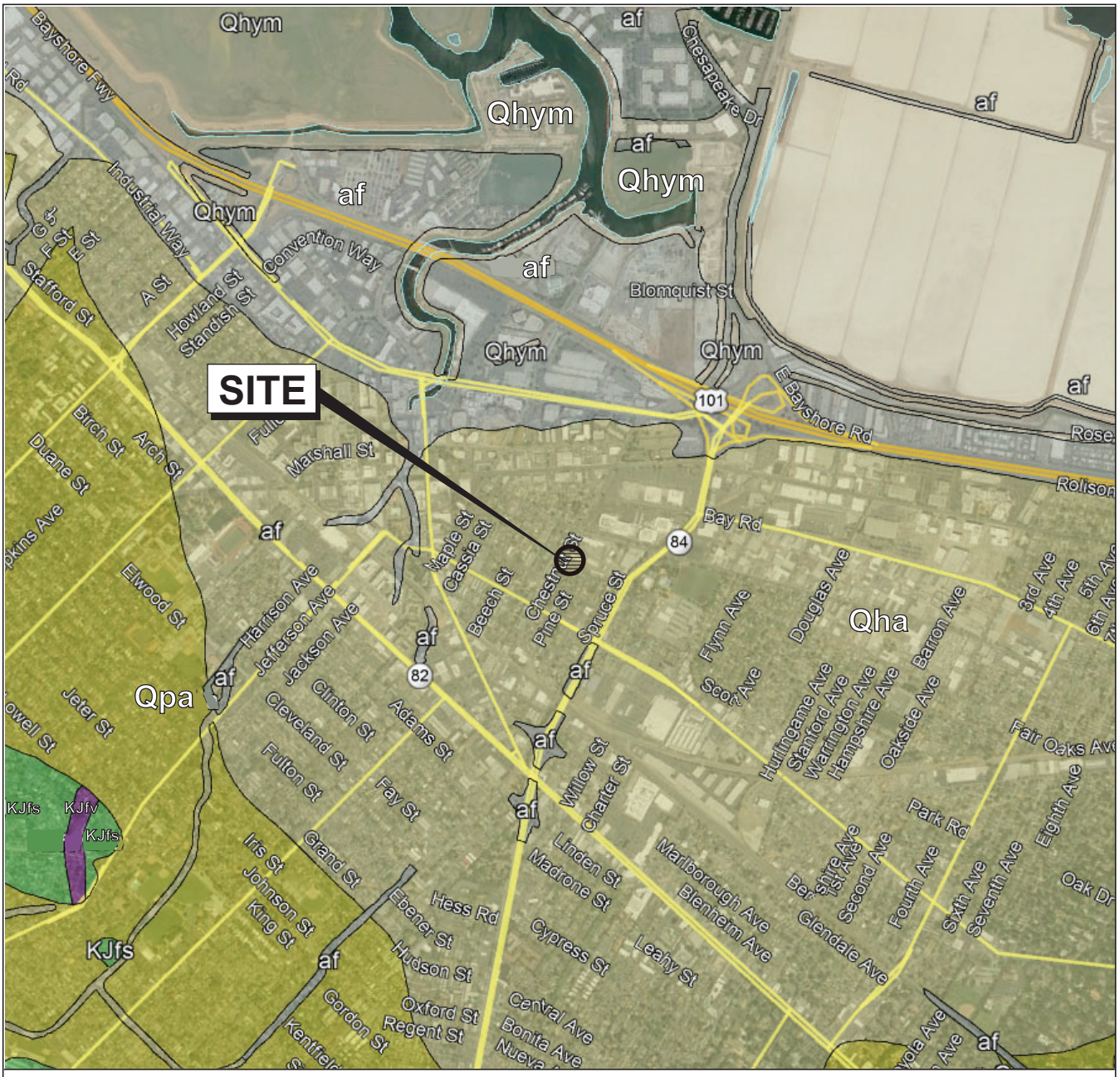

Base map: Google Earth with U.S. Geological Survey (USGS), San Mateo County, 2020.

EXPLANATION

af	Artificial Fill
Qhym	Mud deposits (late Holocene)
Qha	Alluvium (Holocene)
Qpa	Alluvium (Pleistocene)
KJfs	Franciscan Complex sedimentary rocks (Early Cretaceous and (or) Late Jurassic)
KJfv	Franciscan Complex volcanic rocks (Early Cretaceous and (or) Late Jurassic)

Geologic contact: dashed where approximate and dotted where concealed, queried where uncertain

0 2,000 4,000 Feet

Approximate scale

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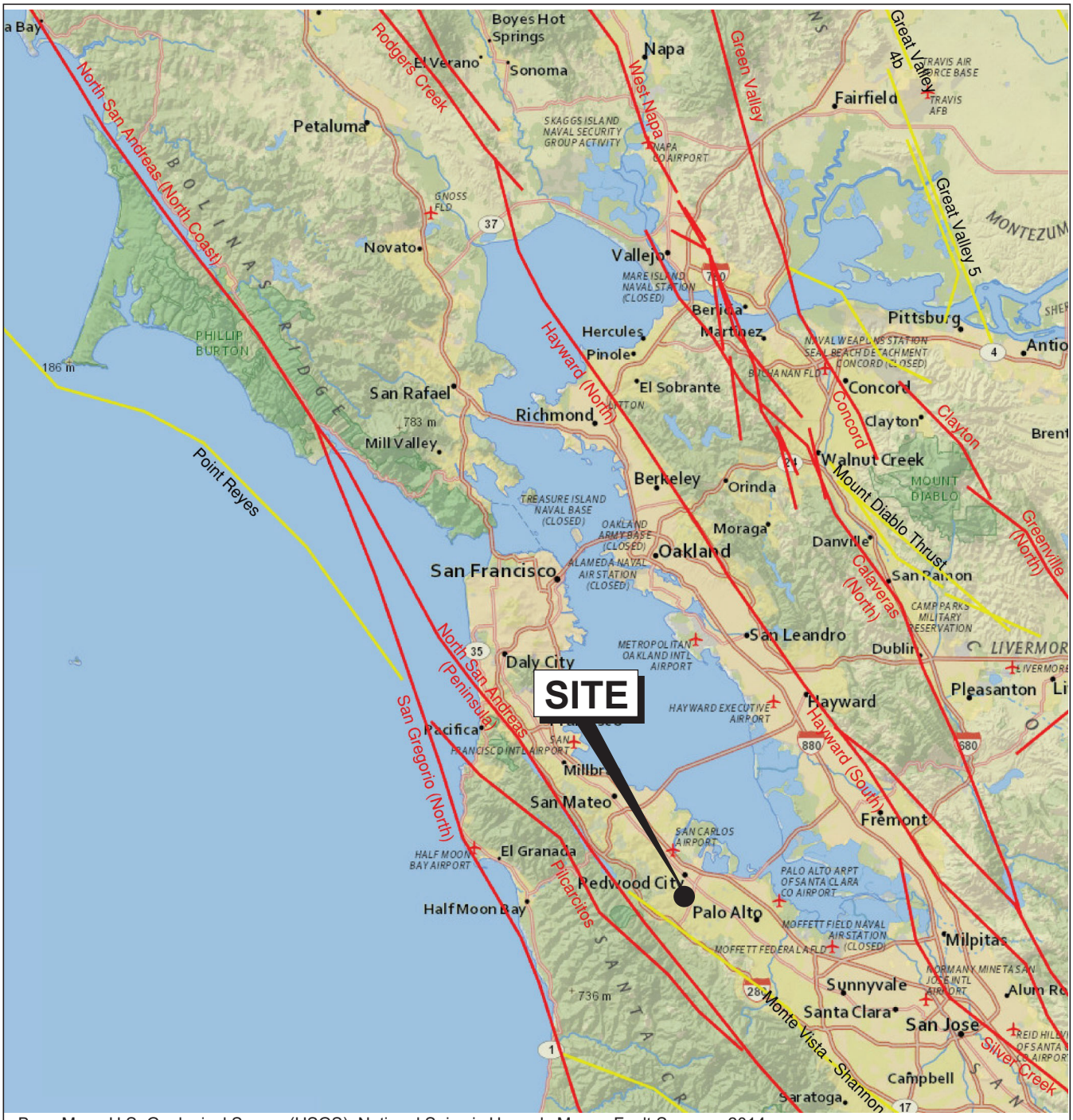
REGIONAL GEOLOGIC MAP

Date 05/12/20 | Project No. 20-1835 | Figure 3



Base Map: U.S. Geological Survey (USGS), National Seismic Hazards Maps - Fault Sources, 2014.

EXPLANATION

- Strike slip
- Thrust (Reverse)
- Normal

N

0 5 10 Miles

Approximate scale

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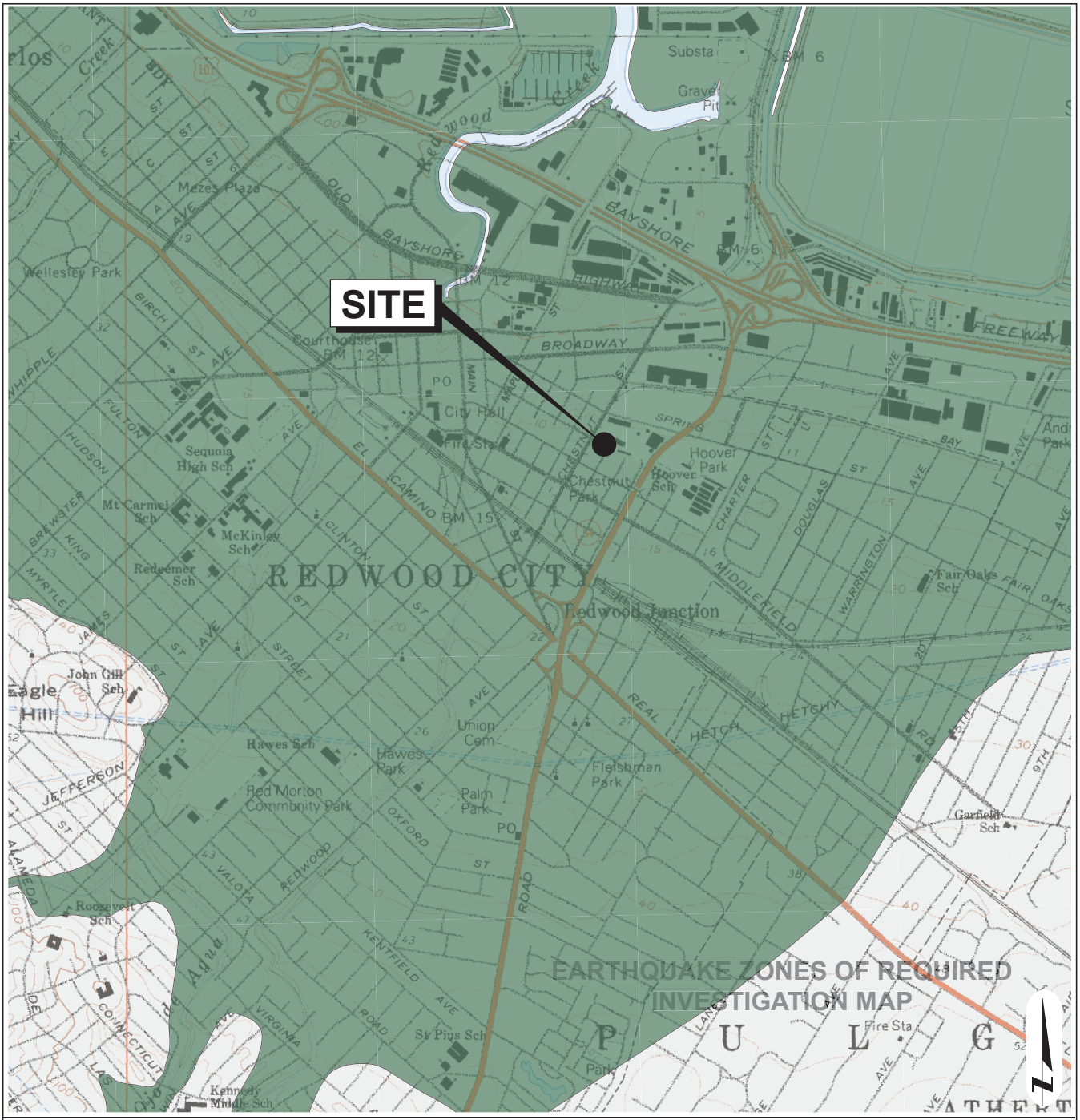
REGIONAL FAULT MAP

Date 05/06/20	Project No. 20-1835	Figure 4



Liquefaction Zones
Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslide Zones
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Reference:
Earthquake Zones of Required Investigation
Palo Alto Quadrangle
California Geological Survey
Released October 18, 2006

0 2,000 4,000 Feet
Approximate scale

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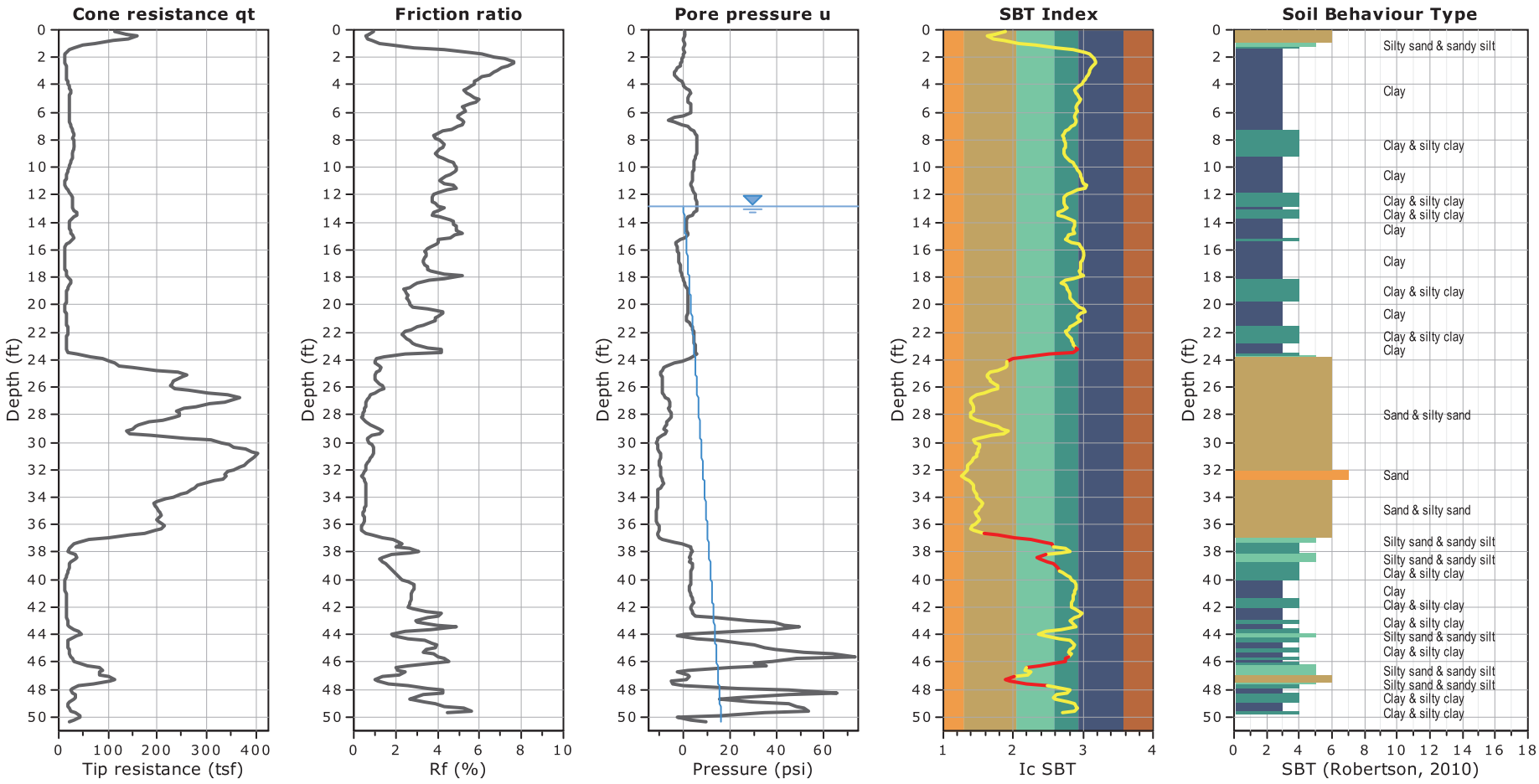
EARTHQUAKE ZONES OF REQUIRED INVESTIGATION MAP

Date 05/12/20	Project No. 20-1835	Figure 5

ROCKRIDGE GEOTECHNICAL

APPENDIX A

Cone Penetration Test Results and Hand-Auger Boring Logs



Total depth: 50.4 ft, Date: May 6, 2020
Depth to Groundwater: 12.8 feet (estimated from pore pressure dissipation test at 46.4 feet)
Cone Operator: Middle Earth Geo Testing, Inc.

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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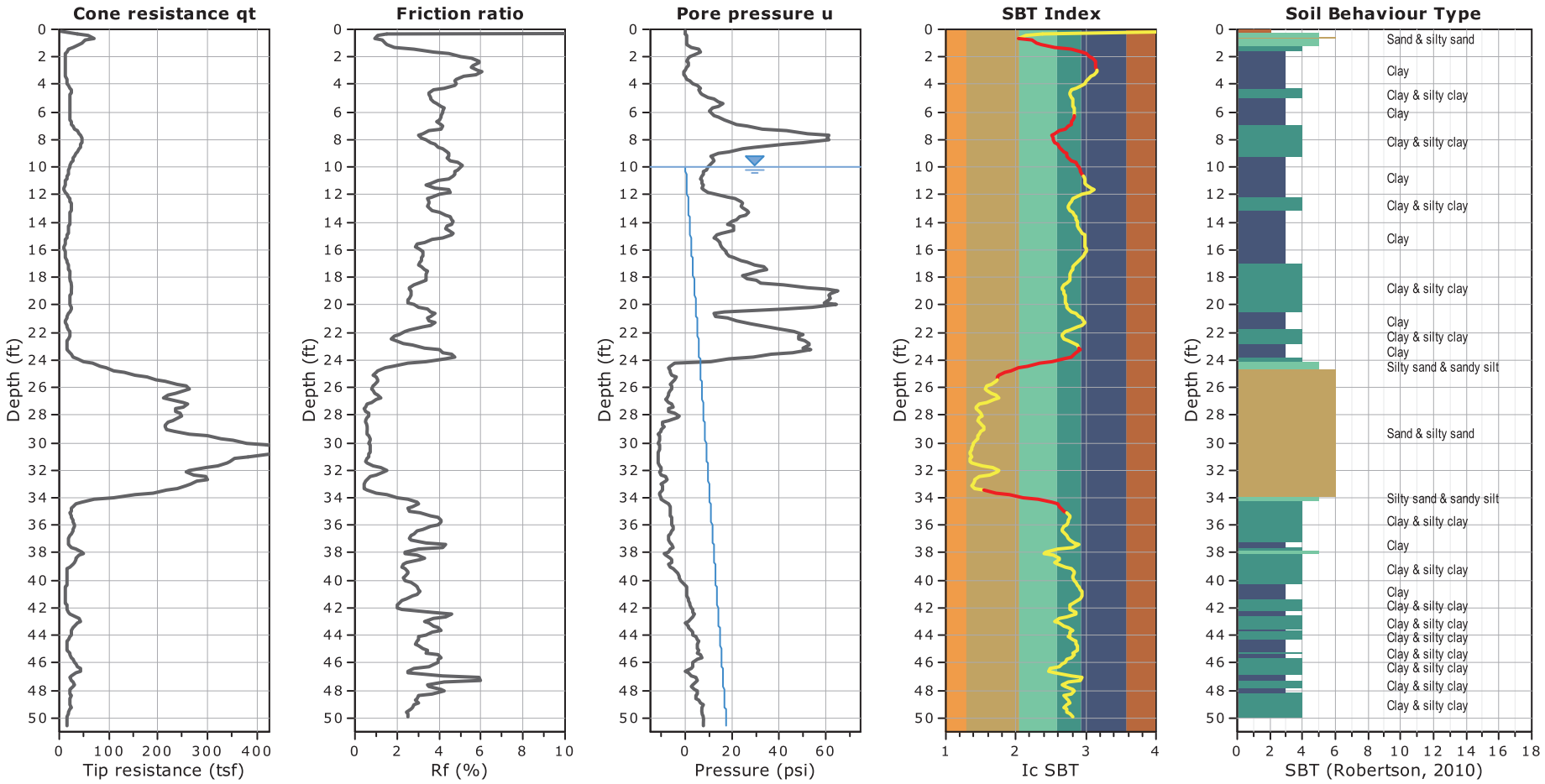
CONE PENETRATION TEST RESULTS
CPT-1

Date 05/13/20	Project No. 20-1835	Figure A-1



Total depth: 50.5 ft, Date: May 6, 2020
Depth to Groundwater: 10.0 feet (estimated from pore pressure dissipation test at 24.9 feet)
Cone Operator: Middle Earth Geo Testing, Inc.

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

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CONE PENETRATION TEST RESULTS
CPT-2

Date 05/13/20	Project No. 20-1835	Figure A-2

PROJECT: **SMC RADIO SHOP BUILDING**
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Redwood City, California

Log of Boring HA-1

Boring location: See Site Plan, Figure 2
Logged by: M. Hachey
Date started: 05/06/2020 Date finished: 05/06/2020
Drilling method: Hand-Auger
Hammer weight/drop: N/A Hammer type: N/A
Sampler: Grab

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION		LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1	GRAB	☒			SC	CLAYEY SAND (SC) gray-brown, dry	FILL						
2					CH	CLAY with SAND (CH) dark gray, moist	ALLUVIUM						
3	GRAB	☒				Corrosion Tests; see Appendix B							
4					CH	SANDY CLAY (CH) dark brown, moist							
5	GRAB	☒											
6													
7													
8													
9													
10													

Boring terminated at a depth of 5 feet below ground surface.
Boring backfilled with soil cuttings.
Groundwater not encountered during hand-augering.

ROCKRIDGE GEOTECHNICAL

Project No.: 20-1835
Figure: A-3

PROJECT:	SMC RADIO SHOP BUILDING 752 CHESTNUT STREET Redwood City, California	**Log of Boring HA-2** PAGE 1 OF 1

Boring location:	See Site Plan, Figure 2		Logged by: M. Hachey
Date started:	05/06/2020	Date finished: 05/06/2020	
Drilling method:	Hand-Auger		
Hammer weight/drop:	N/A	Hammer type: N/A	LABORATORY TEST DATA
Sampler:	Grab		

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value [1]	LITHOLOGY	MATERIAL DESCRIPTION		Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1	GRAB	☒			SC	CLAYEY SAND with GRAVEL (SC) dark brown, moist, trace roots Particle Size Distribution; see Appendix B LL = 46, PI = 28; see Appendix B	FILL				34	13.8	
2					CH	CLAY with SAND (CH) dark gray, moist, trace decayed rootets	ALLUVIUM						
3	GRAB	☒				LL = 64, PI = 41; see Appendix B						23.2	
4					CH	SANDY CLAY (CH) dark brown, increased stiffnes, moist							
5	GRAB	☒										22.1	
6													
7													
8													
9													
10													

Boring terminated at a depth of 5 feet below ground surface.
Boring backfilled with soil cuttings.
Groundwater not encountered during hand-augering.

ROCKRIDGE GEOTECHNICAL

Project No.:	Figure:
20-1835	A-4

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > no. 200 sieve size)	Gravels (More than half of coarse fraction > no. 4 sieve size)	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		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
	Sands (More than half of coarse fraction < no. 4 sieve size)	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
Fine -Grained Soils (more than half of soil < no. 200 sieve size)	Silts and Clays LL = < 50	ML	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	MH	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		PT	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel coarse fine	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
Sand coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.075 4.76 to 2.00 2.00 to 0.420 0.420 to 0.075
Silt and Clay	Below No. 200	Below 0.075

Unstabilized groundwater level

Stabilized groundwater level

SAMPLE DESIGNATIONS/SYMBOLS

Sample taken with Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter. Darkened area indicates soil recovered

Classification sample taken with Standard Penetration Test sampler

Undisturbed sample taken with thin-walled tube

Disturbed sample

Sampling attempted with no recovery

Core sample

Analytical laboratory sample

Sample taken with Direct Push sampler

Sonic

SAMPLER TYPE

C	Core barrel
CA	California split-barrel sampler with 2.5-inch outside diameter and a 1.93-inch inside diameter
D&M	Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube
O	Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube
PT	Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube
S&H	Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter
SPT	Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter
ST	Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure

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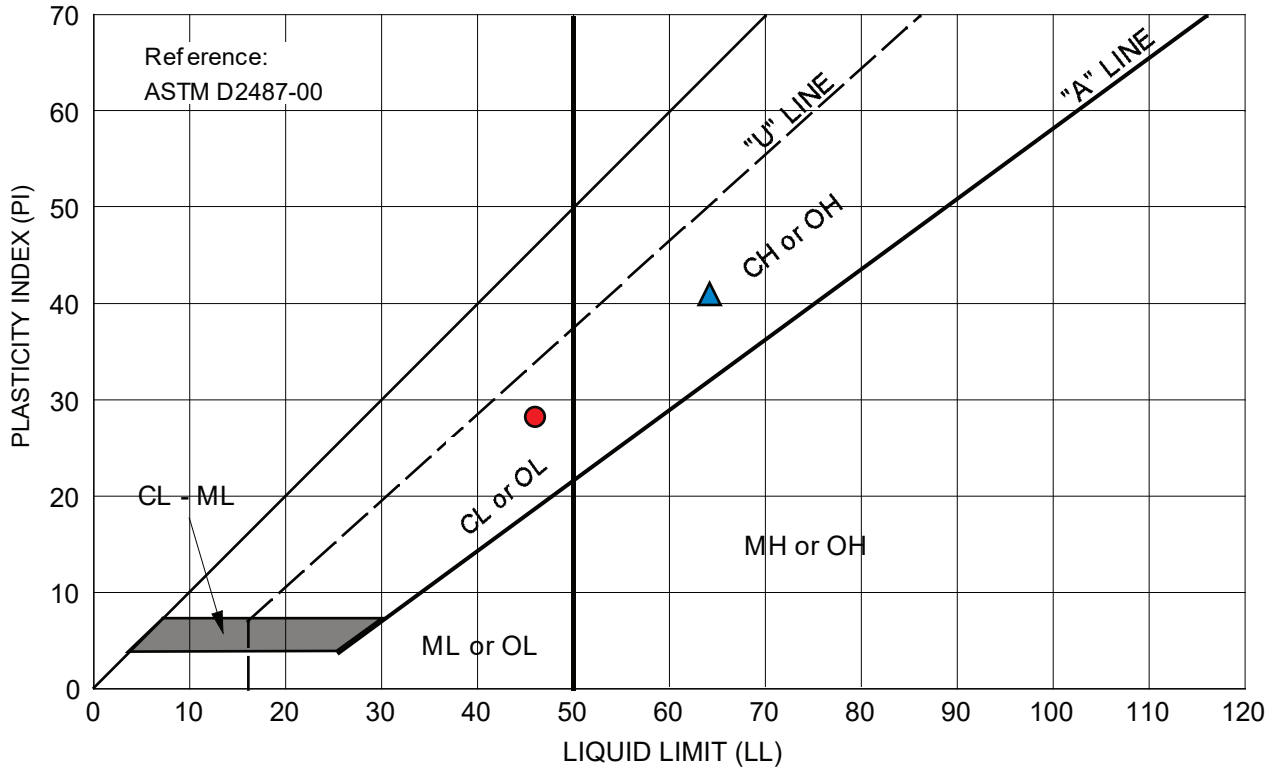
CLASSIFICATION CHART

Date 05/12/20 | Project No. 20-1835 | Figure A-5

ROCKRIDGE GEOTECHNICAL

APPENDIX B

Laboratory Test Results



Symbol	Source	Description and Classification	Natural M.C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
●	HA-2 at 1.0 - 1.5 feet	CLAYEY SAND with GRAVEL (SC), dark brown	13.8	46	28	34
▲	HA-2 at 3.0 - 3.5 feet	CLAY with SAND (CH), dark gray	23.2	64	41	--

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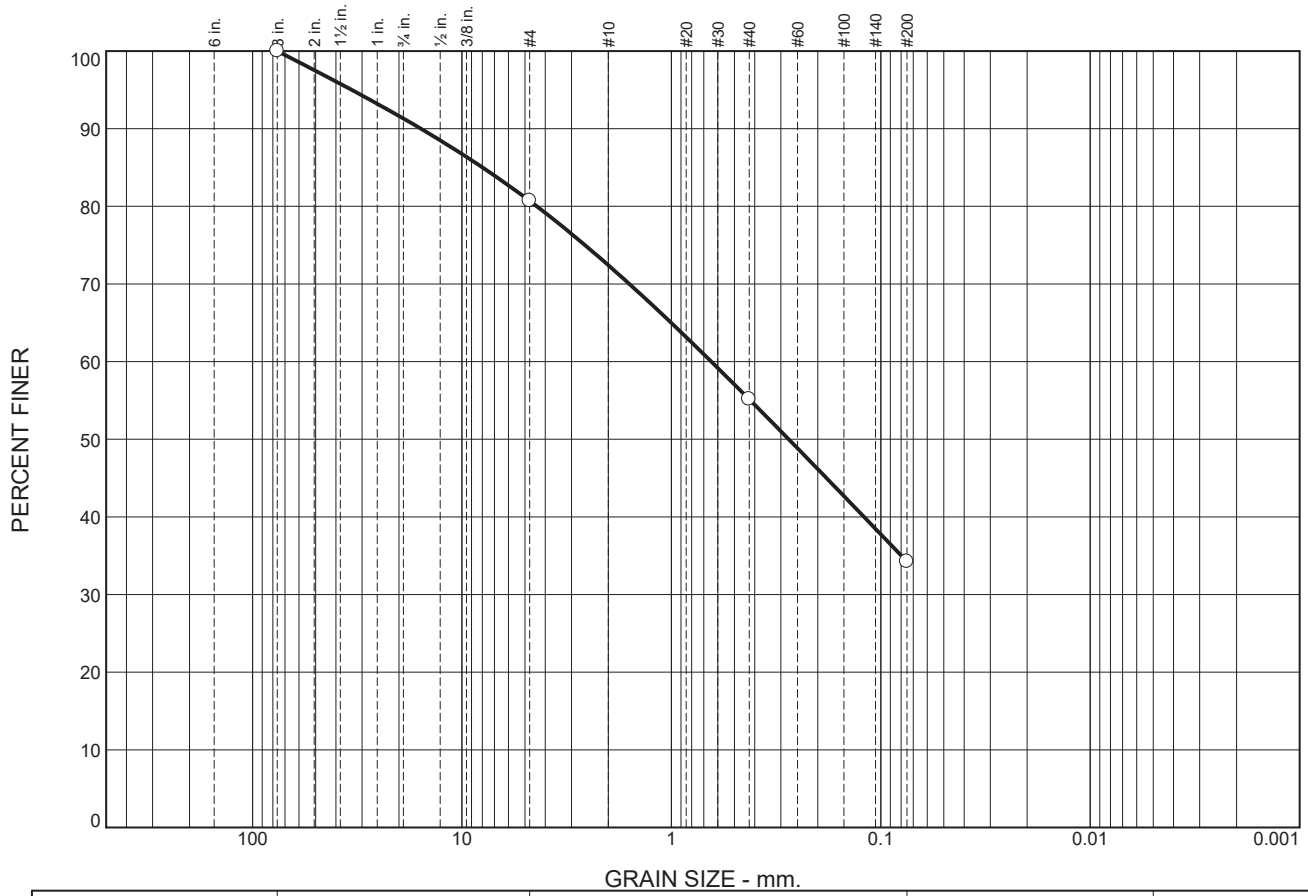
752 CHESTNUT STREET
Redwood City, California

ROCKRIDGE GEOTECHNICAL

PLASTICITY CHART

Date 05/13/20 | Project No. 20-1835 | Figure B-1



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	19.3	46.4	34.3	

SOIL DATA

SYMBOL	SOURCE	DEPTH (ft.)	Material Description	USCS
○	HA-2	1.0 - 1.5'	CLAYEY SAND (SC), dark brown	SC

SMC RADIO SHOP BUILDING
752 CHESTNUT STREET
Redwood City, California

ROCKRIDGE GEOTECHNICAL

PARTICLE SIZE DISTRIBUTION REPORT

Date 05/13/20 | Project No. 20-1835 | Figure B-2

	Method	ASTM D4327		ASTM D4327		ASTM G187		ASTM G51	ASTM G200	SM 4500-S2-D	ASTM D4327	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D4327	ASTM D4327
Bore# / Description	**Depth**	**Sulfates** SO_4^{2-}		**Chlorides** Cl^-		**Resistivity** As Rec'd | Minimum		**pH**	**Redox**	**Sulfide** S^{2-}	**Nitrate** NO_3^-	**Ammonium** NH_4^+	**Lithium** Li^+	**Sodium** Na^+	**Potassium** K^+	**Magnesium** Mg^{2+}	**Calcium** Ca^{2+}	**Fluoride** F_2^{--}	**Phosphate** PO_4^{3-}
	(ft)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(Ohm-cm)	(Ohm-cm)		(mV)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
HA-1-2	3-3.5	49.5	0.0050	11.9	0.0012	2,814	871	9.14	201	0.24	0.4	3.2	ND	223.8	ND	68.7	4.7	13.5	9.3

Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown
Chemical Analysis performed on 1:3 Soil-To-Water extract

SMC RADIO SHOP BUILDING
752 CHESTNUT STREET
Redwood City, California

ROCKRIDGE GEOTECHNICAL

CORROSION RESULTS

Date 09/26/19 | Project No. 20-1835 | Figure B-3

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Researching and collecting documents informing surveys.

2. Performing surveys.

3. Setting of new building corners and alignment.

4. Defining lines of survey prior to demolition activities.

1.02 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Land Title Association and American Congress on Surveying and Mapping (ALTA-ACSM):

1. Accuracy Standards for ALTA-ACSM Land Title Surveys.

C. Federal Geographic Data Committee (FGDC):

1. STD-007.03-98 - Geospatial Positioning Accuracy Standards Part 3: National Standard for Spatial Data Accuracy.

2. STD-007.04-02 - Geospatial Positioning Accuracy Standards Part 4: Standards for Architecture, Engineering, Construction (A/E/C) and Facility Management.

1.03 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Survey Drawings:

1. Prints: Two sets of black line, full size prints of each drawing.

2. Electronic Files: Consistent with computer-aided design (CAD) Standards.

1.04 QUALITY ASSURANCE

A. Land Surveyor: One of the following:

1. Experienced professional land surveyor licensed in California.

2. Experienced professional civil engineer licensed in California and authorized to practice land surveying as civil engineer.

PART 2 PRODUCTS

2.01 ACCESSORIES

A. Monuments: Iron pin, with driven 16 mm (5/8 inch) diameter, minimum 600 mm (24 inches) long to prevent displacement.

B. Stakes: Hardwood.

C. Flagging: Plastic, roll form, highly visible, solid color.

D. Survey equipment as required to perform survey

PART 3 EXECUTION

3.01 EXAMINATION

A. Research public records for deeds, maps, monuments, plats, surveys, title certificates or abstracts, rights-of-way, easements, section line, other boundary line locations, and other documents pertaining to project site.

B. Research public and utility records for aerial, surface, and subgrade structures and utility service lines and easements.

C. Examine construction documents for new construction.

3.02 PREPARATION

A. Coordinate with Owner for site access.

3.03 SURVEYS

A. Perform survey on ground according to Accuracy Standards for ALTA-ACSM Land Title Surveys and FGDC STD-007.3 and FGDC STD-007.4.

B. Utility Survey:

1. Locate piped utilities and utility structures. Identify service type, sizes, depths, and pressures.

2. Locate fire hydrants.

3. Locate wired utilities and utility structures. Identify service type, rated capacities, and elevations above and below grade.

4. Identify each utility authority including contact person and phone number.

C. Locate permanent structures within survey boundary by perpendicular dimension to property lines.

1. Determine structure plan dimensions, heights, and vertical offsets.

2. Determine projections and overhangs beyond structure perimeter at grade.

D. Locate rights-of-way and easements within and adjacent to survey boundary by perpendicular dimension to property line.

1. Locate project site access from rights-of-way by dimension from survey monument. Determine site access width.

3.04 SURVEY DRAWING REQUIREMENTS

A. Confirm survey requirements with Owner.

1. Drawing Size: Maximum 760 by 1070 mm (30 by 42 inches).

2. Boundary Survey Scale: Maximum 1 to 35 (1 inch equals 30 feet).

3. Plan Orientation: North at top of drawing sheet.

B. Drawing Notations:

1. Land Surveyor: Name, address, telephone number, signature, seal, and registration number.

2. Survey Dates: Date survey was initially completed and subsequent revision dates.

3. Evidence of Possession: Indicate character and location of evidence of possession affecting project site. Notation absence signifies no observable evidence of possession.

C. Record Documents Forming Survey Basis: Indicate titles, source, and recording data of documents relied upon to complete survey.

D. Boundary Lines: Show point of beginning, length and bearing for straight lines, and angle, radius, point of curvature, point of tangency, and length of curved lines.

1. When recorded and measured bearings, angles, and distances differ, indicate both recorded and measured data.

a. Indicate when recorded description does not mathematically close survey.

2. Indicate found and installed monuments establishing basis of survey.

3. Contiguity, Gores, and Overlaps: Identify discrepancies within and along survey boundary.

E. Roadways: Indicate names and widths of rights-of-way and roadways within and abutting survey boundary.

F. Structures and Site Improvements: Indicate new building, walls, fences, signs, and other visible improvements.

1. Indicate each building dimensioned to property lines and other structures.

2. Indicate exterior dimensions of new building at ground level. Show area of building footprint and gross floor area of entire building.

3. Indicate structures and site improvements within 1500 mm (5 feet) of survey boundary.

4. Identify setback, restrictions set by site plan.

G. Easements:

1. Indicate easements evidenced by recorded documents.

a. Indicate when easements cannot be located.

2. Indicate observable easements created by roadways, rights-of-ways, water courses, drains, telephone, telegraph, electric and other wiring, water, sewer, oil, gas, and other pipelines within project site and on adjoining properties when potentially affecting project site.

3. Indicate observable surface improvements of underground easements.

H. Indicate topographic contours and spot elevations.

I. Public and Private Utilities:

1. Indicate information source and operating authority for each utility.

2. Indicate utilities existing on or serving project site.

3. Indicate fire hydrants on project site and within 150 m (500 feet) of survey boundary.

4. Indicate manholes, catch basins, inlets, vaults, and other surface indications of subgrade services.

5. Indicate depths or invert elevations, sizes, materials, and pressures of utility pipes.

6. Indicate wires and cables serving, crossing, and adjacent to project site.

7. Indicate exterior lighting, traffic control facilities, security, and communications systems.

8. Indicate utility poles on project site and within 3 m (10 feet) of survey boundary.

9. Indicate dimensions of cross-wires or overhangs affecting project site.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies demolition and removal of buildings, portions of buildings, utilities, other structures and debris from trash dumps shown.

1.02 RELATED WORK

A. All sections listed in the Table of Contents are a Condition of this Section.

1.03 PROTECTION

A. Perform demolition in such a manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures.

B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations.

C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.

D. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily. Follow City and County requirements.

E. In addition to previously listed fire and safety rules to be observed in performance of work, include following:

1. No wall or part of wall shall be permitted to fall outwardly from structures.

2. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.

3. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 15 feet of fire hydrants.

F. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the site; any damaged items shall be repaired or replaced. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works.

1.04 UTILITY SERVICES

A. Demolish and remove outside utility service lines shown to be removed and as required to install new utility lines and building.

B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.

C. Coordinate removal of utilities with utility companies.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 DEMOLITION

A. Completely demolish and remove buildings and structures, including all appurtenances related or connected thereto. Completely demolish pavements, curbs, walks, pads , irrigation systems, utility boxes, gutters, exterior signage, landscaping, landscape features wood deck, fencing and all other site features required to install new building and site elements.

1. As required for installation of new utility service lines.

2. To full depth within an area defined by hypothetical lines located 20 feet outside building lines of new structures.

3. As required to install new site/civil components.

B. Debris, including brick, concrete, stone, metals and similar materials shall become the property of Contractor and shall be disposed daily, off the property to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Owner. Contractor shall dispose of debris in compliance with applicable federal, state or local permits, rules and/or regulations.

C. Remove and legally dispose of all materials, other than earth to remain as part of project work. Materials removed shall become the property of the contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations. Materials that are located beneath the surface of the surrounding ground more than 5 feet except utilities.

D. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Owner. When utility lines are encountered that are not indicated on the drawings, the Owner shall be notified prior to further work in that area.

E. Refer to Sections 02 82 13.41 and 02 83 33.13 for hazardous material removal before and during demolition activities.

3.02 CLEAN-UP

A. On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to Owner. Clean-up shall include off-site disposal of all items and materials not required to remain property of the Owner as well as all debris and rubbish resulting from demolition operations.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the requirements for tests and inspections for site concrete work specified in Sections 03 20 00 Concrete Reinforcement and 03 30 00 Cast in Place Concrete.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit for review and approval.

1. Design Data: Certified copies of mix designers for each concrete class specified

2. Certifications that materials comply with requirements specified.

3. Samples: As requested by the Testing Laboratory and accompanied by certification from vendor that samples originate from and are representative of each lot proposed for use.

4. Test Reports

a. Mill test reports for reinforcement.

b. Reports from testing organization.

1.04 QUALITY ASSURANCE

A. Referenced Standards

1. California Building Code (CBC), 2016.

2. ACI 301 – Specifications for Structural Concrete for Buildings.

3. ACI 318 – Building Code Requirements for Structural Concrete.

4. ASTM C143 / C143M-15a – Standard Test Method for Slump of Hydraulic-Cement Concrete

1.05 DELIVERY, STORAGE AND HANDLING

A. Pursuant to Section 01 45 29 Owner is responsible for all testing and inspection of concrete work. The owner shall retain the services of a certified testing laboratory to perform concrete testing.

PART 2 PRODUCTS

2.01 REINFORCEMNT

A. The Testing Laboratory

1. Take samples from bundles delivered to job site from the mill, unless bundles are identified by heat number and accompanied by mill certificates. When reinforced is not positively identified by heat numbers or when random sampling is intended two specimens will be taken from each 2 ½ tons or fraction thereof of each size and grade.

2. Test for tensile and bending strength in accordance with CBC Chapters 17 and 19.

2.02 CAST IN PLACE CONCRETE

A. The Testing Laboratory will:

1. Review mix designs, compliance certificates and samples of materials proposed for use.

2. Test and inspect materials according to CBC 1903 from compliance with requirements specified in Section 03 30 00 Cast-in-Place Concrete.

3. Inspect batch plant prior to concrete being furnished to verify that:

a. Plant is equipped with approved metering devices for determining moisture content of fine aggregate.

b. Other plant quality controls are satisfactory.

PART 3 EXECUTION

3.01 CAST-IN-PLACE CONCRETE

A. The Testing Laboratory will:

1. Perform testing in accordance with ACI 318

2. Test concrete slump in accordance with ASTM C143

3. Test concrete for required compressive strength in conformance with CBC Section 1905, as follows.

a. Make and cure a minimum of five specimen cylinders according to ASTM C31 for each 150 cubic yards, or fraction thereof, of each class of concrete placed each day.

b. As a minimum, one set of five specimen cylinders shall be made for each 5,000 square feet of slab or wall surface area or fraction thereof placed each day

c. Retain one cylinder for 7-day test, one for 14-day test, and two for 28-day test. Hold one or more cylinders for subsequent testing, in necessary.

d. Number each cylinder, date each set of cylinders and record placement represented by each set of cylinders.

e. Transport specimen cylinders from jobsite to laboratory.

f. Test specimen cylinders according to ASTM C30 from specified strength after cylinders have aged for 7 days, 14 days, and 28 days.

B. Furnish to the Testing Laboratory the ready-mix delivery tickets for each batch of concrete delivered to the jobsite, each ticket bearing the following:

1. Design mix number

2. Time of batching

3. Weight of cement, type and maximum size of aggregates, water, and admixtures in each batch.

4. Total volume of concrete in each batch.

C. When laboratory tests of specimen cylinders show compressive strengths below the minimum specified, the Contractor will be back charged for costs of the taking and testing core specimens of hardened concrete according to ASTM C42.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This section includes the requirements for furnishing and placing concrete formwork.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE

A. Referenced Standards

1. California Building Code (CBC), 2016
2. ACI 301 – Specifications for Structural Concrete for Buildings.
3. ACI 318 – Building Code Requirements for Reinforced Concrete
4. ACI 347R – Guide to Formwork for Concrete.
5. CRSI Manual of Standard Practice
6. PSI-95 US Product Standard for Construction and Industrial Plywood
7. West Coast Lumber Inspection Bureau (WCLB) Standard.
8. Western Wood Products Association (WWPA) Publication: Western Lumber Grading Rules.

B. Design Criteria: Unless otherwise shown, noted, or specified, formwork shall be in conformance with ACI 347

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials subject to damage from dirt and moisture maintaining them clean and dry, off the ground, and suitably protected.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Form materials shall be new at start of work.

B. Form Lumber: Douglas Fir, Construction Grade, S1S2E

C. Plywood Forms and Architectural Smooth Finish: Five-ply, 3/4-inch thick, APA A-A Plyform, Class I, Exterior Type, with mill-oiling treatment omitted for architecture smooth finish; or Owner approved equal.

D. Flexible spring steel forms or laminated boards for forming radius bends.

E. Form Accessories:

1. Accessories which will be entirely or partially embedded in concrete, such as ties and hangers, shall be of metal and of standard manufacture; wire ties are not acceptable.

2. The portion of embedded accessories remaining in concrete shall have no metal within one inch of face of concrete, and shall have no fractures, spalls, depressions, or other surface disfigurations exceeding 3/4 inch in diameter.

3. Spreader cones on ties shall not exceed one inch in diameter.

F. Form Sealer: Sealer shall eliminate grain raise as a result of moisture, and shall not interfere with color, bond, or subsequent treatment of or application of finishes to concrete surface; Sonneborn Building Products, Inc. "Form Saver," Grace Construction Materials "Form Film," Burke "Form Sealer," or approved equal.

G. Form Release Agents:

1. For Concrete Exposed to View in the Finished Work or to Receive Applied Finishes: Use chemically-active types producing water-insoluble soaps. Release agents shall contain no petroleum-based solvents such as creosote, paraffin, wax, or diesel oil.

2. For ABS form liners, use only form release agents recommended by form liner manufacturer.

3. For Unexposed Concrete: Any type that will not interfere with bond of finishes to be applied.

PART 3 EXECUTION

3.01 PREPARATION

A. Treat contact surface of plywood and board forms with a form sealer in accordance with the manufacturer's printed instructions.

B. Clean form surfaces and reseal before each use. The use of form oil will not be permitted.

3.02 CONSTRUCTION

A. Design, construct, and brace formwork and temporary falsework to safely support concrete and hold personnel during construction operations.

B. Coordinate design, construction, and installation of formwork to accommodate openings, sleeves, chases, pipes, nailers, anchors, ties, inserts, and other embedded items.

C. Construct forms of sufficient strength and rigidity to produce finished concrete of the size, shape, and location shown, without exceeding specified tolerances. Form assembly shall permit removal in proper sequence without damaging concrete.

D. Use only new plywood form material for creating smooth architectural finish where required; reuse of forms not permitted for creating smooth architectural finish.

E. Install form liners for architectural finishes in strict accordance with manufacturer's printed instructions and approved submittal.

F. Arrange forms to permit single pours of exposed areas and panels without joints between adjacent form materials in the same plane.

G. Construct forms for all exposed to view concrete full height and width between construction joints in surface of concrete. Do not break forms for pour or construction joints within such areas.

H. Forms shall not extend higher than 12 inches above the top of a pour or construction joint.

I. Form construction joints as specified in Section 03 30 00 – Cast-In-Place Concrete. Provide a surfaced pouring strip where construction joints intersect faces of surfaces to be exposed to view in the finished work; prior to subsequent pour, remove strip and tighten forms.

J. Construction joints shall show no overlapping or offsetting of concrete surfaces and shall as closely as possible have the same appearance as butted board joints. Joints in a continuous line shall be straight and true.

K. Provide cleanouts as required to permit inspection and thorough cleaning of loose dirt and debris. Cleanouts shall not be apparent on concrete surfaces exposed to view in finished work.

L. Arrange forms to permit proper erection sequence and subsequent form removal without damaging concrete.

M. Whenever concrete bases and foundations are required for equipment furnished as part of the work of other Sections, verify equipment dimensions prior to placing concrete.

N. Forms for concrete surfaces exposed to view in the finished work shall be constructed to match existing concrete finish.

O. Forms for unexposed concrete surfaces shall be undressed lumber, form plywood, or other suitable material.

P. Formwork shall be clean and free of foreign material when concrete is placed.

3.03 FORM REMOVAL

A. Do not remove forms until concrete has attained sufficient strength to support its own weight and anticipated construction live loads without damage, but in no case less than the following.

1. Walls: Four (4) days

2. Footings, Curbs, Walks, Paving: Side forms may be removed 24 hours after concrete placement.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This section includes the requirements for furnishing and installing concrete reinforcement.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Shop Drawings: Complete bending and placing details of reinforcement.

1. Details of reinforcement not shown on Drawings shall be in conformance with ACI 315 and ACI 318.

2. Detailing, fabricating and spacing of reinforcement shall be in conformance with ACI 315 unless otherwise shown or noted.

B. Test Reports: Certified copies of mill tests showing chemical and physical analyses of each heat or melt from which reinforcement was made.

1.04 QUALITY ASSURANCE

A. Referenced Standards

1. California Building Code (CBC), 2016

2. ACI 301 – Specifications for Structural Concrete for Buildings

3. ACI 318 – Building Code Requirements for Reinforced Concrete

4. ACI 347R – Guide to Formwork for Concrete

5. CRSI Manual of Standard Practice

B. Allowable Tolerances Fabricating/placing tolerances shall be in conformance with ACI 301.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement from the mill in securely tied bundles, each bundle limited to one size and grade of reinforcement. Identify each bundle with readily visible metal or plastic tags identifying the reinforcement by the same item marking as on the approved shop drawings; tags shall also identify the mill, heat or melt number, and the grade and size of reinforcement.

B. After bundles are broken, identify by segregating reinforcement by sizes and grades.

C. Store reinforcement off the ground, protected from the elements and foreign material which could adversely affect its bond with concrete.

PART 2 PRODUCTS

2.01 MATERIALS

A. Reinforcing Bars: ASTM A625, Grade 60 for all bars except where noted otherwise on plans.

B. Wire for Ties, Stirrups, and Spiral Reinforcement: ASTM A82.

C. Spacers, Bar Supports, and Other Accessories: In conformance with ACI 315. Where portions of accessories will be within 1/2 inch of concrete surfaces which will be exposed to the elements in the finished work, such accessories shall be of non-corrosive material or shall be corrosion-resistant treated; aluminum products will not be acceptable.

2.02 FABRICATION

A. Fabricate reinforcement in accordance with the requirements of ACI 315, where specific details are not shown or where Contract Documents are not more restrictive.

B. Fabrication of reinforcement shall begin only after approval of bar lists and shop drawings, with each item of reinforcement fabricated in conformance with such approved documents.

C. Bend reinforcing steel cold; do not straighten/rebend, doing damage to the material.

PART 3 EXECUTION

3.01 INSTALLATION

A. At time of concrete placement, reinforcement shall be free of dirt, oil, scale, loose rust, and other foreign material that could adversely affect the bond with concrete.

B. Fasten reinforcement/support to prevent displacement beyond the tolerances specified in ACI 301, by construction loads and concrete placement. Sizes and dimensions of supports shall be as required to position the reinforcement as shown on the approved shop drawings and in conformance with the minimum concrete protective covering requirements of ACI 301.

C. Furnish reinforcing bars full length whenever possible; splices will be permitted only where shown or noted on the approved shop drawings, or as otherwise permitted by the Owner.

D. Splices may be made in horizontal reinforcement by lapping and placing ends of bars in contact and securely wiring; or bars may be separated sufficiently to permit the embedment of the entire surface of each bar in concrete.

1. Locate all splices as per drawings. Lap bars 48 diameters minimum.

2. Stagger splices in adjacent bars.

E. Obstructions: Should items to be embedded in concrete interfere with placement of reinforcements, notify the Owner to obtain written approval of procedure before starting.

F. Concrete Cover: Install reinforcement to achieve the minimum concrete coverage shown or noted on the Drawings, unless otherwise specified.

G. Welding: Reinforcing bars shall not have welded joints.

H. Misplaced Reinforcing Bars:

1. If reinforcing bars are found to be misplaced after concrete placement, immediately notify the Owner for recommendations for correcting the misplacement; perform no corrective measures without such prior recommendations.

2. Redesign, alterations, corrections, and replacement of concrete or reinforcing bars due to misplaced bars shall be performed at no additional expense to the Owner.

3.02 MAINTENANCE OF REINFORCEMENT

A. Continuously inspect/maintain reinforcement in proper position during concreting operations.

B. Where reinforcement cannot otherwise be kept properly aligned, provide additional bracing ties, stirrups, and other items as necessary.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the requirements for furnishing and placing cast-in-place concrete, including cast-in-place architectural finish concrete, curing and finishing.

B. All Sections listed in the Table of Contents are a Condition of this Section.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Mix design for each class of concrete proposed for use. If concrete will be pneumatically placed, mixes shall be specifically so designed and designated.

B. Laboratory test reports for concrete mixes. Compression test data (field experience method) or results of testing (trial batch method) used to establish mix proportions.

C. Product Data: Manufacturers' and suppliers' proprietary information on materials.

D. Layout Drawings: Submit layout drawings showing proposed locations of construction joints, control joints, details of construction, and connections for approval prior to concrete placement.

E. Submit delivery ticket to Owner for each batch of concrete delivered.

1.04 QUALITY ASSURANCE

A. Reference Standards

1. California Building Code (CBC), 2016.

2. ACI 301 – Specifications for structural Concrete for Buildings.

3. ACI 318 – Building Code Requirements for Reinforced Concrete.

B. Quality Control: Contractor to retain the services of a qualified testing organization as specified in Testing Laboratory Services Section 01 45 29.

C. Quality Control Supervisor: Owner will retain the services of an independent concrete contractor that will observe Contractor’s work to achieve desired results.

D. Allowable Tolerances: Deviation from plumb and level shall not exceed 1/8 inch within ten feet in any direction, as determined with a ten-foot straightedge. Cumulative deviation over the length or height of the building shall not exceed 3/8 inch in any direction.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle packaged materials in the manufacturers' original, sealed packages, each clearly identified with the manufacturer's name, and name and type of material.

B. Deliver, store, and handle materials subject to damage from dirt and moisture maintaining them clean and dry, off the ground, and suitably protected.

C. Store coarse and fine aggregates in separate, covered bins to prevent them from mixing, and to preserve moisture content of aggregate at batch plant.

D. Store bulk cement in covered bins.

1.06 PROJECT CONDITIONS

A. Environmental Requirements for Concrete Placement:

1. Hot Weather: In conformance with ACI 305.

2. Cold Weather: In conformance with ACI 306.

3. During Precipitation: Do not place unless adequate protection is provided.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete, ready-mixed, ASTM C94.

1. Cement: ASTM C150, Type II, Portland Cement.

2. Aggregate:

a. Fine Aggregate: ASTM C33

b. Coarse Aggregate: ASTM C33

c. Source of aggregate shall remain constant for the duration of the work.

3. Water: Clean, clear, and potable.

B. Curing materials:

1. Liquid Membrane: ASTM C308, Type I.

2. Sheet material: ASTM C171.

C. Admixtures

1. Water reducing Admixture: ASTM C494, only with prior review of mix design.

2. Air-Entraining Admixture: ASTM C260, for lightweight concrete only with prior review of mix design.

3. Unspecified Admixtures: Not Permitted.

4. Calcium Chloride: not Permitted.

5. Hydrogen Chloride: Not Permitted

D. Non-shrink Grout: Premixed, requiring only addition of specified water; Master Builders "Masterflow 928," or approved equal.

1. Flowable, low shrinkage, 5,000 psi at 7 days.

2. Non-metallic Type: For all uses.

3. Metalic Type: Will not be permitted.

E. Bonding Agent: Larsen Products Corp. "Weld-Crete," Sika Chemical Corp. "Sikastix 370" or "Sikadur Hi-Mod," or approved equal.

F. Hardener: Clear, dust-on type; Sonneborn-Contech "Harcol Standard Natural," Upco Co. "Hydroment," Lambert Corp. "Colorhard," or approved equal.

G. Sealer: Heavy penetrating type, from same manufacturer as hardener.

1. Without wax or other constituent that will impair application of finishes.

H. Epoxy Grout for Reinforcement and Bolt Installation: Hilti "HIT-RE 500-SD" Adhesive Anchor System", Simpson Strong-Tie "SET XP", or equal.

I. Detectable Warning - Truncated Domes:

1. Spacing, height and configuration of truncated domes shall meet CBC 11B-705. Base diameter of 0.9 inch min. and 0.92 inch max, a top diameter of 0.45 inch minimum and 0.47 inch maximum, and a height of 0.2 inch. Dome spacing shall have center to center 2.3 inch min. and 2.4 inch max., and a base-to-base spacing of 0.65 inch minimum.

2.02 MIXES

A. Design Criteria

1. Concrete shall develop the minimum compressive strength noted on the Contract Documents at 28 days on cylinders made and tested in accordance with referenced ASTM standards.

2. The average of the sets of three consecutive strength tests shall be equal to or greater than the specified strength, and no individual strength test results shall fall below the specified strength by more than 500 psi.

B. General

1. Mix designs shall be in conformance with CBC Section 1905, based on materials tested and approved by the Testing Laboratory.

2. If concrete will be pneumatically placed, mixes shall be specifically so designed and designated.

3. If concrete is to be pumped, mixes shall be specifically so designed and designated.

C. Nonshrink Grout: Mix in accordance with the manufacturer's printed instructions.

D. Dry Pack: Mix, in proportions by volume, one-part cement to two-and-one-half parts fine aggregate, screening out materials retained on a No. 4 sieve. Mix with water to a consistency so that when a ball of mixture is compressed in the hand, it will show finger marks but maintain its shape and not show any surface water.

E. Patching Mortar: Mix in proportion by volume, one part cement to two parts fine aggregate.

2.03 MIXING

A. Batch Plant:

1. Equipment and plant shall be capable of weighing, segregating, and efficiently handling materials. Automatic metering capable of determining moisture content of sand shall be utilized.

2. Equipment and plant shall be subject to the approval of the Testing Laboratory; equipment and processes not so approved shall not be used for the work.

B. General:

1. Mixing shall be in conformance with ASTM C94 and CBC.

2. Mix cement, fine and coarse aggregate, admixtures, and water to exact proportions of approved mix designs.

3. Measure fine and coarse aggregates separately according to approved method which affords accurate control and checking.

4. Adjust grading to improve workability; do not add water unless otherwise recommended by the Owner.

C. Admixtures: use automatic metering dispenser to incorporate admixtures into mix

2.04 CONCRETE CLASSES

A. Definitions:

1. Strength: Minimum compressive strength after 28 days, when tested in accordance with ASTM C39.

2. Aggregate: Maximum size.

3. Weight: Pounds per cubic foot, air dry.

4. Slump: When tested in accordance with ASTM C143.

5. Maximum water/ cement ratio of 0.45

B. Concrete Classes and Uses:

Class	Weight (psf)	Strength (psi)	Aggregate (inches)	Use
A	145	4000	3/4	Cast-In-Place Concrete, Concrete Foundations, Concrete Slabs, etc.
B	110	3000	5/8	Sand Lightweight Concrete over metal deck

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to concrete placement, determine finishes required to accommodate the work of other sections, and prepare for such finishes. Where determination for such finishes may be in question, refer to Owner for resolution.

B. Remove loose dirt/foreign material from excavations and forms and standing and saturated soil from excavations and cavities. Placing concrete in standing water is not permitted.

C. Thoroughly clean reinforcement and other items to be embedded in concrete of loose rust and other foreign matter which could inhibit bond with concrete.

D. Thoroughly wet wood forms, except coated plywood, and adjacent concrete a minimum of one hour prior to placing concrete; securely close cleanout and inspection ports; repeat wetting as required to keep forms damp.

E. Work form release agent into all areas of form liner as recommended by form manufacturer.

F. Apply form release agent to form liners before each use and within the same day that concrete is placed.

G. Subgrade and forms shall have been checked for line and grade, and work areas shall have been inspected by Engineer and observed by the Owner prior to starting concrete placement.

H. Roughen surfaces +/- ¼" amplitude at all joints and at all contact surfaces between new and existing concrete. Provide shear keys and prepare joints as per Drawings and Specifications. Apply bonding agent between existing and new concrete pours.

3.02 TRANSPORTING

A. Transport concrete from the mixer to the place of final deposit as quickly as possible, and by methods which prevent the separation and loss of ingredients. Concrete shall be of uniform density when placed.

B. Concrete shall not be freely dropped where reinforcement will cause segregation. Spouts, elephant trunks, or other approved means shall be utilized to prevent segregation.

C. In no case shall concrete be freely dropped more than six (6) feet. Provide formwork with pour ports at four (4) feet or closer horizontally so that concrete will be deposited freely such that no more than six (6) feet is dropped at any location.

D. Concrete may be pumped from the mixer to the place of deposit, provided that information on mix design adjustments, equipment, and procedures have received the Owner's written approval.

3.03 PLACING

A. General:

1. Notify Owner a minimum of 72 hours prior to each major concrete placement.

2. Place concrete in a continuous operation until a section of approved size and shape has been completed.

3. For horizontal surfaces, maintain a plastic surface essentially horizontal until completion of placement of the section.

4. Prevent displacement of reinforcement and other items to be embedded.

5. Before concrete sets, completely remove concrete spilled on forms and reinforcement in sections where concrete is not to be immediately installed.

6. An interruption of more than 60 minutes in concrete placement will be cause for shutting down the work and disposing of remaining mixed concrete. If such interruption occurs, provide construction joints where and as instructed, and cut concrete back to such line, cleaning forms and reinforcement as specified.

7. Record the date and time of concrete placement in each section. Retain records until completion of the work and make available at all times to the review of the Owner.

B. Consolidation:

1. Thoroughly consolidate concrete by puddling with suitable tools during placement, and by thoroughly working around reinforcement and other embedded items.

2. In addition to manual spading and tamping, internally vibrate concrete with high-speed mechanical vibrators of sufficient amplitude for thorough consolidation.

3. Prevent formation of shoulders and ledges.

4. Provide keys across vertical joints as shown on drawings. Place dowels across joints.

5. Joints for Slabs on Grade: Locate construction joints where approved and under partitions, whenever possible.

3.04 PROTECTION AND CURING

A. Protection:

1. Maintain concrete temperature above 50 degrees F during curing.

2. Protect concrete from sun and rain.

3. Do not subject concrete to loads until it has completely cured and attained minimum 28-day strength.

4. Water cure concrete continuously for minimum duration specified, including Saturdays, Sundays, and holidays; do not permit it to dry out until it has cured for the specified time.

5. Protect concrete during/after curing from damage from construction operations.

6. Cover traffic areas with kraft paper and plywood sheets; maintain protective covering in place and in good repair as long as necessary to protect concrete from damage.

7. Keep finished areas free from traffic for a minimum of four days, or as long as necessary for concrete to have set sufficiently to prevent its being damaged.

B. Curing: Curing shall immediately follow finishing and shall be performed as follows.

1. Flatwork Surfaces: Membrane cure for a minimum of seven days.

3.05 DEFECTIVE CONCRETE

A. Repair or replace defective concrete as instructed by Owner, and at no additional expense to Owner. Repair materials shall include, as necessary, cements, aggregates, admixtures, and epoxy.

B. With written approval of Owner, some minor defective work may be repaired by use of cement mortar; however, if the defects affect the strength of the structure, its appearance, or are otherwise detrimental, Owner may require the removal and replacement of that portion of the structure.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the Labor, products, equipment and services necessary for concrete floor stain Work in accordance with the Contract Drawings.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Submit manufacturer's product data, including physical properties and colors available.

C. Manufacturer’s Safety Data Sheet for each product being used.

D. Product Samples: Submit Architectural Standard samples representative of the final finish, as applied. The Standard shall be approved in writing by the Architect and shall be the final standard of acceptance of the finish.

E. Maintenance Instructions: Submit manufacturer's maintenance instructions.

F. Mock-Up: See drawings for location of wall, column and floor mock-up.

1.04 REFERENCES

A. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete.

B. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete.

C. ASTM D 3359 - Standard Test Methods for Measuring Adhesion by Tape Test.

D. ASTM D 3363 - Standard Test Method for Film Hardness by Pencil Test.

E. South Coast Air Quality Management District (SCAQMD) Rule 1113 (2008).

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years of experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with demonstrated experience in installing products of the same type and scope as specified.

C. Pre-installation Meeting: Convene a pre-installation meeting before start of Work. Require attendance of parties directly affecting work of this section, including Contractor, Architect, and Applicator. Review surface preparation, application, protection, and coordination with adjacent surfaces.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Mock-up areas designated by Architect.

2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

3. Refinish mock-up area as required to produce an acceptable completed project.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation. Store materials in a clean, dry area indoors in accordance with manufacturer's instructions. Keep containers sealed until ready for use.

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 PROJECT 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. Do not apply materials in wet weather.

1.08 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.01 CONCRETE SEALER

A. Stone Tone Sealer: Acrylic water-based, non-yellowing urethane clear sealer.

B. Solids (By Volume): 30 percent.

C. Gloss: High gloss

D. Gloss: Flat to satin gloss.

E. Resistant to blush.

F. VOC: Less than 50 g/L. Meets final SCAQMD Rule 1113 (2008).

G. Pencil Hardness, ASTM D 3363: 2H.

H. Dry Tape Adhesion, ASTM D 3359: 5A-5B.

I. Dry Time at 70F (21C) with 50 percent RH:

J. Recoat: 1 hour.

K. Foot Traffic: 4 hours.

L. Full Cure: 48 hours.

1. Recoat: 1 hour

2. Foor Traffic: 4 hours

3. Full Cure: 48 hours

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly, in accordance with manufacturer’s instructions.

B. Protection:

1. Protect walls and surrounding surfaces not to receive concrete floor stain.

2. Do not allow stain to come in contact with wood or metal surfaces.

C. Prepare concrete surface in accordance with manufacturer’s instructions.

D. Concrete shall be as specified in Section 03 30 00, Cast-in-place Concrete. Ensure concrete is a minimum of 28 days old.

E. Ensure surface is clean, dry, structurally sound, and free from dirt, dust, oil, grease, solvents, paint, wax, asphalt, concrete curing compounds, sealing compounds, surface hardeners, bond breakers, adhesive residue, and other surface containments.

F. Do not acid wash or use heavy alkali cleaners.

3.03 INSTALLATION - REMBRANDT POLYMER STAINS AND TOPCOATS

A. Install in accordance with manufacturer’s instructions.

B. Concrete Floor Sealer: Apply concrete floor sealer over concrete floor stain in accordance with manufacturer's instructions.

C. Keep material containers closed when not in use to avoid contamination.

3.04 PROTECTION

A. Protect stained surfaces from damage during construction.

B. Protect surfaces from foot traffic for a minimum of 24 hours

C. Do no wash surfaces for a minimum of 48 hours.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION:

A. This section specifies structural steel shown and classified by Section 2, Code of Standard Practice for Steel Buildings and Bridges.

1.02 RELATED WORK:

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE:

A. Fabricator and erector shall maintain a program of quality assurance in conformance with Section 8, Code of Standard Practice for Steel Buildings and Bridges. Work shall be fabricated in an AISC certified Category Std fabrication plant.

B. Before authorizing the commencement of steel erection, the controlling contractor shall ensure that the steel erector is provided with the written notification required by 29 CFR 1926.752. Provide copy of this notification to the Resident Engineer.

1.04 TOLERANCES:

A. Fabrication tolerances for structural steel shall be held within limits established by ASTM A6, by AISC 303, Sections 6 and 7, Code of Standard Practice for Buildings and Bridges, except as follows:

B. Elevation tolerance for closure plates at the building perimeter and at slab openings prior to concrete placement is 6 mm (1/4 inch).

1.05 REGULATORY REQUIREMENTS:

A. AISC 360: Specification for Structural Steel Buildings

B. AISC 303: Code of Standard Practice for Steel Buildings and Bridges.

1.06 SUBMITTALS:

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples,

B. Shop and Erection Drawings: Complete

C. Certificates:

1. Structural steel.

2. Steel for all connections.

3. Welding materials.

D. Test Reports:

1. Welders' qualifying tests.

E. Design Calculations and Drawings:

1. Connection calculations, if required.

F. Record Surveys.

1.02 APPLICABLE PUBLICATIONS:

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American Institute of Steel Construction (AISC):

1. AISC 360-10 Specification for Structural Steel Buildings

2. AISC 303-10 Code of Standard Practice for Steel Buildings and Bridges

C. American National Standards Institute (ANSI):

B18.22.1-65(R2008) ..... Plain Washers

B18.22M-81(R2000)..... Metric Plain Washers

D. American Society for Testing and Materials (ASTM):

A6/A6M-11 ..... Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

A36/A36M-08 ..... Standard Specification for Carbon Structural Steel

A53/A53M-10 ..... Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

A123/A123M-09 ..... Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A242/A242M-04(R2009) ..... Standard Specification for High-Strength Low- Alloy Structural Steel

A283/A283M-03(R2007) ..... Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

A307-10..... Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

A325-10.....Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

A490-12.....Standard Specification for Heat-Treated Steel Structural Bolts 150 ksi Minimum Tensile Strength

A500/A500M-10a. .....Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

A501-07.....Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

A572/A572M-07 .....Standard Specification for High-Strength

Low-Alloy Columbium-Vanadium Structural Steel A992/A992M-11……Standard Specification for Structural Steel Shapes

E. American Welding Society (AWS):

D1.1/D1.1M-10.....Structural Welding Code-Steel

F. Research Council on Structural Connections (RCSC) of The Engineering Foundation:

Specification for Structural Joints Using ASTM A325 or A490 Bolts

G. Military Specifications (Mil. Spec.):

MIL-P-21035 .....Paint, High Zinc Dust Content, Galvanizing, Repair

H. Occupational Safety and Health Administration (OSHA):

29 CFR Part 1926-2001.....Safety Standards for Steel Erection

PART 2 PRODUCTS

2.01 MATERIALS:

A. Structural Steel: ASTM A572 W Shapes, A36 misc. steel

B. Structural Tubing: ASTM A500, Grade B.

C. Steel Pipe: ASTM A53, Grade B.

D. Bolts, Nuts and Washers:

1. High-strength bolts, including nuts and washers: ASTM A325 or A490 as noted.

2. Bolts and nuts, other than high-strength or as shown on plans: ASTM A307, Grade A.

3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ANSI Standard B18.22.1.

E. Zinc Coating: ASTM A123.

F. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035.

PART 3 EXECUTION

3.01 CONNECTIONS (SHOP AND FIELD):

A. Welding: Welding in accordance with AWS D1.1. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required.

B. High-Strength Bolts: High-strength bolts tightened to a bolt tension not less than 70% of their minimum tensile strength. Tightening done with properly calibrated wrenches, by turn-of-nut method or by use of direct tension indicators (bolts or washers). Tighten bolts in connections identified as slip-critical using Direct Tension Indicators. Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections.

3.02 FABRICATION:

A. Fabrication in accordance with Chapter M, AISC 360.

3.03 SHOP PAINTING:

A. General: Shop paint steel with primer in accordance with AISC 303, Section 6.

B. Do not apply paint to following:

1. Surfaces within 50 mm (2 inches) of joints to be welded in field.

2. Surfaces which will be encased in concrete.

3. Surfaces which will receive sprayed on fireproofing.

4. Top flange of members which will have shear connector studs applied.

C. Structural steel in the interstitial space that does not receive sprayed on fireproofing shall be painted with primer in accordance with general requirement of shop painting.

3.04 ERECTION:

A. General: Erection in accordance with AISC 303, Section 7B.

B. Temporary Supports: Temporary support of structural steel frames during erection in accordance with AISC 303, Section 7

3.05 FIELD PAINTING:

A. After erection, touch-up steel surfaces specified to be shop painted. After welding is completed, clean and prime areas not painted due to field welding.

B. Finish painting of steel surfaces is specified in Section 09 91 00, PAINTING.

3.06 SURVEY:

A. Upon completion of finish bolting or welding on any part of the work, and prior to start of work by other trades that may be supported, attached, or applied to the structural steel work, submit a certified report of survey to Resident Engineer for approval. Reports shall be prepared by Registered Land Surveyor or Registered Civil Engineer as specified in Section 01 00 00, GENERAL REQUIREMENTS. Report shall specify that location of structural steel is acceptable for plumbness, level and alignment within specified tolerances specified in the AISC Manual.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION:

A. This section specifies material and services required for installation of composite steel decking including shear connector studs and miscellaneous closures required to prepare deck for concrete placement as shown and specified.

1.02 RELATED WORK:

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 DESIGN REQUIREMENTS:

A. Design steel decking in accordance with American Iron And Steel Institute publication "Specifications for the Design of Cold Formed Steel Structural Members", except as otherwise shown or specified.

B. Design all elements with the latest published version of applicable codes.

1.04 SUBMITTALS:

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Shop Drawings: Shop and erection drawings showing decking unit layout, show decking dimensions including distances from beam centerline to deck edges, connections to supporting members, and information necessary to complete the installation as shown and specified, including supplementary framing, cant strips, cut openings, special jointing or other accessories. Show welding, side lap, closure, deck reinforcing and closure reinforcing details. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.

C. Manufacturer's Literature and Data: Showing steel decking section properties and specifying structural characteristics as specified herein.

D. Manufacturer's written recommendations for:

1. Cleaning of steel decking prior to concrete placement.

E. Test Report - Establishing structural characteristics of composite concrete and steel decking system.

F. Test Report - Stud base qualification.

G. Welding power setting recommendation by shear stud manufacturer.

H. Shear Stud Layouts: Submit drawings showing the number, pattern, spacing and configuration of the shear studs for each beam and girder.

1.05 APPLICABLE PUBLICATIONS:

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Refer to the latest edition of all referenced Standards and codes.

B. American Iron and Steel Institute (AISI):

Specification and Commentary for the Design of Cold-Formed Steel Structural Members (Latest Edition).

C. American Society of Testing and Materials (ASTM):

A36/A36M-08 ..... Standard Specification for Carbon Structural Steel

A108-07 ..... Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality

A653/A653M-10 ..... Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process

D. American Institute of Steel Construction (AISC):

1. Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design (Latest Edition)

2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition)

E. American Welding Society (AWS):

D1.1/D1.1M-10 ..... Structural Welding Code - Steel

D1.3/D1.3M-08 ..... Structural Welding Code - Sheet Steel

F. Military Specifications (Mil. Spec.):

MIL-P-21035B ..... Paint, High Zinc Dust Content, Galvanizing Repair

1.06 LEED SUBMITTALS

A. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

B. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating the location of material manufacturer and point of extraction, harvest or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material and fraction by weight that is considered regional.

1. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.

2. Include statement indicating location of manufacturer and point of extraction, harvest and recovery for each raw material used in regionally extracted and manufactured materials. Indicate distance to Project and fraction by weight of each regionally manufactured material that is regionally extracted.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Steel Decking and all Flashings: ASTM A653, Structural Quality suitable for shear stud weld-through techniques.

B. Galvanizing: ASTM A653, G90.

C. Shear connector studs: ASTM A108, Grades 1015-1020, yield 350 Mpa (50,000 psi) minimum, tensile strength - 400 Mpa (60,000 psi) minimum, reduction of area 50 percent minimum. Studs of uniform diameter; heads shall be concentric and normal to shaft; stud, after welding free from any substance or defect which would interfere with its function as a shear connector. Studs shall not be painted or galvanized. Size of studs shall be as shown on drawings. Studs manufactured by a company normally engaged in the manufacturer of shear studs and can furnish equipment suitable for weld-through installation of shear studs.

D. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.

E. Miscellaneous Steel Shapes: ASTM A572, Fy=50.

F. Welding Electrode: E70XX minimum.

G. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:

1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.

2. Continuous sheet metal edging: at openings and concrete slab edges. Same quality as deck units but not less than 1.3 mm (18 gauge) steel. Side and end closures supporting concrete and their attachment to supporting steel shall be designed by the manufacturer to safely support the wet weight of concrete and construction loads. The deflection of cantilever closures shall be limited to 3 mm (1/8 inch) maximum.

3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.

4. Seat angles for deck: Where a beam does not frame into a column.

2.02 REQUIREMENTS:

A. Steel decking depth, gage, and section properties to be as shown. Provide edges of deck with vertical interlocking male and female lip providing for a positive mechanical connection.

B. Fabricate deck units with integral embossments to provide mechanical bond with concrete slab. In combination with concrete slab, capable of supporting total design loads on spans shown.

C. Steel decking capable of safely supporting total, normal construction service loads without damage to decking unit.

PART 3 EXECUTION

3.01 ERECTION:

A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.

B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

C. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection and prior to casting concrete at no cost to the Government.

D. Erect steel deck in accordance with manufacturer's printed instructions.

E. Ship steel deck units to project in standard widths and cut to proper length.

F. Provide steel decking in sufficient lengths to extend over 3 or more spans, except where structural steel layout does not permit.

G. Place steel decking units on supporting steel framework and adjust to final position before being permanently fastening. Bring each unit to proper bearing on supporting beams. Place deck units in straight alignment for entire length of run of flutes and with close registration of flutes of one unit with those of abutting unit. Maximum space between ends of abutting units is 13 mm (1/2 inch). If space exceeds 13 mm (1/2 inch), install closure plates at no additional cost to Government.

H. Fastening Deck Units:

1. Fasten floor deck units as shown on the drawings or as follows (whichever is the most stringent):

a. Fasten floor deck units to steel supporting members as per drawings but not less than 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength, spaced not more than 305 mm (12 inches) o.c. with a minimum of two welds per unit at each support. Where two units abut, fasten each unit individually to the supporting steel framework.

b. Tack weld or use self-tapping No. 8 or larger machine screws at 915 mm (3 feet) o.c. for fastening end closures. Only use welds to attach longitudinal end closures.

c. Weld side laps of adjacent floor deck units that span more than 1524 mm (5 feet). Fasten at midspan or 915 mm (3 feet) o.c., whichever is smaller.

J. Welding to conform to AWS D1.3 and performed by competent experienced welding mechanics.

K. Areas scarred during erection and welds shall be thoroughly cleaned and touched-up with zinc rich galvanizing repair paint. Paint touch-up not required for welds or scars that are in direct contact with concrete.

L. Provide metal concrete stops at edges of deck as required.

M. Cutting and Fitting:

1. Cut all metal deck units to proper length in the shop prior to shipping.

2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the structural drawings.

3. Other penetrations shown on the approved metal deck shop drawings but not shown on the structural drawings are to be located, cut and reinforced by the trade requiring the opening.

4. Make all cuts neat and trim using a metal saw, drill or punchout device; cutting with torches is expressly prohibited.

5. Do not make any cuts in the metal deck that are not shown on the approved metal deck drawings. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and any other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the Owner. Provide any additional reinforcing or framing required for the opening at no cost to the Government. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected metal deck.

6. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.

N. Installation of shear connector studs through previously installed metal deck to conform to AWS D1.1, Section 7, except all studs will be installed with automatically timed welding equipment and as specified below:

1. Do not place reinforcing steel temperature mesh or other materials and equipment which will interfere with stud installation on steel deck until shear connector studs are installed.

2. Steel deck sheets shall be free of oil, rust, dirt, and paint. Release water in deck’s valley so that it does not become entrapped between deck and beam. Surface to which stud is to be welded shall be clean and dry.

3. Rest metal deck tightly upon top flange of structural member with bottom of deck rib in full contact with top of beam flange.

4. Weld studs only through a single thickness of deck. Place decking so that a butt joint is obtained. Place studs directly over beam web, where one row of studs are required.

5. Ferrules specially developed for the weld-through technique must be used. Ferrules shall be appropriate for size of studs used and be removed after welding.

6. Submit report of successful test program for stud base qualification as required by AWS D1.1, Appendix K.

3.02 CLEANING:

A. Clean deck in accordance with manufacturer's recommendation before concrete placement.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide labor, materials and equipment required to complete all cold-formed metal framing work as indicated in the Contract Documents. This includes all axially or laterally loaded cold-formed steel studs, track, joists, bridging and related accessories.

1.02 RELATED SECTIONS

A. All sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE

A. Reference Standards

1. American Iron and Steel Institute (AISI)

a. Specification for the design of cold-formed steel structural members.

b. Cold-formed steel design manual (latest).

2. American Society for Testing materials (ASTM)

a. ASTM A446 – Steel sheet, zinc-coated (galvanized) by Hot-Dip process, structural (physical) quality.

b. ASTM A570 Hot-rolled carbon steel sheet and strip, structural quality.

c. ASTM A525 – Sheet steel, zinc-coated (galvanized) by the hot-dip process, general requirements.

d. ASTM A611 – Standard specification for steel, cold rolled sheet, carbon, and structural.

e. ASTM C955 – Standard specifications for load bearing steel studs, runners (track), bracing, and bridging.

3. American Welding Society (AWS):

a. AWS D1.1 – Structural Welding Code and D1.3 – Specifications for welding sheet steel in structures.

b. AWS – Standard Qualification Procedure.

4. Federal Specification

a. FS TT-P636C – Rust-inhibitive paint.

5. Quality Control: Field testing and inspection

a. Inspect all work in order to assure strict conformance to the shop drawings at all phases of construction.

b. All members shall be checked for proper alignment, bearing, completeness of attachments, proper placement, reinforcement, etc.

c. All attachments shall be checked for conformance with the shop drawings. All welds shall be touched-up as specified herein.

d. General inspection of structure shall be completed prior to applying loads to those members.

e. Inspections where and as required by local codes shall be controlled inspections.

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product data:

1. Manufacturer's literature containing product and installation specifications and details.

C. Shop Drawings:

1. Documents illustrating materials, shop coatings, steel thickness, details of fabrication and erection, details of attachment, spacing of fasteners, required accessories and critical installation procedures. All shop drawings must bear the seal and signature of an engineer registered in the State of California.

D. Calculations:

1. Engineering calculations verifying the framing assembly's ability to meet or exceed design requirements as stated here-in and required by local codes, prepared under the supervision of a Professional Engineer. Calculations must bear the seal and signature of an engineer registered in the State of California.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered and handled in a manner to avoid bending and other damage and to avoid contact with the soil or other contaminating materials.

B. finish of the framing members shall be maintained at all times, using an approved high zinc duct contents galvanizing repair paint whenever necessary to prevent the formation of rust.

PART 2 PRODUCTS

2.01 MATERIALS

A. Material shall be corrosion resistant steel complying with ASTM A 653/A 653m, Grade 230 33 or higher, having a maximum yield of 230 MPa (33,000) psi and a G 60 minimum zinc coating.

B. All studs and accessories shall be of the type, size and spacing shown on the plans. Studs, runners (track), bracing and bridging shall be manufactured per ASTM Specifications C-955. All soffit framing shall be galvanized.

C. All section properties shall be calculated in accordance with AISI Specification for the Design of Cold-Formed Steel Structural Members (latest edition).

2.02 CONNECTIONS

A. Screws for steel-to-steel connections shall be self-drilling tapping in compliance with SAE J 78. Electroplated screws shall have a Type II coating in accordance with ASTM B 633. Screws, bolts and anchors shall be hot-dipped galvanized in accordance with ASTM A 123/A 123M of ASTM A 153/A 153M as appropriate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required and ready to receive Work.

B. Report in writing to Owner prevailing conditions that will adversely affect satisfactory execution of the Work of this section. Do not proceed with work until unsatisfactory conditions have been corrected.

C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 INSTALLATION

A. General Requirements

1. Prefabricated frames shall be square, with components attached to prevent racking during fabrication, transportation and lifting. Design and construction of frames shall include provisions for lifting.

2. Cutting of steel framing shall be done by saw, shear or plasma cutting equipment. Oxyacetylene torch cutting is not permitted.

3. Temporary bracing shall be provided and remain in place until work is permanently stabilized.

4. Abutting lengths of track shall be butt-welded, spliced, or each length securely anchored to a common structural element. Track shall be securely anchored to the supporting structure as shown on the drawings.

5. Splicing of framing components, other than track and tension members, is not permitted.

6. Wire tying of framing members is not permitted.

B. Load Bearing Walls

1. Axial Load

2. Installation shall comply with ASTM C1007 and the following:

   a. Studs shall be placed as shown on drawings but shall not exceed 16 inches on center.

   b. Studs shall be installed seated squarely against the web of the top and bottom track to assure transfer of axial load. Studs shall be plumbed, aligned, and secured to the continuous runner tracks at each end before the installation of components which induce axial load.

   c. Studs, other than at framed openings, shall align vertically to allow for full transfer of the loads to the foundation. Vertical alignment shall be maintained at floor/wall intersections. Where vertical alignment is not possible, a continuous load distribution member at the top track shall be provided as required by calculations.

   d. Foundation bearing bottom track shall rest on a continuous, uniform, and level beating surface.

   e. Tracks shall be securely anchored to the supporting structure as shown on the drawings.

   f. Bridging spaced as required by calculations and shall be installed prior to loading and the installation of facing materials.

   g. Framed wall openings shall include headers and supporting components as required by calculations. Headers shall be installed in all openings which are larger than the stud spacing in a wall.

   h. At wall openings for doors, windows and other similar features, the framing system shall provide for installation and anchorage of the required subframes or finished frames. Steel frames shall be securely attached through built-in anchors to the nearest stud on each side of the openings with self-drilling screws. Double studs shall be provided at both jambs of all door openings.

   i. Installation of sheathing, wallboards, or any other collateral material shall be performed in accordance with the manufacturer's specifications.

3.03 CONNECTIONS

A. Screws shall be of the self-drilling self-tapping type. Screw penetration through joined materials shall be less than three exposed threads. Minimum spacings and edge distances for screws shall be as specified in AISI Cold-Formed Specifications. Screws covered by sheathing materials shall have low profile heads.

3.04 TOLERANCES

A. Vertical alignment (plumbness) of studs shall be within $1/960^{th}$ of the span. Horizontal alignment (levelness) of walls shall be within $1/960^{th}$ of their respective lengths. Spacing of studs shall not be more than plus 3 mm, 1/8 inch from the designed spacing providing the cumulative error does not exceed the requirements of the finishing material.

3.05 ADJUST AND CLEAN

A. Clean premises of all litter, dirt and debris created by work of this section. Leave premises broom clean.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.

B. Items specified.

1. Support for Wall and Ceiling Mounted Items

2. Metal Railings

3. Bollards

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Shop Drawings:

1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.

2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.

3. Provide templates and rough-in measurements as required.

C. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

1.04 QUALITY ASSURANCE

A. Each product type shall be the same and be made by the same manufacturer.

B. Assemble product to the greatest extent possible before delivery to the site.

C. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.05 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society of Mechanical Engineers (ASME):

B18.2.2-87(R2005).....Square and Hex Nuts

C. American Society for Testing and Materials (ASTM):

A36/A36M-08 .....Structural Steel

A47-99(R2009).....Malleable Iron Castings

A53-10.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

A123-09.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A307-10.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

A653/A653M-10 .....Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

A786/A786M-09 .....Rolled Steel Floor Plate

C1107-08 .....Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

F436-10.....Hardened Steel Washers

F1667-11.....Driven Fasteners: Nails, Spikes and Staples

D. American Welding Society (AWS):

D1.1-10 .....Structural Welding Code Steel

D1.3-08 .....Structural Welding Code Sheet Steel

E. National Association of Architectural Metal Manufacturers (NAAMM)

AMP 521-01 .....Pipe Railing Manual

AMP 500-06 .....Metal Finishes Manual

Structural Steel Painting Council (SSPC)/Society of Protective Coatings:

SP 1-04 .....No. 1, Solvent Cleaning

SP 2-04 .....No. 2, Hand Tool Cleaning

SP 3-04 .....No. 3, Power Tool Cleaning

1.06 DESIGN CRITERIA

A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.

B. Ladders and Rungs: 120 kg (250 pounds) at any point.

C. Railings and Handrails: 900 N (200 pounds) in any direction at any point.

PART 2 PRODUCTS

2.01 MATERIALS

A. Structural Steel: ASTM A36.

B. Floor Plate:

1. Steel ASTM A786.

2. Aluminum: ASTM B632.

C. Steel Pipe: ASTM A53.

1. Galvanized for exterior locations.

2. Coated for interior locations, see SECTION 09 06 00 for coating.

D. Cast-Iron: ASTM A48, Class 30, commercial pattern.

E. Grout: ASTM C1107, pourable type.

F. Steel Pipe (Bollard): ASTM A53.

1. Galvanized for exterior locations.

2. Type S, Grade A unless specified otherwise.

3. NPS (inside diameter) as shown.

2.02 HARDWARE

A. Rough Hardware:

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.

2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.

B. Fasteners:

1. Bolts with Nuts:

a. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.

b. ASTM F593 for stainless steel.

c. Screws: ASME B18.6.1.

d. Washers: ASTM F436, type to suit material and anchorage.

e. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

2.03 FABRICATION GENERAL

A. Material

1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.

2. Use material free of defects which could affect the appearance or service ability of the finished product.

B. Size:

1. Size and thickness of members as shown.

2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

C. Connections

1. Except as otherwise specified, connections may be made by welding, riveting or bolting.

2. Field riveting will not be approved.

3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.

4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.

5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.

6. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.

7. Use stainless steel connectors for removable members machine screws or bolts.

D. Fasteners and Anchors

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.

2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.

3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.

4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.

5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self-drilling and tapping screws or bolts.

E. Workmanship

1. General:

a. Fabricate items to design shown.

b. Furnish members in longest lengths commercially available within the limits shown and specified.

c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.

d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.

e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.

f. Prepare members for the installation and fitting of hardware.

g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.

h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.

2. Welding:

a. Weld in accordance with AWS.

b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.

c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.

d. Finish welded joints to match finish of adjacent surface.

3. Joining:

a. Miter or butt members at corners.

b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.

4. Cutting and Fitting:

a. Accurately cut, machine and fit joints, corners, copes, and miters.

b. Fit removable members to be easily removed.

c. Design and construct field connections in the most practical place for appearance and ease of installation.

d. Fit pieces together as required.

e. Fabricate connections for ease of assembly and disassembly without use of special tools.

f. Joints firm when assembled.

g. Conceal joining, fitting and welding on exposed work as far as practical.

h. Do not show rivets and screws prominently on the exposed face.

i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:

1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.

2. Aluminum: NAAMM AMP 501.

a. Mill finish, AA-M10, as fabricated, use unless specified otherwise.

b. Clear anodic coating, AA-C22A41, chemically etched medium matte, with Architectural Class 1, 0.7 mils or thicker.

c. Colored anodic coating, AA-C22A42, chemically etched medium matte with Architectural Class 1, 0.7 mils or thicker.

d. Painted: AA-C22R10.

3. Steel and Iron: NAAMM AMP 504.

a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.

b. Surfaces exposed in the finished work:

1) Finish smooth rough surfaces and remove projections.

2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.

c. Shop Prime Painting:

1) Surfaces of Ferrous metal:

a) Items not specified to have other coatings.

b) Galvanized surfaces specified to have prime paint.

c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.

d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.

e) After cleaning and finishing apply one coat of primer as specified in Section 09 90 00, PAINTING.

4. Stainless Steel: NAAMM AMP-504 Finish No. 4.

G. Protection:

1. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

2.04 SUPPORTS

A. General:

1. Fabricate ASTM A36 structural steel shapes where shown.

2. Use clip angles or make provisions for welding hangers and braces to overhead construction.

3. Field connections may be welded or bolted.

B. For Wall Mounted Items:

1. For items supported by metal stud partitions.

2. Steel strip minimum of 150 mm (6 inches) wide, length extending one stud space beyond end of item supported.

C. For Trapeze Bars:

1. Construct assembly above ceilings as shown and design to support not less than a 340 kg (750 pound) working load at any point.

2. Fabricate trapeze supports as shown, with all exposed members, including screws, nuts, bolts and washers, fabricated of stainless steel.

3. Continuously weld connections where welds shown.

4. Use modular channel where shown with manufacturers bolts and fittings.

2.05 GATE HINGES LATCH AND STOP

A. Manufacturer: Tymetal, Hoover Fence Co., or approved equal

B. Galvanized ASTM A123, G-90 after fabrication.

C. Doors:

1. Provide pre-fabricated steel hinged door and frame as shown.

2. Color: to match fence color

3. Hardware:

a. Install lock or latch specified in Section 08 71 00, DOOR HARDWARE.

2.06 METAL RAILING

A. In addition to the dead load design railing assembly to support live load specified.

B. Fabrication General:

1. Provide continuous welded joints, dressed smooth and flush.

2. Standard flush fittings, designed to be welded, may be used.

3. Exposed threads will not be approved.

4. Form handrail brackets to size and design shown.

5. Interior Post Anchors:

a. Provide flanged fittings for securing fixed posts to floor with expansion bolts, unless shown otherwise.

b. Weld or thread flanged fitting to posts at base.

c. For securing removable posts to floor, provide close fitting sleeve insert or inverted flange base plate with stud bolts or rivets concrete anchor welded to the base plate.

d. Provide sliding flange base plate on posts secured with set screws.

e. Weld flange base plate to removable posts set in sleeves.

C. Handrails:

1. Close free ends of rail with flush metal caps welded in place except where flanges for securing to walls with bolts are shown.

2. Make provisions for attaching handrail brackets to wall, posts, and handrail as shown.

D. Aluminum Railings:

1. Fabricate from extruded aluminum.

2. Use tubular posts not less than 3 mm (0.125 inch) wall thickness for exterior railings.

3. Punch intermediate rails and bottom of top rails for passage of posts and machine to a close fit.

4. Where shown use extruded channel sections for top rail with 13 mm (1/2 inch) thick top cover plates and closed ends.

5. Fabricate brackets of extruded or wrought aluminum as shown.

6. Fabricate stainless pipe sleeves with closed bottom at least six inches deep having internal dimensions at least 13 mm (1/2 inch) greater than external dimensions of posts where set in concrete.

2.06 METAL LADDER

A. Aluminum Ladders:

1. Fixed-rail type, constructed of structural aluminum, with mill finish.

2. Fabricate side rails and rungs of size and design shown, with the rungs shouldered and headed into and welded to the rails.

3. Where shown fabrication side rails curved, twisted and formed into gooseneck.

4. Fabricate angle brackets at top and bottom and intermediate brackets where shown. Drill for bolting.

B. Ladder Rungs:

1. Fabricate from 25 mm (one inch) diameter steel bars.

2. Fabricate so that rungs will extend at least 100 mm (4 inches) into wall with ends turned 50 mm (2 inches), project out from wall 175 mm (7 inches), be 400 mm (16 inches) wide and be designed so that foot cannot slide off end.

3. Galvanized after fabrication, ASTM A123, G-90 rungs for exterior use and for access to pits.

2.07 STEEL PIPE BOLLARD

A. Provide bollard in accordance with ASTM A53 with dimensions as shown in standard detail SD320523-04. Anchor posts in concrete and fill solidly with concrete with a minimum compressive strength of 17 MPa 2500psi.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Set frames of access doors and similar items flush with finish floor and, where applicable, flush with side of opening.

C. Field weld in accordance with AWS.

1. Design and finish as specified for shop welding.

2. Use continuous weld unless specified otherwise.

D. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified.

E. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.

3.02 INSTALLATION OF SUPPORTS

A. Anchorage to structure:

1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.

2. Secure supports to concrete inserts by bolting as shown.

3. Secure steel plate to studs as detailed.

B. Supports for Wall Mounted items:

1. Locate center of support at anchorage point of supported item.

2. Locate support at top and bottom of wall hung cabinets.

3. Locate support at top of floor cabinets and shelving installed against walls.

4. Locate supports where required for items shown.

C. Supports for Trapeze Bars:

1. Secure plates to overhead construction with fasteners where shown.

2. Secure angle brace assembly to overhead construction with fasteners where shown and bolt plate to braces.

3. Fit modular channel unit to equipment and secure with modular channel unit manufacturer's standard fittings as shown.

3.03 CLEAN AND ADJUSTING

A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.

B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

3.04 INSTALLATION OF STEEL PIPE BOLLARD

A. Set bollards vertically in concrete piers. Compressive strength of concrete piers shall be 21MPa 3000psi. For dimensions of concrete piers

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Section specifies steel stairs AND railings.

B. Types:

1. Stairs with steel plate treads, risers and top/intermediate landing steel pan filled concrete.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: Show design, fabrication details, installation, connections, material, and size of members.

1.04 APPLICATION PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation.

B. American Society for Testing and Materials (ASTM):

A36/A36M-08	Structural Steel
A47-99 (R2009)	Ferritic Malleable Iron Castings
A48-03(R2008)	Gray Iron Castings
A53-10	Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless
A307-10	Carbon Steel Bolts and Studs, 60000 psi Tensile Strength
A653/653M-10	Steel Sheet, Zinc Coated (Galvanized) or Zinc Alloy Coated (Galvannealed) by the Hot-Dip Process
A563-07	Carbon and Alloy Steel Nuts
A1008-10	Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low-Alloy
A786/A786M-09	Rolled Steel Floor Plates
A1011-10	Steel, Sheet and Strip, Strip, Hot-Rolled Carbon, Structural, High-Strength, Low-Alloy

C. American Welding Society (AWS):

D1.1-10.....Structural Welding Code-Steel

D1.3-08.....Structural Welding Code-Sheet Steel

D. The National Association of Architectural Metal Manufactures (NAAMM) Manuals: Metal Bar Gratings (ANSI/NAAMM MBG 531-09)

AMP521-01.....Pipe Railing Manual, Including Round Tube

E. American Iron and Steel Institute (AISI):

2001.....Design of Cold-Formed Steel Structural Members

PART 2 PRODUCTS

2.01 DESIGN CRITERIA

A. Design stairs to support a live load of 500 kg/m2 (100 pounds per square foot).

B. Structural design, fabrication and assembly in accordance with requirements of NAAMM Metal Stairs Manual, except as otherwise specified or shown.

C. Design pipe railings in accordance with NAAMM Pipe Railing Manual for 900 N (200 pounds) in any direction at any point.

2.02 MATERIALS

A. Steel Pipe: ASTM A53, Standard Weight, zinc coated.

B. Sheet Steel: ASTM A1008.

C. Structural Steel: ASTM A36.

D. Steel Floor Plate: ASTM 786.

E . Steel Plate: ASTM A1011.

2.03 FABRICATION GENERAL

A. Fasteners:

1. Conceal bolts and screws wherever possible.

2. Use countersunk heads on exposed bolts and screws with ends of bolts and screws dressed flush after nuts are set.

B. Welding:

1. Structural steel, AWS D1.1 and sheet steel, AWS D1.3.

2. Where possible, locate welds on unexposed side.

3. Grind exposed welds smooth and true to contour of welded member.

4. Remove welding splatter.

C. Remove sharp edges and burrs.

D. Fit stringers to head channel and close ends with steel plates welded in place where shown.

E. Fit face stringer to newel post by tenoning into newel post, or by notching and fitting face stringer to side of newel where shown.

F. Shop Prime Painting: Prepare surface and apply primer as specified for ferrous metals in Section 09 91 00, PAINTING.

2.04 RAILINGS

A. Fabricate railings, including handrails, from steel pipe with flush.

1. Connections may be standard fittings designed for welding, or coped or mitered pipe with full welds.

B. Return ends of handrail to wall and close free end.

C. Provide standard terminal castings where fastened to newel.

D. Space intermediate posts not over six feet on center between end post or newel post.

E. Fabricate handrail brackets from cast malleable iron.

F. Provide standard terminal fittings at ends of post and rails.

2.05 CLOSED RISER STAIRS

A. Provide treads, risers, platforms, railings, stringers, headers and other supporting members with closed treads and risers.

B. Fabricate pans for platforms from sheet steel. Fabricate pans for platforms from steel decking where shown. Fabricate risers and treads from ¼" thick formed non-slip checkered steel floor place, galvanized finishes.

C. Form risers with sanitary cove.

D. Fabricate stringers, headers, and other supporting members from structural steel, galvanized finish.

E. Construct newel posts of steel tubing having wall thickness not less than 5 mm (3/16-inch), with forged steel caps and drops.

PART 3 EXECUTION

3.01 STAIR INSTALLATION

A. Provide hangers and struts required to support the loads imposed.

B. Perform job site welding and bolting as specified for shop fabrication.

C. Set stairs and other members in position and secure to structure as shown.

D. Install stairs plumb, level and true to line.

E. Fill with conctrete.

3.02 RAILING INSTALLATION

A. Install standard terminal fittings at ends of posts and rails.

B. Secure brackets, posts and rails to steel by welds, and to masonry or concrete with expansion sleeves and bolts, except secure posts at concrete by setting in sleeves filled with commercial non-shrink grout.

C. Set rails horizontal or parallel to rake of stairs to within 3 mm in 3650 mm (1/8-inch in 12 feet).

D. Set posts plumb and aligned to within 3 mm in 3650 mm (1/8-inch in 12 feet).

3.03 FIELD PRIME PAINTING

A. When installation is complete, clean field welds and surrounding areas to bright metal, and coat with same primer paint used for shop priming.

B. Touch-up abraded areas with same primer paint used for shop priming

C. Touch up abraded galvanized areas with zinc rich paint as specified in section 09 91 00, PAINTING.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Provide labor, materials and equipment to complete all rough and finish carpentry work as indicated in the Contract Documents.

B. Work of this section include rough carpentry, plywood, composite lumber, finish carpentry and miscellaneous installed finished items.

1. Establish lines and levels for use of other trades.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 REFERENCES

A. AHA A135.4 - Basic Hardboard; American Hardboard Association.

B. ANSI A208.1 - Wood Particleboard.

C. ASTM C1036 - Standard Specification for Flat Glass.

D. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. AWI P-200 - Architectural Woodwork Quality Standards; Architectural Woodwork Institute.

G. AWPA C2 - Lumber, Timbers, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes; American Wood Preservers Association.

H. NWWDA I.S.4 - Industry Standard for Water-Repellent Preservative Non-Pressure Treatment for Millwork; National Wood Window and Door Association.

I. NIST PS 1 - Construction and Industrial Plywood.

J. NIST PS 20 - American Softwood Lumber Standard.

K. WIC - Manual of Millwork; Woodwork Institute of California.

L. Forest Products Society (FPS): National Design Specification for Stress Grade Lumber and its Fastening.

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Submit wood treatment certifications and instructions for proper use of each type of treated material.

C. Wood Product Certifications:

1. FSC Certification: Furnish certification indicating wood products are from “well-managed” forests.

2. Toxicity Certification: Furnish certification plywood has no added formaldehyde and has no toxic materials as defined by LEED.

1.05 QUALITY ASSURANCE

M. Lumber Grades: Provide visible grade stamp of an agency certified by FPS.

N. Lumber Standard: Comply with US Product Standard PS20 for each indicated use, including moisture content and actual sizes related to indicated nominal sizes.

O. Plywood Standard: Comply with PS1 (ANSI A199.1).

P. FSC Certified Wood Products: Wood products to be from forests certified “well-managed” by an agency accredited by Forest Stewardship Council (FSC) including SmartWood Program and Forest Conservation Program.

PART 2 PRODUCTS

2.01 MATERIALS

A. Blocking: Provide dimensional lumber graded in accordance with FPS Grading Rules; Construction Grade, Douglas Fir; minimum S-Dry.

B. Plywood: Provide minimum APA C-D exterior (CDX) plywood; stress rated where spanning between supporting members; fire retardant treated; minimum 3/4" thick unless otherwise indicated. Where plywood will be exposed in finished work with painted finish provide A-C/EXT-APA plywood with Grade A face exposed and Grade C face concealed for exterior use: and A-C/INT-APA plywood with Grade A face exposed and Grade C face concealed for interior use.

1. General: Provide plywood certified with no added formaldehyde (NAF) and with no toxic materials as defined by LEED.

C. Nails, Spikes and Staples: Galvanized; size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins and Screws: Medium carbon steel; galvanized; size and type to suit application.

E. Fasteners: Provide fasteners as required for complete, secure installation of miscellaneous rough carpentry.

1. Steel: Bolts or powder activated type.

F. Hardwood Lumber: Graded in accordance with WIC Custom; of quality suitable for transparent finish. Species as directed by architect. Exterior planter bench work shall include brackets and fasteners.

G. Primer: Alkyd primer sealer type.

H. Wood Filler: Solvent base, tinted to match surface finish color.

I. Wood Treatment: Water Repellant Preservative Treatment by Dipping Method: NWWDA I.S.4, with 0.25 percent retainage.

J. Building Paper

1. 15 Lb. asphalt impregnated felt paper.

K. Recessed Mount Key Box

1. Knox Box, 3200 Series, recesses, 10 key steel vault, hinged door, color TBD. Located at street entry.

L. Construction Adhesives

1. Products of Contech Division of Rexnord Chemical Corporation or equal as approved by Architect.

a. Interior work dry areas – PL200

b. Exterior work and wet areas – PL 400

c. Treated Wood – PL500

2.02 FABRICATION

A. Wood Preservation: Treat lumber and plywood to comply with applicable requirements of American Wood Preservers Association.

1. Decay Resistance Treatment: Pressure treat following items with water-borne preservatives for above ground use with AWPA C-2.

a. Treat wood members in connection with roofing, flashing, vapor barriers and waterproofing.

b. Treat wood members in contact with masonry, with concrete, and below grade.

c. Kiln-dry wood to a maximum moisture content of 19% after treatment with water-borne preservative.

2. Fire Retardant Treatment: Comply with AWPA standards for pressure impregnation with fire-retardant chemicals to achieve flame-spread rating of not more than 25 in accordance with ASTM E84 or UL Test 723.

a. Treat interior wood and plywood complying with AWPA C20 and C27, Interior Type A, and identify with FRTW.

b. Provide UL label on each piece of fire-retardant wood and plywood.

c. Kiln-dry treated items to maximum moisture content of 19%.

3. Complete fabrication of treated items prior to treatment, wherever possible; if cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment.

4. Inspect each piece after drying and discard damaged and defective pieces.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place miscellaneous rough carpentry true to lines and levels.

B. Correlate location so attached work will comply with design requirements and be properly located. For equipment, accessory, part of other item intended to be installed.

C. Construct members of continuous pieces of longest possible lengths.

D. Fit carpentry work to other work; scribe and cope as required for accurate fit.

E. Shim with metal or slate for bearing on concrete and masonry.

F. Securely attach carpentry work to substrates by anchoring and fastening as required by recognized standards.

1. Provide washers under bolt heads and nuts in contact with wood.

G. Wood Blocking: Provide blocking of S4S lumber not less than 1-1/2" wide and of thickness required to provide adequate support or to properly locate attached material.

1. Provide attachment to other work; form to shapes shown.

2. Countersink bolts and nuts flush with surfaces.

3. Remove temporary blocking when no longer needed.

4. Anchor to formwork before concrete placement.

H. Plywood: Comply with recommendations of American Plywood Association (APA) for fabrication and installation of plywood work.

1. Provide attachment to other work; form to shapes shown.

2. Align fasteners for exposed view aesthetic as shown.

3. Fit carpentry work to other work.

4. Adjust, trim and level.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Provide mill fabricated architectural woodwork with accessories as required for complete finished installation.

1. Provide plastic laminate faced cabinetwork.

2. Provide solid surface counter.

3. Provide solid surface window sills.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Submit manufacturer’s literature for manufactured items.

C. Shop Drawings: Indicate materials and wood species, component profiles, fastening, joining details, finishes, and accessories.

1. Certification: Provide WI MoM Certified Compliance Label on shop drawings.

D. Samples: Furnish samples of each exposed material.

E. Certificates: "Manual of Millwork" (WI MoM) certification is required.

1. General: Before delivery to jobsite, provide WI MoM Certified Compliance Certificate indicating grade of millwork products to be furnished and certify WI MoM requirements for specified grades shall be met.

2. Casework: Each unit to bear WI MoM Certified Compliance Label.

3. Installation: Provide WI MoM Certified Compliance Certificate for Installation.

4. FSC Certification: Furnish certification indicating wood products are from “well-managed” forests.

5. Toxicity Certification: Furnish certification plywood has no added formaldehyde and has no toxic materials as defined by LEED.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Member of Woodwork Institute (formerly Woodwork Institute of California) with minimum five years successful experience fabricating architectural woodwork similar to that required for Project.

B. Standards: Perform architectural woodwork in accordance with recommendations Woodwork Institute "Manual of Millwork" (WI MoM).

C. Seismic Anchorage: Provide seismic anchorage for wall cabinets as required by CBC.

D. FSC Certified Wood Products: Wood products to be from forests certified “well-managed” by an agency accredited by Forest Stewardship Council (FSC) including SmartWood Program and Forest Conservation Program.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver architectural woodwork until site conditions are adequate to receive work; protect items from weather while in transit.

1. Allow architectural woodwork shop finish to completely dry prior to delivery to site; allow materials to off-gas volatile organic compound (VOC) emissions off site.

B. Store materials indoors, in ventilated areas with constant but minimum temperature of 60 degrees F and maximum relative humidity of 25% to 55%.

C. Do not begin installation of architectural woodwork until space is fully enclosed and mechanical systems are fully operational.

1. Maintain interior installation areas at 70 degrees F and 50% to 55% relative humidity.

D. Immediately remove from site materials with visible mold and materials with mildew.

PART 2 PRODUCTS

2.01 MATERIALS

A. Plastic Laminate Finished Casework:

1. Plastic laminate cabinet work: Custom.

2. Plastic Laminates:

a. Types: NEMA LD-3.1 high pressure laminates.

1) Horizontal Surfaces: General Purpose Type, nominal 0.050".

2) Vertical Surfaces: Vertical Surface Type, nominal 0.032".

3) Unexposed Surfaces: Balanced with 0.030" melamine backing sheet.

3. Countertop and window sill:

a. Solid Polymer Systems: Manufacturer's standard polymer system with color throughout thickness; provide manufacturer recommended joint adhesive; exposed surfaces finished to match top.

1) Quality: Comparable to WI MoM/Premium Grade.

2) Type: Not less than 1/2" thick sheet designed to accept bowls as indicated and as specified in Division 15 and with edge conditions as indicated on Drawings.

3) Color: Manufacturer's standard color as selected by Architect.

4) Manufacturers:

i. DuPont Co./Corian.

ii. Avonite, Inc./Avonite.

iii. Formica Corp./Surell.

4. Core: Provide plywood with no added formaldehyde and no toxic materials.

B. Anchors, Nails and Screws: Select material, type, size and finish required by each substrate for secure anchorage; provide toothed steel or lead expansion bolt screws for drilled-in-place anchors.

2.02 FABRICATION

A. General: Fabricate architectural woodwork in accordance with specified quality standards.

B. Plastic Laminate:

1. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes.

2. Make corners and joints hairline; slightly bevel arises.

3. Locate butt joints at least 2'-0" from cutouts.

4. Cap exposed edges with plastic laminate of same finish and pattern.

5. Apply laminate backing sheet to reverse side of laminate surfaces.

6. Provide cutouts for inserts, fixtures and fittings; verify locations from on-site dimensions.

7. Prime paint contact surfaces of cutouts.

C. Use exposed fastening devices or nails only when approved and unavoidable; arrange neatly.

D. Assemble woodwork in shop in sizes easily handled and to ensure passage through building openings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible; do not delay job progress, allow for trimming and fitting.

3.02 INSTALLATION

A. Install work consistent with specified quality grade, plumb, level, true and straight with no distortions.

1. Shim as required, using concealed shims.

B. Secure work to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

C. Scribe and cut for accurate fit to other finished work.

D. Attach architectural woodwork securely in place with uniform joints providing for thermal and building movements.

E. Attach countertop material to casework per manufacturer.

F. Acceptable Tolerances:

1. Variation from True Position: Maximum 1/16" at any position and maximum 1/8" in any 10'-0" length.

2. Adjoining Surfaces of Same Material: No variation permitted.

3. Offset with Abutting Materials: Maximum 1/32".

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Modified bituminous sheet material used for exterior below grade waterproofing and split slab waterproofing.

1.02 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. Federal Specifications (Fed. Spec.):

1. UU-B-790A Notice 2- Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent, and Fire Resistant).

C. ASTM International (ASTM):

1. C578-15b - Rigid, Cellular Polystyrene Thermal Insulation.
2. D41/D41M-11 - Asphalt Primer Used in Roofing, Dampproofing and Waterproofing.
3. D4586/D4586M-07(2012)e1 - Asphalt Roof Cement, Asbestos-Free.
4. D6380/D6380M-03(2012)e1 - Asphalt Roll Roofing (Organic Felt).

D. American Hardboard Association (AHA):

1. A135.4-2012 - Basic Hardboard.

1.03 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.

1. Required Participants:

a. Contracting Officer's Representative.
b. // Architect/Engineer. //
c. // Inspection and Testing Agency. //
d. Contractor.

e. Installer.
f. // Manufacturer's field representative. //
g. Other installers responsible for adjacent and intersecting work, including substrate and flashing installers.

2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.

a. Installation schedule.
b. Installation sequence.
c. Preparatory work.
d. Protection before, during, and after installation.
e. Installation.
f. Terminations.
g. Transitions and connections to other work.
h. Inspecting and testing.
i. Other items affecting successful completion.

3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.04 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show size, configuration, and installation details.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Installation instructions.
3. Warranty.

D. Samples:

1. Waterproofing and Flashing Sheet: 200 mm (8 inch) square, each type and color.
2. Insulation: 200 mm (8 inch) square.

E. Test reports: Certify products comply with specifications.

F. Certificates: Certify products comply with specifications.

G. Qualifications: Substantiate qualifications comply with specifications.

1. Installer with project experience list.

1.05 QUALITY ASSURANCE

A. Installer Qualifications:

1. Regularly installs specified products.
2. Installed specified products with satisfactory service on five similar installations for minimum five years.

a. Project Experience List: Provide contact names and addresses for completed projects.

1.06 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.07 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight conditioned facility.

B. Protect products from damage during handling and construction operations.

1.08 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 4 degrees C (40 degrees F) for minimum 48 hours before installation.
2. Weather Limitations: Install waterproofing only during dry current and forecasted weather conditions.

1.09 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant waterproofing system against material and manufacturing defects and agree to repair any leak caused by a defect in the waterproofing system materials or workmanship of the installer.

1. Warranty Period: 10 years.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Waterproofing System: Modified bituminous sheet material for exterior below grade and split slab waterproofing.

2.02 PRODUCTS - GENERAL

A. Provide each product from one manufacturer.

B. Sustainable Construction Requirements:

1. Insulation Recycled Content:

a. Rigid Foam: 9 percent total recycled content, minimum.

2.03 BITUMINOUS SHEET

A. Cold applied waterproofing membrane composed primarily of modified bituminous material prefabricated in sheet form designed for below grade exterior and split slab waterproofing. Sheet reinforced with fibers at manufacturer's option.

B. Thickness: 1.5 mm (60 mils), plus or minus 0.13 mm (5 mils), and bonded to 0.1 mm (4 mil) thick plastic sheet.

C. Provide release sheet to prevent bonding of bituminous sheet to itself.

2.04 PROTECTION MATERIAL

A. Polystyrene Insulation: ASTM C578, Type I or VIII, 13 mm (1/2 inch) minimum thickness.

B. Hardboard: AHA A135.4, Service Type, 6 mm (1/4 inch) thick.

C. Waterproofed Building Paper: Fed. Spec. UU-B-790A Notice 2, Type I, Grade C.

D. Roll Roofing: ASTM D6380/D6380M, Class S (smooth), Type III with minimum net mass per unit area of roofing, 2495 g/sq. m (51 lbs./100 sq. ft.).

2.05 ACCESSORIES

A. Patching Compound: Factory-prepared, non-shrinking, fast-setting, cementitious adhesive compound containing no ferrous metal or oxide.

B. Primer: ASTM D41/D41M.

C. Roof Cement: ASTM D4586/D4586M.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine and verify substrate suitability for product installation.

1. Concrete surfaces cured minimum time recommended by waterproofing manufacturer.
2. Substrate to be dry as recommended by waterproofing manufacturer.

B. Protect existing construction and completed work from damage.

C. Correct substrate deficiencies.

1. Fill voids, joints, and cracks with patching compound.

D. Clean substrates. Remove contaminants capable of preventing full adhesion.

E. Priming:

1. Prime concrete and masonry surfaces.
2. Application method, amount of primer and condition or primer before installation of bituminous sheet as recommended by primer manufacturer.
3. Reprime when required according to manufacturer's instructions.

3.02 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.03 WATERPROOFING INSTALLATION

A. Bituminous Sheet Installation:

1. Remove release sheet before application.
2. Lay bituminous sheet from low point to high point so laps shed water.
3. Treat expansion, construction and control joints and evident working cracks as expansion joints. Apply bituminous sheet in double thickness over joint by first applying a strip of bituminous sheet minimum 200 mm (8 inches) wide, centered over joint.
4. Lap seams minimum 50 mm (2 inches).
5. Lay succeeding sheet with laps, and roll or press into place.
6. Repair misaligned or inadequately lapped seams according to manufacturer’s instructions.
7. Seal seams and terminations according to sheet manufacturer’s instructions.

B. Corner Treatment:

1. At inside and outside corners, apply double cover using an initial strip minimum 280 mm (11 inches) wide, centered along axis of corner.
2. Cover each strip completely by the regular application of bituminous sheet.
3. Provide a fillet or cant on inside corners.
4. Form cants using patching compound.
5. Do not use wood, fiber, and insulating materials for cants.

C. Projection Treatment:

1. Apply a double layer of bituminous sheet around pipes and similar projections at least 150 mm (6 inches) wide.
2. At drains, apply a bead of roof cement over a double layer of bituminous sheet under clamping rings.

D. Patching:

1. Repair tears, punctures, air blisters, and inadequately lapped seams, according to manufacturer's instructions before protection course is applied.

E. Permanent Protection:

1. Vertical Surfaces:

a. Install hardboard, polystyrene insulation, or roll roofing protection material.
b. Extend protection full height from footing to top of backfill.
c. If graded backfill is used, use roll roofing or hardboard.

F. Horizontal Surfaces:

1. Install roll roofing protection under concrete wearing courses.
2. Install roll roofing, hardboard, or polystyrene insulation under earth backfill.
3. Where no concrete wearing course occurs or when surfaces will bear heavy traffic and will not immediately be covered with a wearing course, use protection specified for vertical surfaces.

G. Temporary Protection:

1. When waterproofing materials are subjected to damage by sunlight and cannot be immediately protected as specified, protect waterproofing materials by waterproof building paper or suitable coating approved by manufacturer of waterproofing system used.

3.04 FIELD QUALITY CONTROL

A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.

B. Testing:

1. Before any protection or wearing course is applied, test all horizontal applications of waterproofing with a minimum of 25 mm (1 inch) head of water above highest point and leave for 24 hours.
2. Mark leaks and repair when waterproofing is dry.

3. Certify, to Contracting Officer's Representative, that water tests have been made and that areas tested were found watertight.

C. Inspection:

1. Do not cover waterproofed surfaces by other materials or backfill until work is approved by Contracting Officer's Representative.

3.05 CLEANING

A. Remove excess adhesive before adhesive sets.

B. Clean exposed waterproofing surfaces. Remove contaminants and stains.

3.06 PROTECTION

A. Protect waterproofing from construction operations.

B. Remove protective materials immediately before acceptance.

C. Repair damage.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Provide labor, material, equipment and services to furnish and install building insulation as shown on the drawings, as specified herein and as required for a complete and proper installation, including, but not limited to, the following:

1. Thermal Insulation

2. Acoustic Insulation

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Furnish manufacturer's literature for each type of insulation.

1. Submit Underwriter's Laboratory approval numbers for required fire ratings; approvals of other laboratories contingent upon acceptance of applicable authorities.

C. Certificates: Stating the type, thickness and "R" value (thermal resistance) of the insulation to be installed.

1.04 STORAGE AND HANDLING

A. Store insulation materials in weathertight enclosure.

B. Protect insulation from damage from handling, weather and construction operations before, during, and after installation.

1.05 APPLICABLE STANDARDS: The latest edition of publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

A. Federal Specifications (Fed. Spec.)

FF N 105B (3) Nails, Brads, Staples and Spikes: Wire, Cut and Wrought

B. California Building Codes (CBC) 2019 Energy Codes

C. American Society for Testing and Materials (ASTM):

C552 Cellular Glass Block and Pipe Thermal Insulation

C553 Mineral Fiber Blanket and Felt Insulation (Industrial Type)

C578 Preformed Cellular Polystyrene Thermal Insulation

C591 Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation

C612 Mineral Fiber Block and Board Thermal Insulation

C665 Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

C728 Perlite Thermal Insulation Board

C954 Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Base to Steel Studs From 0.033 inch to 0.112 inch in thickness

C1002 Steel Drill Screws for the Application of Gypsum Board

PART 2 PRODUCTS

2.01 MATERIALS

A. Thermal Batt Insulation: Thermafiber SAFB, preformed slag mineral or glass fiber with thermosetting resin binders, conforming to ASTM C665, Type 1, HH-I-521F, unfaced; formaldehyde-free and with no toxic materials. Flame Spread/Smoke Density Rating: Maximum 0/0, ASTM E84. Combustibility: Pass ASTM E136.

B. Acoustical Insulation

1. Mineral Fiber Batt or Blankets: ASTM C665, Type 1. Thickness as shown; of widths and lengths to fit tight against framing.

C. Rigid Insulation

1. On the inside face of exterior walls.

2. Cellular Glass Block, ASTM C552, Type 1.

D. Accessories: Furnish as recommended by insulation manufacturer for insulation types, substrates, and conditions involved.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify substrate and adjacent materials are dry and ready to receive insulation; beginning installation signifies acceptance of conditions.

B. Ensure mechanical and electrical items affecting work are properly placed, complete, and have been inspected by Architect prior to commencement of installation.

3.02 INSTALLATION

A. Install batt or blanket insulation with tight joints and filling framing void completely. Seal cuts, tears, and un-lapped joints with tape.

B. Fit insulation tight against adjoining construction and penetrations, unless specified otherwise. Install insulation in accordance with manufacturer's instructions.

C. Cut and trim insulation neatly, to fit spaces.

D. Fit insulation tight within spaces and tight to and behind mechanical and electrical services within insulation plane; leave no gaps or voids; maintain integrity of thermal barrier.

E. Friction fit batt insulation in place; use tape or penetration supports as necessary to assure permanent installation.

F. Fasten blanket insulation between metal studs and wall furring with continuous pressure sensitive tape along edges or adhesive.

G. Pack insulation around door frames and windows and in cracks, expansion joints, control joints, door soffits and other voids. Pack behind outlets, around pipes, ducts, and services encased in wall or partition. Hold insulation in place with pressure sensitive tape or adhesive.

H. Do not compress insulation below required thickness except where embedded items prevent required thickness.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Roof and deck insulation on new construction ready to receive roofing or waterproofing membrane over concrete deck.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.

B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):

90.1-07 ..... Energy Standard for Buildings Except Low-Rise Residential Buildings

C. ASTM International (ASTM):

C208-08 ..... Cellulosic Fiber Insulating Board
C552-07 ..... Cellular Glass Thermal Insulation
C726-05 ..... Mineral Fiber Roof Insulation Board
C728-05 ..... Perlite Thermal Insulation Board
C1177/C1177M-08 ..... Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
C1278/C1278M-07 ..... Standard Specification for Fiber-Reinforced Gypsum Panel
C1289-10 ..... Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
C1396/C1396M-09 ..... Standard Specification for Gypsum Board
D41-05 ..... Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
D312-06 ..... Asphalt Used in Roofing
D1970-09 ..... Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
D2178-04 ..... Asphalt Glass Felt Used in Roofing and Waterproofing
D2822-05 ..... Asphalt Roof Cement
D4586-07 ..... Standard Specification for Asphalt Roof Cement, Asbestos-Free

E84-09 ..... Standard Test Method for Surface Burning Characteristics of Building Material

F1667-05 ..... Driven Fasteners: Nails, Spikes, and Staples

D. FM Approvals: RoofNav Approved Roofing Assemblies and Products.

4450-89 ..... Approved Standard for Class 1 Insulated Steel Deck Roofs

4470-10 ..... Approved Standard for Class 1 Roof Coverings

1-28-09 ..... Loss Prevention Data Sheet: Design Wind Loads.

1-29-09 ..... Loss Prevention Data Sheet: Above-Deck Roof Components

1-49-09 ..... Loss Prevention Data Sheet: Perimeter Flashing

E. National Roofing Contractors Association: Roofing and Waterproofing Manual

F. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog, www.biopreferred.gov

G. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory (2009)

H. U.S. Department of Commerce National Institute of Standards and Technology (NIST):

DOC PS 1-09 ..... U.S. Product Standard for Construction and Industrial Plywood

DOC PS 2-04 ..... Performance Standard for Wood-Based Structural-Use Panels.

1.04 PERFORMANCE REQUIREMENTS

A. Thermal Performance: Provide roof insulation meeting minimum overall average R-value of 33, with minimum R-value at any location of 20.

B. FM Approvals: Provide roof insulation complying with requirements in FM Approvals 4450 and 4470 as part of specified roofing system, listed in FM Approvals "RoofNav" as part of roofing system meeting Fire/Windstorm Classification in Division 07 roofing section.

1.05 QUALITY CONTROL

A. Requirements of Division 07 roofing section for qualifications of roofing system insulation Installer; Work of this Section shall be performed by same Installer.

B. Requirements of Division 07 roofing section for inspection of Work of this Section and qualifications of Inspector.

C. Unless specified otherwise, comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to insulation for storage, handling, and application.

D. Requirements of roofing system uplift pressure design for specified roofing system.

E. Requirements of applicable FM Approval for specified roofing system insulation attachment.

G. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.

1.06 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:

1. Asphalt and adhesive materials, each type.

2. Roofing cement, each type.

3. Roof insulation, each type.

4. Fastening requirements.

C. Federal Sustainable Design Submittals:

1. Product Data for Federally-Mandated Bio-Based Materials: For roof materials, indicating USDA designation and compliance with definitions for bio-based products, Rapidly Renewable Materials, and certified sustainable wood content.

D. Shop Drawings: Include plans, sections, details, and attachments.

1. Nailers, cants, and terminations.

2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.

E. Samples:

1. Roof insulation, each type.

2. Nails and fasteners, each type.

F. Certificates:

1. Indicating type, thermal conductance, and minimum and average thickness of insulation.

2. Indicating materials and method of application of insulation system meet the requirements of FM Approvals for specified roofing system.

G. Laboratory Test Reports: Thermal values of insulation products.

H. Layout of tapered roof system showing units required.

I. Documentation of supervisors' and inspectors' qualifications.

1.07 DELIVERY, STORAGE AND MARKING

A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to built-up roofing for storage, handling and installation requirements.

1.08 QUALITY ASSURANCE:

A. Roof insulation on combustible or steel decks shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E84, or shall have successfully passed FM Approvals 4450.

1. Insulation bearing the UL label and listed in the UL Building Materials Directory as meeting the flame spread and smoke developed ratings will be accepted in-lieu-of copies of test reports.

2. Compliance with flame spread and smoke developed ratings will not be required when insulation has been tested as part of a roof construction assembly of the particular type used for this project and the construction is listed as fire-classified in the UL Building Materials Directory or listed as Class I roof deck construction in the FM Approvals "RoofNav."

3. Insulation tested as part of a roof construction assembly shall bear UL or FM labels attesting to the ratings specified herein.

PART 2 - PRODUCTS

2.01 ADHESIVE MATERIALS

A. Adhesive Materials, General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.

1. Liquid-type adhesive materials shall comply with VOC limits of authorities having jurisdiction.

2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Plastic Foam Adhesives: 50 g/L.

b. Multipurpose Construction Adhesives: 70 g/L.

c. Fiberglass Adhesives: 80 g/L.

d. Contact Adhesives: 80 g/L.

e. Other Adhesives: 250 g/L.

f. Non-membrane Roof Sealants: 300 g/L.

g. Sealant Primers for Non-porous Substrates: 250 g/L.

h. Sealant Primers for Porous Substrates: 775 g/L.

B. Primer: ASTM D41.

C. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.

D. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

E. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

F. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

G. Roof Cement: Asbestos free, ASTM D2822, Type I or Type II, ; or, D4586, Type I or Type II.

2.02 ROOF AND DECK INSULATION

A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer and listed as component of FM Approvals-approved roofing system.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

C. Cellular Glass Board Insulation: ASTM C552, Type IV, kraft-paper sheet faced.

D. Perlite Board Insulation: ASTM C728, expanded perlite, cellulosic fibers, binders, and waterproofing agents with top surface seal coated.

E. Cellulosic Fiber Board Insulation: ASTM C208, Type II, Grade 1 for built-up asphalt or modified bitumen roofing.

F. Tapered Roof Insulation System:

1. Fabricate of mineral fiberboard, polyisocyanurate, perlite board, or cellular glass. Use only one insulation material for tapered sections. Use only factory-tapered insulation.

2. Cut to provide high and low points with crickets and slopes as shown.

3. Minimum thickness of tapered sections; 38 mm (1-1/2 inch).

4. Minimum slope 1:48 (1/4 inch per 12 inches).

2.03 INSULATION ACCESSORIES

A. Glass (Felt): ASTM D2178, Type VI, heavy duty ply sheet.

B. Cants and Tapered Edge Strips:

1. Wood Cant Strips: Refer to Division 06 Section "Rough Carpentry."

2. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

3. Tapered Edge Strips: 1:12 (one inch per foot), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.

a. Cellulosic Fiberboard: ASTM C208.

b. Mineral Fiberboard: ASTM C726.

c. Perlite Board: ASTM C728.

C. Vapor Retarder:

1. Glass-Fiber Felts: ASTM D2178, Type IV, asphalt impregnated.

2. Self-Adhering Sheet Vapor Retarder: ASTM D1970, minimum of 1.0-mm- (40-mil-) thick, polyethylene film laminated to layer of rubberized asphalt adhesive, or 0.76- to 1.0-mm- (30- to 40-mil-) thick, polyethylene film laminated to layer of butyl rubber adhesive; maximum permeance rating of 6 ng/Pa x s x sq. m (0.1 perm).

2.04 FASTENERS

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening substrate board to roof deck.

B. Staples and Nails: ASTM F1667. Type as designated for item anchored and for substrate.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Comply with requirements of Division 07 roofing section.

3.02 PREPARATION

A. Comply with requirements of Division 07 roofing section.

3.03 RIGID INSULATION INSTALLATION

A. Insulation Installation, General:

1. Install roof insulation in accordance with roofing system manufacturer's written instructions.

2. Install roof insulation in accordance with requirements of FM Approval's Listing for specified roofing system.

3. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate prior to installation of insulation.

4. Cant Strips: Install preformed insulation cant strips at junctures of roofing system with vertical construction.

B. Insulation Thickness:

1. Thickness of roof insulation shown on drawings is nominal. Actual thickness shall provide the average thermal resistance "R" value of not less than that specified in Performance Requirements Article.

2. When thickness of insulation to be used is more or less than that shown on the drawings, make adjustments in the alignment and location of roof drains, flashing, gravel stops, fascias and similar items at no additional cost to the Government.

3. Where tapered insulation is used, the insulation thickness at high points and roof edges shall be as shown on the drawings; the thickness at the low point (drains) shall be not less than 38 mm (1-1/2 inches).

5. Use not less than two layers of insulation when insulation is 68 mm (2.7 inch) or more in thickness unless specified otherwise. Stagger joints minimum 150 mm (6 inches).

C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.

D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.

E. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.

F. Cut to fit tight against blocking or penetrations.

G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.

H. Installation Method:

1. Adhered Insulation:

a. Prime substrate as required.

b. Set each layer of insulation firmly in solid mopping of hot asphalt.

c. Set each layer of insulation firmly in ribbons of bead-applied insulation adhesive.

d. Set each layer of insulation firmly in uniform application of full-spread insulation adhesive.

2. Mechanically Fastened Insulation:

   a. Fasten insulation in accordance with FM Approval's "RoofNav" requirement in Division 07 roofing section.

   b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.

3. Mechanically Fastened and Adhered Insulation:

   a. Fasten first layer of insulation according to "Mechanically Fastened Insulation" requirements.

   b. Fasten each subsequent layer of insulation according to "Adhered Insulation" requirements.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Vapor retarder under concrete slabs on grade.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Submit for vapor retarder sheet and installation accessories. Include data from tests performed within 18 months of submittal showing compliance with specified standard.

C. Shop Drawings: Show extent of vapor retarder work. Include details for edges at walls, grade beams, and the like. Include details for penetrating elements including conduit, piping, and structural membranes.

PART 2 PRODUCTS

2.01 VAPOR RETARDER

A. Plastic Sheet Vapor Retarder: Meeting ASTM E 1745, Class A. Minimum 15 mil thick polyolefin sheet.

Acceptable types include:

1. Stego Wrap by Stego Industries
2. Moistop Ultra A by Fortifiber Corp
3. VaporBlock 15 by Raven Industries
4. Perminator by W.R. Meadows

B. Accessory Products

1. Provide manufacturer’s recommended self-adhesive plastic seam tape for seams and penetrations.
2. Penetration boots: Provide manufacturer’s recommended accessory system for sealing pipe and conduit penetrations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface to receive vapor retarder is compacted and trimmed smooth.

B. Verify that all work that will penetrate vapor retarder is complete and rigidly installed.

C. Confirm locations and details of vapor retarder termination.

3.02 VAPOR RETARDER INSTALLATION

A. General: Comply with requirements of ASTM E 1643 and manufacturer's published instructions.

B. Place plastic sheet vapor retarder directly on compacted granular fill. Place sheeting with longest dimension parallel with direction of pour.

C. Lap joints 6 inches and seal with per manufacturer's recommendations with pressure sensitive tape.

D. Tape seal vapor retarder at all perimeters.

E. Tape seal vapor retarder around columns, pipe, and conduit penetrations.

F. Avoid cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Provide materials and accessories as required for complete installation.

1. Surface preparation.

2. Application of liquid applied vapor permeable air barrier. May be referred to weather resistive barrier on Drawings.

3. Application of materials to provide bridge and seal air leakage pathways in

a. Wall and roof connections and penetrations.

b. Walls, windows, louvers or doors

c. All other penetrations through the wall assembly.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 REFERENCES

A. ASTM D412-98a(2002)e1 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

B. ASTM E96-00e1 (Method B) - Standard Test Methods for Water Vapor Transmission of Materials.

C. ASTM E283-91 (1999) - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

D. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.

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.

F. ASTM E2178-01 - Standard Test Method for Air Permeance of Building Materials.

G. ASTM E2357 - 05 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Furnish manufacturer's literature for each type of insulation.

1. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

2. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction. Include details of interfaces with other materials that form part of air barrier.

3. Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of the air barrier.

4. Obtain air/vapor barrier materials from a single manufacturer regularly engaged in manufacturing the product.

5. Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

1.05 MOCK-UP

A. Before beginning installation of air barrier, build mockups of exterior wall assembly, full height by ten (10) feet wide, including parapet, backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.

1. Coordinate construction of mockup to permit inspection of air barrier before external insulation and cladding is installed.

2. Reconstruct mockups do not comply with requirements.

3. Approved mockups may become part of the completed.

4. Include installers of other construction connecting to air barrier, including roofing, waterproofing, composite metal wall panels, metal wall panels, sealants, windows, glazed curtain walls, and door frames.

5. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

B. Store at temperatures at or above 40ºF (4ºC), free from contact with cold or frozen surfaces.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Protect stored materials from direct sunlight.

E. Protect materials during handling and application to prevent damage or contamination.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Product not intended for uses subject to abuse or permanent exposure to the elements.

B. Do not proceed with product application if rainfall is forecast or imminent within 12 hours.

C. Do not apply membrane when air or surface temperatures are below 40ºF (4ºC).

D. Do not apply when air, material and surface temperatures are expected to fall below 32º F (0º C) within 24 hours of completed application.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carlisle

B. Grace

C. Henry

D. Rubber Polymer Corporation

E. Tremco

F. W.R. Meadows

2.02 FLUID-APPLIED MEMBRANE AIR BARRIER

A. Fluid-Applied, Vapor Impermeable Membrane Air Barrier: Two-component, self-curing synthetic-rubber-based membrane, free of solvents, isocyanates and bitumen, suitable for spray application to wet film and dry film thickness of 60 mils.

B. Basis-of-Design Product: Products specified to establish required level of performance, quality, and appearance are by Grace Construction Products, Perm-A-Barrier.

2.03 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits.

B. Transition Membrane Primer: Grace Construction Products; "Perm-A-Barrier WB Primer." Liquid primer recommended for substrate by manufacturer of air barrier material when applying flashing and transition membranes directly to substrate.

C. Flashing and Transition Membrane: Grace Construction Products; "Perm-A-Barrier Wall Flashing."Modified bituminous, 40-mil thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil thick, cross-laminated polyethylene film with release liner backing.

D. Modified Bituminous Transition Membrane: Grace Construction Products; "Perm-A-Barrier Detail Membrane." Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil-thick polyethylene film with release liner backing.

E. Joint Reinforcing Strip: Sheathing manufacturer's glass-fiber-mesh tape.

F. Substrate Patching Membrane: Manufacturer's standard trowel-grade single component substrate filler.

G. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

H. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0250-inch-thick, and Series 300 stainless-steel fasteners.

I. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft. density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive membrane. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

B. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

C. Verify that sheathing is attached with proper fasteners and spacing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Protect adjacent surfaces not designated to receive air barrier.

B. Clean and prepare surfaces to receive air barrier membrane in accordance with manufacturer's instructions.

C. Do not apply membrane to surfaces unacceptable to manufacturer.

D. Patch all holes and voids and smooth out any surface misalignments.

E. Insure joints between dissimilar building materials are sealed with a strip of self-adhesive membrane 10" wide minimum, centered over the joint.

F. Exterior Sheathing Panels:

1. Panels are to be fastened according to sheathing panel manufacturer.

2. Fill all panel joint with detailing compound prior to full application.

3. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 TRANSITION MEMBRANE INSTALLATION

A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

B. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

C. Install modified bituminous transition membrane on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over both substrates.

D. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Re-prime areas exposed for more than 24 hours.

E. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

F. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings.

G. At end of each working day, seal top edge of strips and transition membranes to substrate with termination mastic.

H. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

I. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, doors and louvers. Apply modified bituminous transition membrane so that a minimum of 6 inches of coverage is achieved over both substrates. Maintain 6 inches of full contact over firm bearing to perimeter frames with not less than 2 inches of full contact.

J. Modified Bituminous Transition Membrane: Roll firmly to enhance adhesion.

K. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and membrane.

L. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

M. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counter-flashings or ending in reglets with termination mastic.

N. Repair punctures, voids, and deficient lapped seams in strips and transition membranes. Slit and flatten fish-mouths and blisters. Patch with transition membranes extending 10 inches beyond repaired areas in membrane direction.

3.04 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to form a seal with strips and transition membranes and to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier at walls, soffits and fascia to roof barrier.

C. Apply within manufacturer's recommended application temperature ranges.

D. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Re-prime areas exposed for more than 24 hours.

E. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

F. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions.

G. Vapor-Impermeable Membrane Air Barrier: 60-mil wet film thickness, 60-mil dry film thickness.

H. Apply strip and transition membrane overlapping or onto according to air barrier manufacturer's written instructions.

I. Do not cover air barrier until it has been tested and inspected by testing agency.

J. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.05 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application.

B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace vapor-impermeable air barrier exposed for more than 60 days.

C. Keep barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.

D. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

E. Remove masking materials after installation.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies foamed insulated core concealed fastener metal wall panels.

B. Work shall include but not be limited to panels, stiffeners, corner and trim accessories, fasteners, and weather seals requires for a complete installation of panels to the support system provided for this scope of work.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE

A. Metal wall panels shall be products of a manufacturer regularly engaged in the fabrication and erection of metal panels of the type and design shown and specified.

B. Single Source Quality Control: Metal panel system manufacturer shall provide all design, engineering, panel fabrication, and assembly of panel system in manufacturing facility.

C. Installer Qualifications: Installer shall have a minimum of (5) years experience in the installation of the specified panel type.

D. Metal Panel System Tolerances:

1. Maximum panel bow shall not exceed 2% of panel dimensions in width or length, with an overall maximum tolerance of .1875” within panel face.

2. Face of panel shall not vary in plane to any adjacent panel greater that 1/16”.

3. Metal panel system shall be designed so that attachment allows panels to successfully accommodate seismic and thermal movement without causing “oil-canning”, undue stress on fasteners, or failure of weather seals.

E. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, metal panel installer, metal panel manufacturer’s technical representative and related trade contractors.

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Samples: Metal panel, (4) 12 inch square, showing finish, each color and texture. (3) standard color charts for specified silicone sealant manufacturer.

C. Shop Drawings: Submit complete siding panel shop drawings with keyed plans, elevations and sections. Specific detail shall be included for all panel conditions and all interfaces with all other exterior wall systems. Included coordinated details from shop drawings for other exterior wall systems. Drawings shall also indicate method of attachment weather seals, and drainage method for perimeter extrusion system.

D. Manufacturer's Literature and Data: Wall panels

E. Mock-up

1.05 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.

B. American Society for Testing and Materials (ASTM):

A653/A653M-10..... Steel Sheet, Zinc-Coated (Galvanized), or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

A463-10 ..... Steel Sheet, Cold-Rolled, Aluminum-Coated, by the Hot-Dip Process

A924/A924M-10..... Steel Sheet, Metallic Coated by the Hot-Dip Process

A1008/A1008M-10 ..... Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy

E119-10 ..... Fire Test of Building Construction and Materials

AAMA 621 ..... Voluntary Specifications for High Performance Coatings on Coil Coated Architectural Hop Dipped Galvanized (HDG) and Zinc-Aluminum.

ASTM A 792 ..... Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

NFPA 285 ..... Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping. Protect painted surfaces with a protective covering before shipping.

1. Deliver, unload, store, and erect metal panels and accessory items without deforming panels or exposing panels to surface damage from weather or construction operations.
2. Store in accordance with Manufacturer's written instructions.

3. Shield foam insulated metal panels from direct sunlight until all components are installed.

1.07 WARRANTY

A. Special Manufacturer's Warranty: Submit Manufacturer's two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.

B. The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

C. Special Panel Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.

PART 2 - PRODUCTS

2.01 SHEET STEEL

A. Minimum 0.22 gauge; 2" and 3" thick insulated, architectural flat, horizontal orientation wall panels.

1. 2 inch thick; R valve 14.95 (LI: 0.0669)

2. 3 inch thick; R valve 25.00 (LI:0.400)

B. Steel, Sheet, Galvanized: ASTM A653/A653M, Structural.

1. Galvalume coating.

C. Steel, Sheet, Commercial: ASTM A1008, Type C.

D. Concealed fastening system.

E. Foamed-in-place polyurethane foam, 2.2lbs density.

F. Factory formed outside corners.

2.02 FASTENERS

A. Fasteners for steel panels shall be galvanized or cadmium plated steel.

B. Fasteners of size, type and holding strength as recommended by manufacturer.

C. Sub-girt size and spacing shall be as required by system manufactured and panel sizes. Coordinate location of double studs at panel end conditions with section 05 12 00 and 05 40 00.

2.03 FABRICATION

A. Insulated siding panels, configuration shown on drawings. Connection between panels shall be by interlocking joints filled with sealing compound per manufacturers recommendations. Furnish wall panels in continuous length for vertical orientation.

B. Accessories and flashing shall be the same material as the panels. Thickness and installation of accessories and flashing shall be as recommended by the panel manufacturer.

C. Sub-girts shall be 1.0 mm (0.0396 inches) thick galvanized steel hat channels designed to receive panel fasteners or clips.

2.04 FINISH

A. For steel face sheets, the finishes shall be as follows:

1. Arkema Kynar 500 (50%) or Solvay Solexis Hylar 5000. Fluorocarbon finish, consisting of a prime coat and a polyvinylidene fluoride finish coat of 1.0 mil minimum dry film thickness on one side, and a wash coat of 0.5 mil minimum dry film thickness applied to reverse side AAMA 261.

B. Color coating shall be as required to produce specified color. Color shall be as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

C. Textured colors for wood grain and metallic appearance.

D. 20 year warranty.

2.05 PERFORMANCE REQUIREMENTS

A. General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.

B. Fire Performance Characteristics: Provide metal panel systems with the following fire-test characteristics determined by indicated test standard as applied by testing and inspection agency acceptable to authorities having jurisdiction.

1. Surface-Burning Characteristics: The insulating core shall have been tested per ASTM E 84. The core shall have:

a. Flame spread index: 25 or less.
b. Smoke developed index: 450 or less.

C. Air Infiltration, ASTM E 283:

1. Maximum 0.0002 cfm/sq. ft. (0.001 L/s per sq. m) at static air pressure difference of 1.57 lbf/sq. ft. (75 Pa).
2. Maximum 0.0009 cfm/sq. ft. (0.005 L/s per sq. m) at static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
3. Maximum 0.01 cfm/sq. ft. (0.050 L/s per sq. m) at static-air-pressure difference of 20 lbf/sq. ft. (958 Pa).

D. Water Penetration Static Pressure:

1. ASTM E 331: No uncontrolled water penetration at a static pressure of 20 lbf/sq. ft. (958 Pa).
2. ASTM E 331 Modified (2 hour duration): No uncontrolled water penetration at a static pressure of 6.24 lbf/sq. ft. (300 Pa).

E. Thermal Performance: When tested in accordance with ASTM C 518, Measurement of Steady State thermal Transmission, the panels shall provide a k factor of 0.14 btu/sf/hr/deg F at a 75° F (24° C) mean temperature, as required by code, or 0.126 btu/sf/hr/deg F at a 40° F (4° C) mean temperature.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install panels in accordance with the manufacturer's approved erection instructions and diagrams, except as specified otherwise. Panels shall be in full and firm contact with supports and with each other at side and end laps. Where panels are cut in the field, or where any of the factory applied coverings or coatings are abraded or damaged in handling or installation, they shall, after the necessary repairs have been made with material of the same type and color as the weather coating, be approved before being installed. All cut ends and edges, including those at openings through the sheets shall be sealed completely. Correct defects or errors in the materials in an approved manner. Replace materials which cannot be corrected in an approved manner with nondefective material. Provide molded closure strips where indicated and whenever sheets terminate with open ends after installation.

B. Wall Panels: Provide panels in the longest obtainable lengths, with end laps occurring only at structural members. Seal side and end laps with joint sealing material. Flash and seal walls at the base, at the top, around windows, door frames, framed louvers, and other similar openings. Install closure strips, flashings, and sealing material in an approved manner that will assure complete weather tightness. Flashing will not be required where approved "self-flashing" panels are used. Panel width not to exceed 30”.

C. Fasteners: Fastener spacings shall be in accordance with the manufacturer's recommendations, and as necessary to withstand the design loads indicated. Install fasteners in straight lines within a tolerance of 13 mm (1/2-inch) in the length of a bay. Drive exposed penetrating type fasteners normal to the surface, and to a uniform depth to seat gasketed washers properly, and drive so as not to damage factory applied coating. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Torque used in applying fasteners shall not exceed that recommended by the manufacturer. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide new panels.

D. Concealed-Fastener Insulated Metal Panels with foam core: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.

E. Accessories: Install metal panel accessories with positive anchorage to building and weather tight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.

2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.

3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.02 PROTECTION AND CLEANING

A. Protect panels and other components from damage during and after erection, and until project is accepted by the Owner.

B. Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.

C. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

D. After completion of work, all exposed finished surfaces of panels shall be cleaned of soil, discoloration and disfiguration. Touch-up abraded surfaces of panels.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Thermoplastic Polyolefin (TPO) sheet roofing mechanically fastened to roof deck.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.

B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):

ANSI/SPRI ES-1-03 ..... Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):

ASCE/SEI-7-10 ..... Minimum Design Loads for Buildings and Other Structures

D. ASTM International (ASTM):

C1371-04 ..... Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers

C1549-04 ..... Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer

D6878-08 ..... Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing

E108-10..... Standard Test Methods for Fire Tests of Roof Coverings

E408-71(R2008)..... Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques

E1980-01..... Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field

E 2430 -05. . . . . Rigid Polystyrene Insulation

C 168. . . . . .Test method for Thermal Insulation

C 177. . . . . .Test for Steady State Heat flux Measurements, and Thermal insulation

E. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

ASHRAE 90.1-2007 ..... Energy Standard for Buildings Except Low-Rise Residential Buildings, Appendix f.

F. Cool Roof Rating Council:

CRRC-1 ..... Product Rating Program, www.coolroofs.org

G. FM Approvals: Roof Nav Approved Roofing Assemblies and Products.

1-28-09 ..... Loss Prevention Data Sheet: Design Wind Loads.

1-29-09 ..... Loss Prevention Data Sheet: Above-Deck Roof Components

H. National Roofing Contractors Association: Roofing and Waterproofing Manual

I. U.S. Department of Energy (DoE): Roof Products Qualified Product List, www.energystar.gov

1.04 PERFORMANCE REQUIREMENTS

A. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

B. Roofing System Energy Performance Requirements: Provide a roofing system identical to components that that have been successfully tested by a qualified independent testing and inspecting agency to meet the following requirements:

C. Energy Performance, Energy Star: Provide roofing system that is listed on DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products. www.energystar.gov.

1. Solar Reflectance Index: Not less than 82 when calculated according to ASTM E1980 based on testing identical products by a qualified testing agency. www.coolroofs.com.

1.05 QUALITY CONTROL

A. Installer Qualifications:

1. Licensed or approved in writing by manufacturer to perform work under warranty requirements of this Section.

2. Employ full-time supervisors knowledgeable and experienced in roofing of similar types and scopes, and able to communicate with owner and workers.

B. Inspector Qualifications: Inspection of work by third-party technical inspector or technical representative of manufacturer experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer’s compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be an independent party certified as a Registered Roof Observer by the Roof Consultants Institute (RCI), retained by the Contractor and approved by the Manufacturer

C. Product/Material Requirements:

1. Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system and incorporated in manufacturer's warranty.

D. Roofing system design standard requirements:

1. Recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to Thermoplastic Polyolefin (TPO) roofing for storage, handling and application.

2. Recommendations of FM Approvals 1-49 Loss Prevention Data Sheet for Perimeter Flashings.

3. Recommendations of ANSI/SPRI ES-1 for roof edge design.

4. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.

a. Corner Uplift Pressure: (75 lbf/sq. ft.).

b. Perimeter Uplift Pressure: (75 lbf/sq. ft.).

c. Field-of-Roof Uplift Pressure: (75 lbf/sq. ft.).

5. FM Approvals Listing: Provide roofing membrane, base flashing, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a roofing system and that are listed in FM Approvals "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

a. Fire/Windstorm Classification: Class 1A-75.

b. Hail Resistance: MH.

E. Pre-Roofing Meeting:

1. Prior to roofing, discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection with COR to:

a. Verify that work of other trades which penetrates roof deck is completed.

b. Determine adequacy of deck anchorage, presence of foreign material, moisture and unlevel surfaces, or other conditions that would prevent application of roofing system from commencing or cause a roof failure.

c. Examine samples and installation instructions of manufacturer.

1.06 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, SAMPLES.

B. Product Data:

1. Adhesive materials.

2. Membrane sheet roofing and flashing membrane.

3. Roof Insulation

3. Fastening requirements.

4. Application instructions.

C. Samples:

1. Nails and fasteners, each type.

D. Shop Drawings: Include plans, sections, details, and attachments.

1. Base flashings and terminations.

2. Layout of Insulation,crickets, edge conditions and roof drains, scuppers etc.

E. Certificates:

1. Indicating materials and method of application of roofing system meets requirements of FM Approvals "RoofNav" for specified fire/windstorm classification.

2. Indicating compliance with energy performance requirement.

3. Labatory test reports: Thermal values of insulation products.

4. Indicating Thermal conductance, and minimum average thickness of insulation.

F. Warranty: As specified.

G. Documentation of supervisors' and inspectors' qualifications.

H. Field reports of roofing inspector.

I. Contract Close-out Submittals:

1. Maintenance Manuals.

2. Warranty signed by installer and manufacturer.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with the recommendations of the NRCA “Roofing and Waterproofing Manual” applicable to single ply membrane roofing for storage, handling and installation.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.09 WARRANTY

A. Roofing work subject to 10 years.

1.10 QUALITY ASSURANCE:

A. Roof insulation on steel deck shall have a flame spread rating no greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E 84, or shall have successfully passed FM Approvals 4450.

PART 2 PRODUCTS

2.01 TPO MEMBRANE ROOFING

A. TPO Sheet: ASTM D6878, internally fabric or scrim reinforced, 1.5 mm (60 mils) thick, with no backing.

B. Color: White.

2.02 ACCESSORIES

A. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as TPO sheet membrane.

B. Bonding Adhesive: Manufacturer's standard, water based.

C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 25 by 3 mm (1 by 1/8 inch) thick; with anchors.

D. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 25 mm wide by 1.3 mm (1 inch wide by 0.05 inch) thick, prepunched.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening membrane to substrate.

G. Miscellaneous Accessories: Provide sealers, preformed flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories acceptable to manufacturer.

H. Roof and Deck Insulation per specification section 07 22 00.

2.03 ADHESIVE AND SEALANT MATERIALS

A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.

B. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions with roofing Installer and roofing inspector to verify compliance with project requirements and suitability to accept subsequent roofing work. Correct unsatisfactory conditions before proceeding with roofing work.

B. Do not apply roofing if roof surface will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless system is protected.

3.02 PREPARATION

A. Complete roof deck construction prior to commencing roofing work:

1. Install curbs, blocking, edge strips, nailers, cants, and other components where insulation, roofing, and base flashing is attached to, in place ready to receive insulation and roofing.

2. Complete deck and insulation to provide designed drainage to working roof drains.

3. Document installation of related materials to be concealed prior to installing roofing work.

B. Dry out surfaces, including the flutes of metal deck that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates.

C. Sweep decks to broom clean condition. Remove all dust, dirt or debris.

D. Remove projections that might damage materials.

3.04 INSTALLATION, GENERAL

A. FM Approvals Installation Standard: Install roofing membrane, base flashings, wood cants, blocking, curbs, and nailers, and component materials in compliance with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system as listed in FM Approval's "RoofNav" for fire/windstorm classification indicated. Comply with recommendations in FM Approvals' Loss Prevention Data Sheet 1-49, including requirements for nailers and cants.

B. NRCA Installation Standard: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations.

C. Manufacturer Recommendations: Comply with roofing system manufacturer's written installation recommendations.

D. Coordination with related work: Coordinate roof operations with roof insulation and sheet metal work so that insulation and flashings are installed concurrently to permit continuous roofing operations.

E. Installation Conditions:

1. Apply dry roofing materials. Apply roofing work over dry substrates and materials.

2. Apply materials within temperature range and surface and ambient conditions recommended by manufacturer.

3. Except for temporary protection, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, ice, fog or frost) is present in any amount in or on the materials to be covered or installed:

a. Do not apply materials when the temperature is below 4 deg. C (40 deg. F).

b. Do not apply materials to substrate having temperature of 4 deg. C (40 deg. F) or less.

3.05 RIGID INSULATION INSTALLATION

A. Insulation Installation, General:

1. Install roof insulation in accordance with roofing system manufacturer's written instructions.

2. Install roof insulation in accordance with requirements of FM Approval's Listing for specified roofing system.

3. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate prior to installation of insulation.

4. Cant Strips: Install preformed insulation cant strips strips at junctures of roofing system with vertical construction.

5. Use same insulation as existing for roof repair and alterations unless specified otherwise.

B. Insulation Thickness:

1. Thickness of roof insulation shown on drawings is nominal. Actual thickness shall provide the average thermal resistance "R" value of not less than that specified in Performance Requirements Article.

2. Insulation on Metal Decks: Provide minimum thickness of insulation for metal decks recommended by the insulation manufacturer to span rib opening (flute size) of metal deck used. Support edges of insulation on metal deck ribs.

3. When thickness of insulation to be used is more or less than that shown on the drawings, make adjustments in the alignment and location of roof drains,

flashing, gravel stops, fascias and similar items at no additional cost to the Owner.

4. Where tapered insulation is used, the thickness of the insulation at high points and roof edges shall be as shown on the drawings; the thickness at the low point (drains) shall be not less than 38 mm (1-1/2 inches).

5. Use not less than two layers of insulation when insulation is 68 mm (2.7 inch) or more in thickness unless specified otherwise. Stagger joints minimum 150 mm (6 inches).

C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.

D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.

E. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.

F. Cut to fit tight against blocking or penetrations.

G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.

3.06 INSTALLATION OF TPO ROOFING

A. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances which are not compatible with TPO.

B. Install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.

C. Commence installation at the low point of the roof and work towards the high point. Lap the sheets so the flow of water is not against the edges of the sheet.

D. Position the membrane so it is free of buckles and wrinkles.

E. Roll sheet out on deck; inspect for defects as being rolled out and remove defective areas. Allow for relaxing before proceeding.

1. Lap edges and ends of sheets 50 mm (two inches) or more as recommended by the manufacturer.

2. Heat weld laps. Apply pressure as required. Seam strength of laps as required by ASTM D4434.

3. Check seams to ensure continuous adhesion and correct defects.

4. Finish edges of laps with a continuous beveled bead of sealant to sheet edges to provide smooth transition.

5. Finish seams as the membrane is being installed (same day).

6. Anchor perimeter to deck or wall as specified.

F. Repair areas of welded seams where samples have been taken or marginal welds, bond voids, or skips occurs.

G. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (four-inches) beyond cut.

H. Membrane Perimeter Anchorage:

1. Install metal fastening strip at the perimeter of each roof level, curb flashing, expansion joints and similar penetrations as indicated and in accordance with membrane manufacturer's instructions on top of roof membrane to deck or wall.

2. Mechanically Fastened Metal Fastening Strip:

a. Set top of mechanical fastener set flush with top surface of the metal fastening strip. Space mechanical fasteners a maximum 300 mm (12 inches) on center starting 25 mm (one inch) from the end of the nailing strip.

b. When strips are cut round corners and eliminate sharp corners.

c. After mechanically fastening strip cover and seal strip with a six-inch wide roof membrane strip; heat weld to roof membrane and seal edges.

d. At roof edge metal, turn the membrane down over the front edge of the blocking or the nailer to below blocking. Secure the membrane to the vertical portion of the nailer; or, if required by the membrane manufacturer with fasteners spaced not over 300 mm (12 inches) on centers.

e. At parapet walls, intersecting building walls and curbs, secure the membrane to the structural deck with fasteners 300 mm (12 inches) on centers or as shown on NRCA manual.

I. Mechanically-Attached System:

1. Secure the membrane to the structural deck with fasteners through stress plate or batten strips spaced and patterned in accordance with the membrane manufacturer's instructions to achieve specified wind uplift performance.

2. When fasteners are installed within the laps of adjoining sheets, position the fastener so that the stress plates are a minimum 13 mm (1/2)inch) from the edge of the sheets.

3. Where fasteners are installed over the membrane after the seams have been welded, cover the fasteners with a minimum 175 mm (seven inch) wide round TPO membrane cap centered over the fasteners. If batten strips are used cover the strip with a minimum 175 mm (seven inch) wide TPO strip centered over the batten. Heat weld to the roof membrane and finish edges with sealant as specified. Finish edges with sealant as specified.

4. Before installing fasteners into cast in place concrete, pre-drill the correct size hole into the deck. Drill the hole 9 mm (3/8 inch) deeper than the fastener penetration.

3.07 INSTALLATION OF FLASHING

A. Install flashings as the membrane is being installed. If the flashing cannot be completely installed in one day, complete the installation until the flashing is in a watertight condition and provide temporary covers or seals.

B. Flashing Roof Drains:

1. Install roof drain flashing as recommended by the membrane manufacturer, generally as follows:

a. Coordinate to set the metal drain flashing in asphalt roof cement, holding cement back from the edge of the metal flange.

b. Do not allow the roof cement to come in contact with the TPO roof membrane.

c. Adhere the TPO roof membrane to the metal flashing with the membrane manufacturer's recommended adhesive.

2. Turn down the metal drain flashing and TPO roof membrane into the drain body and install clamping ring and strainer.

C. Installing TPO Base Flashing and Pipe Flashing:

1. Install TPO flashing membranes to pipes, wall or curbs to a height not less than eight-inches above roof surfaces and 100 mm (four inches) on roof membrane.

a. Adhere flashing to pipe, wall or curb with adhesive.

b. Form inside and outside corners of TPO flashing membrane in accordance with NRCA manual. Form pipe flashing in accordance with NRCA manual use pipe boot.

c. Lap ends not less than 100 mm (four inches).

d. Heat weld flashing membranes together and flashing membranes to roof membranes. Finish exposed edges with sealant as specified.

e. Install flashing membranes in accordance with NRCA manual.

2. Anchor top of flashing to walls or curbs with fasteners spaced not over 200 mm (eight inches) on centers. Use fastening strip on ducts. Use pipe clamps on pipes or other round penetrations.

3. Apply sealant to top edge of flashing.

D. Installing Building Expansion Joints:

1. Install base flashing as shown.

2. Coordinate installation with metal expansion joint cover or roof expansion joint system.

E. Repairs to membrane and flashings:

1. Remove sections of TPO sheet roofing or flashing that is creased wrinkled or fish-mouthed.

2. Cover removed areas, cuts and damaged areas with a patch extending 100 mm (four inches) beyond damaged, cut, or removed area. Heat weld to roof membrane or flashing. Finish edge of lap with sealant as specified.

3.08 FIELD QUALITY CONTROL

A. Roofing Inspector: Contractor will engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.

1. Examine and probe seams in the membrane and flashing in the presence of Architect, Owner and Membrane Manufacturer's Inspector.

2. Probe edge of welded seams with a blunt tipped instrument. Use sufficient hand pressure to detect marginal welds, voids, skips, and fish-mouths.

C. Final Roof Inspection:

1. Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

2. Notify Architect and Owner 7 days in advance of date and time of inspection.

D. Repair or remove and replace components of roofing work where test results or inspections indicate that they do not comply with specified requirements. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.09 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of acceptance by Owner.

C. Clean overspray and spillage from adjacent construction. Clean membrane and restore surface to like-new condition meeting solar reflectance requirements.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Provide metal flashings and sheet metal including accessories as required for complete weather tight installation.

B. Patch existing flashing and sheet metal as required by new construction.

1. Interior beam ornamental flashings and sheet metal.

C. Gutters and downspouts, custom shapes, scupper boxes.

D. Provide concealed sealants used in conjunction with installation of metal flashing and sheet metal.

E. Provide miscellaneous sheet metal flashing and reglets not provided by other trades or suppliers.

1. Where reglets are to be installed in conjunction with other work, provide in adequate time for installation.

2. Flashings and trims at windows and extruded aluminum wall transition flashings.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Furnish literature for manufactured products.

C. Shop Drawings: Clearly indicate dimensioning, layout, general construction details including closures, flashings, locations and types of sealants, anchorages, and method of anchorage.

D. Samples: Furnish samples of typical metal flashing fabrication indicating standard soldered joints and edge conditions.

1.04 QUALITY ASSURANCE

A. Referenced Standards

1. California Building Code (CBC), 2019

2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual, Latest Edition

B. Design Requirements: Allow for movement of components without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to 100-year seasonal temperature ranges.

C. Sheet metal fabricator and installer shall have a minimum five (5) years of experience with shop fabrication and installation of shop-fabricated roofing metal and flashings.

1.05 DELIVERY, STORAGE AND HANDLING

A. Provide strippable film protective covering on shop finished flashing materials to protect materials through shipping, fabrication and installation.

1.06 WARRANTY

A. Special Warranty: Provide for correcting failure of metal flashing system to resist penetration of water and damage from wind.

1. Special Warranty Period: Two years.

PART 2 PRODUCTS

2.01 MATERIALS

A. Flashing and Sheet Metal:

1. Minimum gauge of aluminum per SMACNA.

B. Flexible Flashings: Reinforced self- adhered flexible flashing.

C. Solder and Fasteners: As recommended by SMACNA and complying with applicable codes and regulations; hot dipped galvanized minimum coating comparable to G90.

D. Concealed Sealant: Butyl type for use in conjunction with sheet metal; non-staining; non-corrosive; non-shrinking and non-sagging; ultra-violet and ozone resistant for exterior concealed applications.

E. Bituminous Paint: Acid and alkali resistant type; black color; asbestos free.

F. Plastic Cement: Cutback asphaltic type; asbestos free.

G. Sealing Compound: Type recommended by roofing manufacturer; asbestos free.

H. Gaskets: Type suitable for use in conjunction with sheet metal; non-staining, non-corrosive, non-shrinking, non-sagging, ultra-violet resistant, and ozone resistant; for exterior concealed applications.

1. Manufacturers:

a. Sandell Manufacturing Co./Polytite Joint Sealant.

b. Emseal USA, Inc./Emseal Secondary Seal.

I. Downspouts, Gutters and Scuppers:

1. Form from aluminum to profiles shown on drawings.

2. Comply with SMACNA recommendations.

3. Clear silicone GE, DOW, or approved equal.

4. Provide custom spun aluminum collector for transition from gutter to downspouts.

5. Where reglets are to be installed in conjunction with other work, provide in adequate time for installation.

6. Prefabricated downspout filter with neck to match downspout profile. Allow 3" space between filter and bottom of downspout. Install at height shown on drawings. Provide (4) four replacement screens for each filter installed.

2.02 FABRICATION

A. Fabricate sheet metal in accordance with SMACNA Architectural Sheet Metal Manual.

B. Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

C. Fabricate corners and intersections in shop with solder joints; watertight fabrication.

D. Form sections in maximum 10'-0" lengths; make allowance for expansion at joints.

E. Hem exposed edges on underside 1/2".

F. Backpaint flashings with heavy bodied bituminous paint where in contact with cementitious materials or dissimilar metals.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install metal flashing and sheet metal in accordance with SMACNA Architectural Sheet Metal Manual.

1. Install tight in place, with corners square, surfaces true and straight in planes, and lines accurate to profiles as indicated on Drawings.

2. Lap joints in direction of water flow.

3. Install self-adhering flexible flashings and overlap metal flashing joints and adjacent materials in direction of water flow.

B. Exercise care when cutting materials on site, to ensure cuttings do not remain on finished surfaces.

C. Provide expansion joints concealed within system.

D. Use concealed fasteners, continuous cleat type, except where specifically approved by Architect.

1. Exposed fasteners may be used, where clearly indicated on shop drawings and approved by the Owner, at areas not exposed at exterior walls nor in sight of interior spaces.

E. Apply sealing compound at junction of metal flashing and felt flashing.

F. Lock seams and end joints; fit flashing tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

G. Install flashings with minimum joints and as long of section as possible.

H. Install sealants where required to prevent direct weather penetration.

1. Install continuous gasket behind surface-applied reglets.

I. Completed installation shall be free of rattles, noise due to thermal and air movement, and wind whistles.

J. Install metal flashing at all intersections to protect waterproofing, insulation and gypsum sheathing from UV exposure.

K. Install dam flashing at window, louvers, openings and at intersecting horizontal and vertical surfaces.

3.02 CLEANING

A. Remove protective coating from shop finished sheet metal when no longer required to protect roofing and flashing from construction.

B. Touch-up scratched and damaged finish to match new; remove and replace sheet metal units that cannot be repaired to look identical to adjacent sheet metal when viewed from 5'-0" away.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

1. This section specifies stock manufactured roof hatch, integral support curbs, metal ladder and accessories as required for complete weathertight installation.

1.02 RELATED WORK

1. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY CONTROL

1. All roof accessories shall be the products of manufacturers regularly engaged in producing the kinds of products specified.

2. Each accessory type shall be the same and be made by the same manufacturer.

3. Each accessory shall be completely assembled to the greatest extent possible before delivery to the site.

4. All materials shall be delivered to site in manufacturer’s original packaging.

5. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier’s freight bill of lading.

1.04 SUBMITTALS

1. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

2. Samples: Manufacturer to provide upon request; sized to represent material adequately.

3. Shop Drawings: Each item specified showing design, details of general construction, dimensions, configurations, jointing methods, location where applicable installation and fastenings.

4. Manufacturer's Literature and Data: Each item specified.

5. Certificates: Stating that aluminum has been given specified thickness of anodizing.

6. Contract Closeout: Manufacturer shall provide the manufacturer’s warranty prior to contract closeout.

1.05 APPLICABLE PUBLICATIONS

1. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.

2. American Society for Testing and Material (ASTM):
ASTM A 36-93a .....Standard specification for Structural Steel

B209/209M-07 ..... Aluminum and Aluminum Alloy-Sheet and Plate
B221/221M-08 ..... Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
C612-10 ..... Mineral Fiber Block and Board Thermal Insulation
D1187-97 (R2002) ..... Asphalt-Base Emulsions for Use as Protective Coatings for Metal

3. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06 ..... Metal Finishes Manual

4. American Architectural Manufacturers Association (AAMA):
2605-11 ..... High Performance Organic Coatings on Architectural Extrusions and Panels

1.06 JOB CONDITIONS

1. Verify that other trades with related work are complete before installing product(s).

2. Mounting surfaces shall be straight and secure; substrates shall be of proper width.

3. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.

4. Coordinate installation with roof membrane and roof insulation manufacturer's instructions before starting.

5. Observe all appropriate OSHA safety guidelines for this work.

1.07 WARRANTY

1. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.01 MATERIALS

1. Aluminum, Extruded: ASTM B221/B221M.

2. Aluminum Sheet: ASTM B209/B209M.

3. Galvanized Sheet Steel: ASTM A526/A526M; G-90 coating.

4. Insulation: ASTM C612, Class 1 or 2.

5. Asphalt Coating: ASTM D 1187, Type I, quick setting.

2.02 ROOF HATCH

1. Furnish and install where indicated on plans metal roof hatch Type E-50T, size width: 3'0" (914mm) x length: 3'0" (914mm). Length denotes hinge side. The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer.

2. Performance characteristics:

   A. Cover shall be reinforced to support a minimum live load of 40 psf (195kg/m2) with a maximum deflection of 1/150th of the span or 20 psf (97kg/m2) wind uplift.

   B. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.

   C. Operation of the cover shall not be affected by temperature.

   D. Entire hatch shall be weathertight with fully welded corner joints on cover and curb.

3. Cover: Shall be 11 gauge (2.3mm) aluminum with a 4” (102mm) beaded flange with formed reinforcing members. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.

4. Cover insulation: Shall be 2” (50mm) thick polyisocyanurate with an R-value of 12, fully covered and protected by an 18 gauge aluminum liner.

5. Curb: Shall be 12” (305mm) in height and of 11 gauge (2.3mm) aluminum. The curb shall be formed with a 4-1/2” (114mm) flange with 7/16” (11.1mm) holes provided for securing to the roof deck. The curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6” (153mm) on center, to be bent inward to hold single ply roofing membrane securely in place.

6. Curb insulation: Shall be 2” (50mm) thick polyisocyanurate with an R-value of 12.

7. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.

8. Hardware

   A. Heavy pintle hinges shall be provided

   B. Cover shall be equipped with a spring latch with interior and exterior turn handles

   C. Roof hatch shall be equipped with interior and exterior padlock hasps.

   D. The latch strike shall be a stamped component bolted to the curb assembly.

E. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1” (25mm) diameter red vinyl grip handle to permit easy release for closing.

F. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed.

G. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

9. Finish: Factory finish shall be mill finish aluminum

2.03 ALTERNATING TREAD ROOF LADDER

1. Fabricate of 6061-T6 aluminum alloy, no painting required.

2. Ladder to include 1 ¼” schedule 40 aluminum pipe rail side rails.

3. Accessory: Ladder extension safety post(s) permanently mounted to top two rungs of ladder(s).

4. Finish: Standard factory mill finish.

5. Bar grating treads.

6. Riser height – 8 inch min and 9.5 inch max.

7. Minimum 3” x 2” x 1/8” aluminum tube stringer.

8. Mid-support – 10” x ¼” aluminum flat bar.

9. Treads welded and bolted to stringer.

10. Treads 9 7/8” wide.

11. Aluminum mounting plates top and bottom.

PART 3 - EXECUTION

3.01 INSPECTION

1. Verify that roof hatch installation will not disrupt other trades and that substrate is dry, clean, and fee of foreign matter. Report and correct all defects prior to any installation.

3.02 INSTALLATION

1. Install roof hatch, ladder and accessories where shown on contract documents in compliance with manufacturer’s installation instructions.

2. Furnish and secure with mechanical fasteners in accordance with manufacture's printed installation instructions, consistent with roof requirements and approved shop

drawings unless shown otherwise.

3. Coordinate to install insulation where required; see Section 07 21 00, BUILDING INSULATION.

4. Comply with section 07 90 00, JOINT SEALANTS to install sealants where manufactures installation instructions require sealant.

5. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.

3.03 PROTECTION OF ALUMINUM

1. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on side.

2. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two coats of asphalt coating.

3.04 ADJUSTING

1. Adjust roof hatch for weathertight condition insuring maximum allowance for building movement.

2. Protect products from damage during installation and after completion of the work from subsequent construction.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Provide labor, material, equipment and services to furnish and install firestopping systems required for the work as shown on the drawings, as specified herein and as required for a complete and proper installation, including, but not limited to, the following:

1. Closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.

2. Closures of openings in walls against penetration of gases or smoke in smoke partitions.

3. Sealants around penetrations in non-rated smoke barriers where indicated on Drawings.

4. Closures of floor openings in vertical mechanical shafts against penetration of flame, heat, smoke and gases.

5. Closures of openings in elevator shafts against penetration of flame, heat, smoke and gases.

B. Drawings and General Provisions of the Contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to this Section.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Manufacturers' literature, data, and installation instructions for types of firestopping and smoke stopping used.

C. List of FM, UL, or WH classification number of systems installed.

D. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

1.04 DELIVERY AND STORAGE

A. Deliver materials in their original unopened containers with manufacturer's name and product identification.

B. Store in a location providing protection from damage and exposure to the elements.

1.05 QUALITY ASSURANCE

A. FM, UL, or WH or other approved laboratory tested products will be acceptable.

1.06 APPLICABLE STANDARDS: The latest edition of publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

A. American Society for Testing and Materials (ASTM):

1. E84 Surface Burning Characteristics of Building Materials

2. E136 Behavior of Material in a Vertical Tube Furnace

3. E814 Fire Tests of Through-Penetration Fire Stops

B. Factory Mutual Engineering and Research Corporation (FM):

1. Annual Issue Approval Guide Building Materials

C. Underwriters Laboratories, Inc. (UL):

1. Annual Issue Building Materials Directory

2. Annual Issue Fire Resistance Directory

D. Warnock Hersey (WH):

1. Annual Issue Certification Listings

PART 2 PRODUCTS

2.01 FIRESTOP SYSTEMS

A. Metallic Pipe of Conduits: Firestop systems shall comply with the following:

1. Classified for use with the particular type of penetrating material used.

2. Use either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke.

3. Tested through-penetration firestop systems and firestop devices in accordance with ASTM E814 using the "T" rating to maintain the same rating and integrity as the fire barrier being sealed.

4. Products requiring heat activation to seal an opening by its intumescence shall exhibit a demonstrated ability to function as designed to maintain the fire barrier.

5. Firestop sealants used for firestopping or smoke sealing shall have following properties:

a. Contain no flammable or toxic solvents.

b. Have no dangerous or flammable outgassing during the drying or curing of products.

c. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.

d. When used in exposed areas, shall be capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

6. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84.

7. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.

8. Materials to be asbestos free.

B. Glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials: Comply to requirements for metallic pipe and as follows:

1. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.

2. Intumescent products which expand to seal the opening and act as fire, smoke, toxic fumes, and, water sealant.

C. One-Hour Fire Barrier Sealant: One-component neutral-cure silicone rubber sealant.

1. Manufacturers:

a. 3M “Fire Barrier 2000 or 2003 Sealant, Caulk Type CP25 or No. 303 Putty”;

b. International Protective Coatings “Flame-Safe FS500 or FSP1000 Putty”;

c. Fipro “A/D Silicone Firebarrier Sealant-SL”;

d. Or equal.

2.02 SMOKE STOPPING IN SMOKE PARTITIONS

A. Non-Fire-rated Smoke Stop Partitions: Sealants around penetrations in smoke stop partitions or barriers not identified on the plans as part of a rated assembly shall comply as follows:

1. Use silicone sealant in smoke partitions as specified in Section 07 90 00, Joint Sealers.

2. Use mineral fiber filler and bond breaker behind sealant.

3. Sealants shall have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with E84.

4. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

B. Fire-rated Smoke Stop Partitions: Sealants around penetrations in smoke stop partitions or barriers that are identified on the plans as part of a rated assembly shall comply as follows:

1. Use listed firestop system specified above.

2.03 ACCESSORIES

A. Stuffing Material: Mineral fiber matting, permanent.

B. Retainers: Clips to support mineral fiber matting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Submit product data and installation instructions, as required by article, submittals, after an on-site examination of areas to receive firestopping.

B. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping.

3.02 PREPARATION

A. Remove dirt, grease, oil, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.

B. Remove insulation on insulated pipe for a distance of six inches (150 mm) on either side of the fire rated assembly prior to applying the firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.

C. Install backing materials to arrest liquid material leakage.

3.03 INSTALLATION

A. Do not begin work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.

B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.

C. Install smoke stopping seals in smoke partitions.

3.04 FIELD QUALITY CONTROL

A. Owner’s Fire Marshal will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.

B. Do not proceed to enclose firestopping with other construction until reports of Owner Fire Marshal’s examinations are issued.

C. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

3.05 CLEANING

A. As work is completed, remove materials, litter, and debris.

B. Clean up spills of liquid type materials.

END OF SECTION 07 84 00

PART 1 GENERAL

1.01 SUMMARY

A. Provide joint sealers, for interior and exterior joints not specified elsewhere, with backing rods and accessories as required for complete installation. Joint sealers include sealants and caulking as indicated.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Furnish manufacturer's descriptive literature.

C. Samples: Furnish samples of each type of exposed joint sealer in required colors.

D. Certifications:

1. Furnish manufacturer's certification joint sealers comply with Contract Documents and are suitable for Project applications.

2. Furnish certification indicating installers are trained in proper use of specified products, qualified, and familiar with proper installation techniques.

1.04 QUALITY ASSURANCE

A. Performance Requirements:

1. Select materials for compatibility with joint surfaces and indicated exposures.

2. Where not indicated, select modulus of elasticity and hardness or grade recommended by manufacturer for each application indicated.

3. Comply with applicable limitations on volatile organic compound (VOC) emissions.

B. Installer Qualifications: Firm with minimum five years successful experience on projects of similar type and size, using specified products.

1. Installers shall be familiar with proper application procedures to ensure maximum joint sealer expansion and contraction capabilities.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, cure time, and mixing instructions.

1.06 SITE CONDITIONS

A. Do not proceed with installation of joint sealers under unfavorable weather conditions.

B. Install elastomeric sealants when temperature is in lower third of temperature range recommended by manufacturer.

1.07 WARRANTY

A. Special Warranty: Repair or replace joint sealers which fail to perform as intended, because of leaking, crumbling, hardening, shrinkage, bleeding, sagging, staining and loss of adhesion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Elastomeric Sealants:

1. Single-Component Low Modulus Silicone Sealant: ASTM C920 Type S, Class 25, Grade NS; minimum 50% expansion and compaction capability.

a. Provide at exterior locations not exposed to traffic.

b. Manufacturers:

1) General Electric Co./Silpruf, Silglaz or GESIL.

2) Dow Corning Corp./790 or 795.

3) Pecora Corp./864 Architectural Silicone.

4) Tremco/Spectrum 3.

2. Multi-Component Polyurethane Sealant: ASTM C920, Type M, Grade P, Class 25, self-leveling; minimum 25% expansion and compaction capability.

a. Provide following at traffic bearing locations.

b. Manufacturers:

1) Pecora Corp./NR-200 Urexpan.

2) Tremco/Vulkem 245.

3) Sonneborn Division of ChemRex /SL 2

3. Mildew-Resistant Silicone Rubber Sealant: ASTM C920, Type S, Grade NS, Class 25, compounded with fungicide, specifically for mildew resistance and recommended for interior joints in wet areas.

a. Provide at interior joints in wet areas.

b. Manufacturers:

1) General Electric Co./SCS 1702 Sanitary Sealant.

2) Dow Corning Corp./786 Bathtub Caulk.

3) Pecora Corp./863 #345 White.

4) Tremco/Tremsil 200.

B. Non-Elastomeric Sealants:

1. Acrylic-Emulsion Sealant: ASTM C834 acrylic or latex-rubber-modified acrylic sealant, permanently flexible, non-staining and non-bleeding; recommended for general interior exposure; compatible with paints specified in Section 09 90 00.

a. Provide at general interior applications.

b. Manufacturers:

1) Pecora Corp./AC-20.

2) Sonneborn Division of ChemRex/Sonolac.

3) Tremco/Ultrem 1500

C. Miscellaneous Materials:

1. Primers/Sealers: Non-staining types recommended by joint sealer manufacturer for joint surfaces to be primed or sealed.

2. Joint Cleaners: Non-corrosive types recommended by joint sealer manufacturer; compatible with joint forming materials.

3. Bond Breaker Tape: Polyethylene tape as recommended by joint sealer manufacturer where bond to substrate or joint filler must be avoided for proper performance of joint sealer.

4. Sealant Backer Rod: Compressible polyethylene foam rod or other flexible, permanent, durable non-absorptive material as recommended by joint sealer manufacturer for compatibility with joint sealer.

a. Oversize backer rod minimum 30% to 50% of joint opening.

D. Colors: Provide colors indicated or as selected by Architect from manufacturer's full range of colors.

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare joint surfaces in accordance with ASTM C1193 and as recommended by joint sealer manufacturer.

B. Clean joint surfaces immediately before installation of joint sealer; remove dirt, insecure materials, moisture and other substances which could interfere with bond of joint sealer.

C. Prime or seal joint surfaces where recommended by joint sealer manufacturer; do not allow primer/sealer to spill or migrate onto adjoining surfaces.

D. Ensure protective coatings on surfaces in contact with joint sealers have been completely stripped.

3.02 INSTALLATION

A. Comply with manufacturer's printed instructions and ASTM C1193, except where more stringent requirements are shown or specified.

B. Set sealant backer rods at proper depth or position in joint to coordinate with other work, including installation of bond breakers and sealant; do not leave voids or gaps between ends of backer rods.

1. Do not stretch, twist, puncture or tear backer rods.

C. Install bond breaker tape where required by manufacturer's recommendations to ensure joint sealers will perform properly.

D. Size materials to achieve required width/depth ratios.

E. Employ installation techniques that will ensure joint sealers are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of bond surfaces equally on opposite sides.

F. Joint Configuration: Fill sealant joint to a slightly concave surface, slightly below adjoining surfaces, unless otherwise indicated.

G. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture or dirt.

H. Install joint sealers to depths recommended by joint sealer manufacturer but within the following general limitations, measured at center (thin) section of bead.

1. Horizontal Joints: 75% width with minimum depth of 3/8".

2. Elastomeric Joints: 50% width with minimum depth of 1/4".

3. Non-Elastomeric Joints: 75% to 125% of joint width.

I. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces.

1. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.

J. Cure joint sealers in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability.

K. Maintain finished joints free of embedded matter, ridges and sags.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Section specifies building expansion wall joint assemblies.

B. Types of assemblies:

1. Interior wall joint – exposed
2. Interior wall joint – concealed
3. Interior ceiling joint
4. Interior floor joint – elevated slab
5. Interior floor joint – slab on grade – exposed
6. Interior floor joint - concealed
7. Exterior wall joint – face to face
8. Exterior wall joint corner
9. Exterior metal coping joint
10. Exterior roof joint
11. Smoke Seals at joints in smoke barrier locations

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE

A. Project Conditions:

1. Check actual locations of walls and other construction, to which work must fit, by accurate field measurements before fabrication.
2. Show recorded measurements on final shop drawings.

B. Fire tests performed by Factory Mutual, Underwriters Laboratories, Inc., Warnock Hersey or other approved independent testing laboratory.

1.04 DELIVERY STORAGE AND HANDLING

A. Take care in handling of materials so as not to injure finished surface and components.

B. Store materials under cover in a dry and clean location off the ground.

C. Remove materials which are damaged or otherwise not suitable for installation from job site and replace with acceptable materials.

1.05 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Submit copies of manufacturer's current literature and data for each item specified.

2. Clearly indicate movement capability of cover assemblies and suitability of material used in exterior seals for ultraviolet exposure.

C. Certificates: Material test reports from approved independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements specified.

D. Shop Drawings:

1. Showing full extent of expansion joint cover assemblies; include large-scale details indicating profiles of each type of expansion joint cover assembly, splice joints between sections, joiners with other type assemblies, special end conditions, anchorages, fasteners, and relationship to adjoining work and finishes.

2. Include description of materials and finishes and installation instructions.

E. Samples:

1. Samples of each type and color of metal finish on metal of same thickness and alloy used in work.

1.06 APPLICABLE PUBLICATIONS

A. Publications listed form part of this specification to extent referenced. Publications are referred to in text by basic designation only.

B. American Society for Testing and Materials (ASTM):

A36/A36M-08 ..... Structural Steel

A167-99 (R2009) ..... Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

A283/A283M-07 ..... Low and Intermediate Tensile Strength Carbon Steel Plates

A786/A786M-05(R2009) ..... Rolled Steel Floor Plates

B209M-07 ..... Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

B221M-08 ..... Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)

D1187-97 (R2002).....Asphalt Base Emulsions for Use as Protective Coatings for Metal

E119-10 .....Fire Tests of Building Construction and Materials

C. Federal Specifications (Fed. Spec):
TT-P-645B .....Primer, Paint, Zinc-Molybdate, Alkyd Type

D. The National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500 Series.....Metal Finishes Manual.

E. National Fire Protection Association (NFPA):
251-06 .....Tests of Fire Endurance of Building Construction and Materials

F. Underwriters Laboratories Inc. (UL):
263-11 .....Fire Tests of Building Construction and Materials

PART 2 PRODUCTS

2.01 MATERIALS

A. Stainless Steel: ASTM A167, Type 302 or 304.

B. Structural Steel Shapes: ASTM A36.

C. Steel Plate: ASTM A283, Grade C.

D. Aluminum:

1. Extruded: ASTM B221, alloy 6063-T5.

2. Plate and Sheet: ASTM B209, alloy 6061-T6.

E. Thermoplastic Rubber:

1. ASTM C864.

2. Dense Neoprene or other material standard with expansion joint manufacturers having the same physical properties.

F. Zinc-Molybdate Primer: Fed. Spec. TT-P-645.

G. Accessories:

1. Manufacturer's standard anchors, fasteners, set screws, spaces, flexible secondary water stops or seals and filler materials, drain tubes, adhesive and other accessories as indicated or required for complete installations.

2.02 FABRICATION

A. General:

1. Provide expansion joint cover assemblies of design, basic profile, materials and operation indicated required to accommodate joint size variations in adjacent surfaces, and as required for anticipated structural movement.

2. Deliver to job site ready for use and fabricated in as large sections and assemblies as practical. Assemblies identical to submitted and reviewed shop drawings, samples and certificates.

3. Furnish units in longest practicable lengths to minimize number of end joints. Provide mitered corners where joint changes directions or abuts other materials.

4. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections and other assemblies.

5. Fire Performance Characteristics:

a. Provide expansion joint cover assemblies identical to those of assemblies whose fire resistance has been determined per ASTM E119 and E814, NFPA 251, or UL 263 including hose stream test at full-rated period.

b. Fire rating: Not less than rating of adjacent wall construction.

6. Fire Barrier Systems:

a. Material to carry label of approved independent testing laboratory, and be subject to follow-up system for quality assurance.

b. Include thermal insulation where necessary, in accordance with above tests, with factory cut miters and transitions.

7. Seal Strip factory - formed and bonded to metal frames and anchor members.

8. Compression Seals: Prefabricate from thermoplastic rubber or dense neoprene to sizes and approximate profiles shown.

B. Interior Wall Joint Cover Assemblies:

1. Surface Mounted Metal Cover Plates:

a. Concealed frame for fastening to wall on one sides of joint.

b. Extend cover to lap each side of joint and to permit free movement on one side.

c. Provide concealed attachment of cover to frame cover in close contact with adjacent finish wall surfaces.

d. Use angle cover plates at intersection of walls.

e. Use smooth surface cover plates matching floor plates.

f. Use expansion fire inserts in fire rated walls, rated same as hour rating of wall.

C. Exterior Wall Joint Assemblies:

1. Variable movement with seal designed to prevent water and air infiltration.

2. Use vinyl seal strip as secondary seal behind primary seal.

3. Cover Plate Assemblies:

a. Surface mounted cover plate.

b. Concealed frame for fastening to wall on one side of joint.

c. Extend cover to lap each side of joint and to permit free movement on one side.

d. Provide concealed attachment of cover to frame for cover with cover in close contact with adjacent finish surfaces.

e. Use angle cover plate of intersection of walls.

2.03 METAL FINISHES

A. General:

1. Apply finishes in factory after products are fabricated.

2. Protect finishes on exposed surfaces with protective covering before shipment.

B. Aluminum Finishes:

1. Finish letters and numbers for anodized aluminum are in accordance with the NAAMM AMP 501, Aluminum Association's Designation System).

a. Clear anodized finish: AA-C22A41 Chemically etched medium matte, clear anodic coating, Class I Architectural, 0.7 - mil thick.

b. Color anodized finish: AA-C22A42, Chemically etched medium matte, integrally colored anodic coating, Class I Architectural, 0.7-mil thick. Dyes not accepted.

2. Factory-Primed Concealed Surface: NAAMM AMP 505 Protect concealed aluminum surfaces that will be in contact with plaster, concrete or masonry surfaces when installed by applying a shop coat of zinc-molybdate primer to contact surfaces. Provide minimum dry film thickness of 2.0 mils.

C. Stainless Steel: NAAMM AMP 503, finish No. 2B.

D. Carbon Steel: NAAMM AMP 504, Galvanized 690.

PART 3 EXECUTION

3.01 EXAMINATION

A. Manufacturer's representative shall make a thorough examination of surfaces receiving work of this section.

B. Before starting installation, notify prime contractor of defects which would affect satisfactory completion of work.

3.02 PREPARATION

A. Verify measurements and dimensions at job site and cooperate in coordination and scheduling of work with work of related trades.

B. Give particular attention to installation of items embedded in concrete and masonry so as not to delay job progress.

C. Provide templates to related trade for location of support and anchorage items.

3.03 INSTALLATION

A. Install in accordance with manufacturers installation instructions unless specified otherwise.

B. Provide anchorage devices and fasteners for securing expansion joint assemblies to in-place construction including threaded fasteners with drilled-in fasteners for masonry and concrete where anchoring members are not embedded in concrete. Provide metal fasteners of type and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.

C. Perform cutting, drilling and fitting required for installation of expansion joint cover assemblies.

D. Install joint cover assemblies in true alignment and proper relationship to expansion joint opening and adjoining finished surfaces measured from established lines and levels.

E. Allow for thermal expansion and contraction of metal to avoid buckling.

F. Locate wall covers in continuous contact with adjacent surfaces. Securely attach in place with required accessories.

G. Locate anchors at interval recommended by manufacturer, but not less than 75 mm (3-inches) from each ends, and, not more than 600 mm (24-inches) on centers.

H. Maintain continuity of expansion joint cover assemblies with end joints held to a

minimum and metal members aligned mechanically using splice joints.

I. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames or plates.

J. Flush Metal Cover Plates:

1. Secure flexible filler between frames so that it will compress and expand.

2. Adhere flexible filler materials to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

K. Fire Barriers:

1. Install in compliance with tested assembly.

2. Install in floors and in fire rated walls.

3. Use fire barrier sealant or caulk supplied with system.

L. Sealants:

1. Install to prevent water and air infiltration.

3.04 PROTECTION

A. Take proper precautions to protect the expansion joint covers from damage after they are in place.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Interior non-rated and fire-rated welded steel door frames.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 REFERENCES

A. Americans with Disabilities Act (ADA) - Accessibility Guidelines for Buildings and Facilities.

B. DHI - Door Hardware Institute: The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

C. ANSI/SDI 100 - Standard Steel Door and Frames.

D. ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.

E. ASTM A525 - Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process.

F. ASTM C976 - Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box.

G. ASTM E90 - Measurement of Airborne-Sound Transmission Loss of Building Partitions.

H. ASTM E413 - Classification for Rating Sound Insulation.

I. SFM Standard 12-7-4

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Shop Drawings: Indicate frame configuration, anchor types and spacings, location of cut-outs for hardware, glazing and louvers, reinforcement, and finish.

C. Instructions: Submit manufacturer's installation instructions.

D. Manufacturer's Certification: Certify that Products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Conform to the requirements of ANSI/SDI-100 and Americans with Disabilities Act (ADA) - Accessibility Guidelines for Buildings and Facilities.

B. Verify that field measurements are as indicated on approved shop drawings.

C. Performance Standards:

1. Sound-Rated Assemblies at Mechanical Rooms: ASTM E1408 and ASTM E413.

1.06 REGULATORY REQUIREMENTS

A. Installed door and frame assemblies to conform to CBC for fire rated class indicated on schedule.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Prior to shipment label each frame to show location, size, door swing and other pertinent information.

B. Accept frames on site in manufacturer's packaging. Inspect for damage.

1.08 WARRANTY

A. Provide five-year warranty against defects in manufacture and materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ceco Door Products;

B. Curries, “747 Series”;

C. Republic, “DS Series”;

D. Steelcraft, “Series B”;

2.02 DOORS AND FRAMES

A. Interior Frames: Welded 16 gage thick material, core thickness to suit model and grade of doors. Knockdown frames not permitted.

B. Inserts, Bolts, and Fasteners: Manufacturer's standard units for the required application; hot-dip-galvanize items to be embedded in or in contact with concrete foundation wall or slab-on-grade.

2.03 ACCESSORIES

A. Rubber Silencers: Resilient rubber.

B. Glass: As specified in Section 08 80 00 - Glazing.

C. Glazing Stops: Rolled steel channel shape, butted corners, prepared for countersink style tamperproof screws.

2.04 PROTECTIVE COATINGS

A. Primer: Manufacturer's standard red-oxide/zinc-chromate primer for interior surfaces.

B. Paint galvanized surfaces with zinc-dust/zinc-oxide primer.

2.05 FABRICATION

A. Fabricate frames in accordance with requirements of the Steel Door Institute specification SDI-100, and as indicated on drawings. Provide welded frames at interior doors.

B. Fabricate frames with hardware reinforcement plates welded in place. Drill and tap for surface-applied finish hardware. Provide mortar guard boxes where indicated.

C. Accurately form and cut mitered corners of welded type frames. Weld on inside surfaces. Sand-welded joints to a smooth uniform finish. Use welded frames at all interior locations. Use of splice plates at corners is not acceptable.

D. Fabricate frames of pairs of doors wider than 3'-6" of 12 gage steel.

E. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.

F. Prepare frame for silencers. Provide three single silencers for single doors on strike side, and two single silencers on frame head at double doors.

G. Provide jamb and floor anchors in accordance with SDI-100.

H. Attach channel or angle spreaders at bottom of welded type doorframes to ensure proper alignment while shipping.

I. Fill surface depressions with metallic paste filler and sand to a smooth uniform finish.

J. Provide prime coat on frames, including backs of frames.

K. Touch up areas with zinc rich paint where galvanized coating has been removed due to welding, sanding or handling.

L. Attach fire rated label to each frame and door unit scheduled to be labeled.

2.06 FINISH

A. Shop primer, compatible with finish paint specified in Section 09 90 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

3.02 INSTALLATION

A. Install frames in accordance with SDI-100.

B. Install adjustable frames in accordance with manufacturer’s instructions.

C. Coordinate installation of glass and glazing.

D. Install door louvers plumb and level.

E. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.03 ADJUSTING

A. Adjust doors for smooth operation and balanced door movement.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies the installation of wood doors.

B. Factory finished wood doors.

C. Section includes fire rated doors.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 REFERENCES

A. ANSI/NWMA I. S. - Industry Standard for Wood Flush Doors.

B. WIC - Woodwork Institute of California, Manual of Millwork Standards of the Woodwork Industry, latest edition.

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, identify cutouts for glazing and louvers, blocking for hardware attachment.

C. Product Data: Indicate door core materials and construction, veneer species, type and characteristics.

D. Manufacturer's Installation Instructions: Indicate special installation instructions.

E. Labeled fire rated doors showing conformance with NFPA 80.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with WIC, Section 20, Custom Grade.

B. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three (3) years documented experience.

C. Millwork Shop: Company specializing in custom cabinetry and doors specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with W.I.C. Section 20.

1.07 COORDINATION

A. Coordinate work with door opening construction, door frame and door hardware

installation.

1.08 WARRANTY

A. Provide manufacturer's written standard lifetime warranty for full, unlimited, replacement for the life of the original installation for new interior doors.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, telegraphing core construction.

PART 2 PRODUCTS

2.01 DOOR TYPES

A. Interior Doors: 1-3/4 inch flush wood doors and custom fabricated doors per drawing elevations and details. Veneer Finish, Section 09 06 00.

B. Interior Fire Rated Doors:

1. Meet requirements of National Fire Protection Association (NFPA), 80-10 Protection of Buildings from Exterior Fire and 252-08 Fire Tests of Door Assemblies.

2. Adhesive: Type II

3. Thickness: 45 mm (1-3/4 inches) unless otherwise shown or specified.

4. Veneer Finish, Section 09 06 00.

C. Factory Finish: Shop prime with polyurethane opaque finish; color and door veneer species per Architectural Finishes List

2.02 FABRICATION

A. Fabricate wood doors in accordance with requirements of the Woodwork Institute of California (WIC).

B. Make cut-outs and provide stops for glass and louvers. Refer to Drawings for size of openings required.

C. Bevel strike edge of single acting doors 1/8 inch in 2 inches. Radius strike edge of double acting swing doors 2-1/8 inches.

D. Prepare doors to receive hardware. Refer to Section 08 71 00 for hardware requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

B. Do not install doors in frame openings that are not plumb or are out of tolerances for size or alignment.

3.02 DOOR PREPARATION

A. Field, shop or factory preparation: Do not violate the qualified testing and inspection agency label requirements for fire rated doors.

B. Clearances between Doors and Frames and Floors:

5. Maximum 3 mm (1/8 inch) clearance at the jambs, heads, and meeting stiles, and a 19 mm (3/4 inch) clearance at bottom, except as otherwise specified.

6. Maximum clearance at bottom of sound rated doors, light-proofed doors, doors to operating rooms, and doors designated to be fitted with mechanical seal: 10 mm (3/8 inch).

C. Provide cutouts for special details required and specified.

D. Rout doors for hardware using templates and location heights specified in Section, 08 71 00 DOOR HARDWARE.

E. Fit doors to frame, bevel lock edge of doors 3 mm (1/8 inch) for each 50 mm (two inches) of door thickness, undercut where shown.

F. Immediately after fitting and cutting of doors for hardware, seal cut edges of doors with two coats of water resistant sealer.

G. Finish surfaces, including both faces, top and bottom and edges of the doors smooth to touch.

H. Apply a steel astragal on the opposite side of active door on pairs of fire rated doors.

I. Apply a steel astragal to meeting style of active leaf of pair of doors or double egress smoke doors.

3.03 INSTALLATION

J. Install doors in accordance with W.I.C. Technical Bulletin No. 429 REV 1-99.

K. Trim door width by cutting equally on both jamb edges.

L. Trim door height by cutting bottom edges to a maximum of 3/4 inch.

M. Pilot drill screw and bolt holes.

N. Machine cut for hardware. Core for hardware and cylinders.

O. Coordinate the installation of glass and glazing in wood doors.

P. Prime and/or seal all factory-made cutouts prior to delivery.

Q. Finishing: All four edges and both faces of doors shall be factory finished.

3.04 INSTALLATION TOLERANCES

A. Coordinate to W.I.C. requirements for fit and clearance tolerances.

B. Conform to W.I.C. requirements for maximum diagonal distortion.

3.05 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies electrically operated sectional overhead steel doors, operators, loop detectors, fasteners and accessories.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 REFERENCES

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

B. American Architectural Manufacturers Association (AAMA):
2603-13 ..... Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

C. American Society of Civil Engineers (ASCE):
7-10 ..... Wind Load Provisions

D. SFM (ASTM):
A36/A36M-14 ..... Structural Steel
A227/A227M-06(R2011) ..... Steel Wire, Cold-Drawn for Mechanical Springs
A229/229M-12 ..... Steel Wire, Oil-Tempered for Mechanical Springs
A653/A653M-12(R2013) ..... Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy Coated (Galvanized) by the Hot Dip Process
C1036-11(R2012) ..... Flat Glass
C1363-11 ..... Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
E84-14 ..... Surface Burning Characteristics of Building Materials
E283-04(R2012) ..... Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Difference Across the Specimen
E330/E330M-14 ..... Structural Performance of Exterior Windows, Curtain Walls, and Doors by the Uniform Static Air Pressure Difference.
E331-00(R2009) ..... Water Penetration of Exterior Windows, Curtain Walls, and Doors by the Uniform Static Air Pressure Difference.

E. American National Standards Institute and Door and Access Systems Manufacturer Association (ANSI/DASMA):
102-11 ..... Sectional Overhead Type Doors.

F. National Electrical Manufacturer's Association (NEMA):
ICS 6-93(R2011) ..... Industrial Controls and Systems: Enclosures
MG 1-11(R2014) ..... Motors and Generators
ST 20-14 ..... Dry Type Transformers for General Applications

G. National Fire Protection Association (NFPA):
70-14 ..... National Electrical Code

H. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06 .....Metal Finishes Manual

I. Underwriters Laboratories, Inc. (UL):
325-06(R2013).....Door, Drapery, Gate, Louver, and Window Operators and Systems

1.04 SUBMITTALS

A. Shop Drawings:

1. Details of construction, accessories and hardware, electrical and mechanical items, supporting brackets for motors, location, and ratings of motors, and safety devices. Standard details shall not be accepted, Drawings shall show conditions of actual construction and coordinated assembly details.

2. Wiring diagrams for motors and controls, including wiring diagram for door, showing electrical interlock for motor with manually operated deadlock.

B. Manufacturer's Literature, Data & Samples:

1. Brochures or catalog cuts.

2. Manufacturer's installation procedures and instruction.

3. Maintenance instructions, parts list.

4. 12 inch long sample of metal finish.

C. Installer's qualifications.

D. Manufacturer's qualifications

E. Certificates:
1. Attesting door, anchors and hardware will withstand the horizontal loads specified.

2. Attesting door complies with thermal performance, air filtration, and water infiltration requirements.

F. Manufacturer warranty.

1.05 QUALITY ASSURANCE

A. Source: Obtain sectional doors from single source from single manufacturer. Obtain operators and controls from sectional door manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with W.I.C. Section 20.

1.07 WARRANTY

A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".

B. Manufacturer Warranty: Manufacturer shall warranty their sectional doors for a minimum

of two (2) years from the date of installation and final acceptance by the Government. Submit manufacturer warranty.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel: ASTM A653/A653M for forming operations. ASTM A36/A36M for structural sections.

B. Hard Drawn Spring wire: ASTM A227/A227M

C. Oil Tempered Spring wire: ASTM A229/A229M.

D. Weather-strips, Gaskets, and Thermal Breaks:

1. Neoprene, EPDM, PVC, silicone rubber, or other low conductance material.

2. Standard with door manufacturer.

2.02 DESIGN REQUIREMENTS

A. Wind Load: Design to withstand uniform pressure (velocity pressure) of 960 Pa (20 lbs. per sq. ft.) acting inward and outward when tested in accordance with ASTM E330/E330M. Doors are to remain operable under design wind load.

B. Thermal Performance for Insulated Doors: Maximum R value 15.5 for door when tested in accordance with ASTM C1363.

C. Air Infiltration for Exterior Doors: Maximum of 0.10 cfm at 24 Km (15 miles per hour) wind speed per foot of crack between door sections and door perimeter opening when tested in accordance with ASTM E283.

D. Water Infiltration for Exterior Doors: No infiltration when tested in accordance with ASTM E331.

E. Seismic Performance: Sectional doors are to withstand the effects of earthquake motions determined according to ASCE 7.

F. Comply with ANSI/DASMA 102. Provide metal doors with horizontal sections hinged together to operate in a system of tracks to completely close the door opening in the closed position and make the full width and height of the door opening available for use in the open position.

G. Comply with ANSI/DASMA 102. Provide metal doors with horizontal sections hinged together to operate in a system of tracks to completely close the door opening in the closed position and make the full width and height of the door opening available for use in the open position.

2.03 FABRICATION

A. Steel Door Sections:

1. Formed of hot-dipped galvanized steel.

2. Meeting rails: Interlocking joints with thermal breaks separating face sheets formed to provide weathertight closure and alignment for full width of door.

3. Height of Each Section: To match 20 inch building module, horizontally. Dorr thickness 2” minimum.

4. Install glazing panels where indicated using rubber thermal break gaskets standard with door manufacturer.

5. Provide board foamed in place insulation with flame spread rating of not more than 25 and a smoke development factor of not more than 50 when tested in accordance with ASTM E84.

6. Reinforced for hardware anchorage with not less than 10 gage galvanized steel.

7. Glass, insulated unit with low E coating.

B. Tracks:

1. Manufacturer's standard, formed of galvanized steel.

2. Track Configuration: See drawings and conditions for lift and track support requirements.

3. Minimum of 75 mm (3 inch) tracks.

4. Vertical tracks fabricated with adjustable brackets for mounting at incline to continuous steel angle wall bracket.

5. Horizontal Track: Reinforce with continuous steel angle anchored to vertical steel angle wall bracket and to ceiling angle supports. Provide vertical and cross or diagonal braces to obtain rigid installation of horizontal track.

6. Provide not less than 2.38 mm (11 gage) galvanized steel angles.

6. Brace per non-structural seismic component requirements.

C. Hardware:

1. Manufacturers standard hinges, brackets, rollers, locking devices and other hardware required for a complete installation.

2. Hinges and Roller Brackets: Minimum of 2.38 mm (11 gage) galvanized steel.

3. Provide rollers with ball bearings and case hardened races.

4. Provide positive locking device to receive cylinder lock with interlocking switch to motor actuator.

5. Weatherseals: Manufacturer’s standard fitted to bottom and top around entire perimeter of door. Provide combination bottom weatherseal and sensor edge.

D. Manual Operation:

1. Chain Hoist Operation: Provide galvanized, endless chain operating over a sprocket.

    a. Extend chain to within 1219 mm (4 feet) of the floor and mount on inside of building.

    b. Obtain reduction by use of roller chain and sprocket drive or gearing.

    c. Provide chain cleat and pin for securing actuator chain.

    d. Allow for installation of power actuators to chain hoist operator when indicated in construction documents.

    e. Do not exceed the maximum lifting force of 111 newton (N) (25 pound force) required to operate the door.

2.04 ELECTRIC MOTOR OPERATORS

A. Complete with electric motor, machine cut reduction gears, steel chain and sprockets, magnetic brake, overload protection, brackets, wall mount push button controls, limit switches, magnetic reversing contactor, and other accessories necessary for proper operation, including emergency manual actuator.

B. Design:

1. Design the actuator for motor removal without disturbing the limit-switch adjustment and without affecting the emergency manual actuators.

2. Make provision for emergency manual operation of door by chain-gear mechanism in case of electrical failure.

3. Arrange the emergency manual operating mechanism to immediately be put into and out of operation from the floor with a mechanical device to disconnect the motor from the operating mechanism when the emergency manual operating mechanism is engaged. This operation is not to affect the adjustment of the limit switches.

4. Provide interlock with motor to prevent motor from operating when manual locks are activated.

C. Motors:

1. NEMA MG 1, maximum operation 3600 rpm.

2. Suitable for operation on power current of the characteristics indicated on the electrical construction documents.

3. Use high starting torque, reversible type, of sufficient horsepower and torque output to move the door in either direction from door position, and produce door travel speed range of 0.20 to 0.30 m per second (8 to 12 inches per second), without exceeding the rated capacity.

4. Single-phase motors are not to have commutation or more than one starting contact.

5. Motor Enclosures: Drip proof type or NEMA TENV type.

D. Controls:
   1. Control Enclosures:
      a. Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
   2. At door actuators, provide an enclosed, across-the-line type, magnetic reversing contactor, thermal overload protection, solenoid operated brake, limit switches, and remote control switches at locations on construction documents. See electrical drawings and specifications for additional information
   3. Control switches:
      a. Three push button type on interior, unless noted to be key activated.
      b. Buttons marked, OPEN, CLOSE and STOP.
      c. The OPEN and STOP buttons: Momentary pressure or contact type.
      d. The CLOSE button: Constant pressure type.
      f. Limit switches: Manufacturers standard, position of switches readily adjustable.
   4. Operation:
      a. Open door upon activation of OPEN button.
      b. Close door only when constant key pressure applied to CLOSE button.
      c. When the door is in motion, and the STOP button is pressed, door is to stop instantly and remain in the stop position; from stop position, door may be operated in either direction by OPEN or CLOSE button.
      d. Limit switches automatically stop doors at their fully open and closed positions.
   5. Provide push buttons with guards to prevent accidental operation.
   6. Remote controls for in-vehicle operation. 8 controllers.
   7. Transformer:
      a. Provide control transformer in power circuits to reduce the voltage on control circuits to 120 volts or less.
      b. Conform to NEMA ST 20.
   8. Electrical Components: Conform to NFPA 70.
   9. Safety Device:
      a. Provide bottom door edge weather-strip safety device to immediately stop and reverse the door closing to full open position upon contact with an obstruction in compliance with UL 325. Door is to open upon failure of device, component of device or component of control system.

b. The door closing circuit is to be electrically locked out and door to remain capable of manual operation until the failure or damage has been corrected.

c. Do not use safety device as a limit switch.

d. Safety Device Connecting Cable to Motor: Flexible type SO cable, with spring loaded automatic take up reel or equivalent device, as required for proper operation of the doors.

2.05 FINISHES

A. Steel:

1. Comply with NAAMM's AMP 500-06 Metal Finishes Manual for recommendations for applying and designating finishes.

2. Clean surfaces free of scale, rust, oil and grease.

3. Mill finish

4. Do not paint track, rollers, hinges, or locks.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with approved shop drawings and manufacturer's instructions.

B. Locate anchors and inserts for tracks, brackets, motors, switches, hardware, and other accessories in accordance with approved shop drawings.

C. Lubricate, adjust and demonstrate door to operate freely.

D. Upon completion, leave door openings weathertight and doors free from warp, twists, or distortion.

3.02 REPAIR

A. Repair zinc-coated surfaces both bare and painted, by the application of galvanizing repair compound.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies aluminum storefronts and other components to make complete assemblies.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Shop Drawings: (1/2 full scale) showing construction, anchorage, reinforcement, installation details and glass elevations and images.

C. Manufacturer’s Literature and Data:

1. Doors, each type.

D. Samples:

1. Two samples of anodized aluminum of each color showing finish and maximum shade range. Glass showing color and finish.

E. Manufacturer’s Certificates:

1. Stating that aluminum has been given specified thickness of anodizing.

2. Indicating manufacturer’s qualifications specified.

1.04 QUALITY ASSURANCE

A. Approved by Architect is required of products of proposed manufacturer, or supplier, and will be based upon submission by Contractor certification.

B. Certify manufacturer regularly and presently manufactures aluminum entrances and storefronts as one of their principal products.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, cure time, and mixing instructions.

B. Store door and aluminum material in weather-tight and dry storage facility.

C. Protect from damage from handling, weather and construction operations before, during and after installation.

1.06 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. America Society for Testing and Materials (ASTM):

B209-07	Aluminum and Aluminum-Alloy Sheet and Plate
B221-08	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
E283-04	Rate of Air Leakage Through Exterior Windows, Certain Walls, and Doors Under Specified Pressure Differences Across the Specimen
E331-00 (R2009)	Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
F468-10	Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
F593-03(R2008)	Stainless Steel Bolts, Hex Cap Screws, and Studs

C. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series	Metal Finishes Manual

PART 2 PRODUCTS

2.01 MATERIALS

A. Aluminum, ASTM B209 and B221:

1. Alloy 6063 temper T5 for doors, door frames, storefronts and transoms.

2. For color anodized finish, use aluminum allow as required to produce specified color.

B. Thermal Break: Manufacturer standard low conductive material retarding heat flow in the framework, where insulation glass is scheduled.

C. Fasteners:

1. Aluminum: ASTM F468, Alloy 2034.

2. Stainless Steel: ASTM F593, Alloy Groups 1, 2 and 3.

D. Framing

1. Provide nominal 2” x 4” thermally-broken aluminum framing system with positive mechanical bonding of interior and exterior aluminum sections.

2. Position frame and secure in opening with concealed fasteners to maintain the integrity of thermal breaks in frame and wall, and in accordance with details provided.

E. Sealant

1. Glazing Sealant: Clear structural silicone sealant, G.E. Dow, or approved equal.

2. Frame to masonry component gun grade polyurethane, Tremco, Bostic, or Sonneborn or approved equal. Color to be selected by Architect/Engineer.

F. Miscellaneous: .060” thick aluminum break metal cladding at windows. Finish to framing metals which it adjoins.

2.02 FABRICATION

A. Fabricated doors, of extruded aluminum sections not less than 3 mm (0.125 inch) thick. Fabricate glazing beads of aluminum not less than 1.0 mm (0.050 inch) thick.

B. Accurately form metal parts and accurately fit and rigidly assemble joints, except those joints designed to accommodate movement. Seal joints to prevent leakage of both air and water.

C. Make welds in aluminum in accordance with the recommended practice AWA D1.2. Use electrodes and methods recommended by the manufacturers of the metals and alloys being welded. Make welds behind finished surfaces so as to cause no distortion or discoloration of the exposed side. Clean welded joints of welding flux and dress exposed and contact surfaces.

D. Make provisions in doors and frames to receive the specified hardware and accessories. Coordinate schedule and template for hardware specified under Section 08 71 00, Door Hardware. Where concealed closers or other mechanisms are required, provide the necessary space, cutouts, and reinforcement for secure fastening.

E. Fit and assemble the work at the manufacturer's plant. Mark work that cannot be permanently plant-assembled to assure proper assembly in the field.

2.03 PROTECTION OF ALUMINUM

A. Isolate aluminum from contact with dissimilar metals other than stainless steel, white bronze, or zinc by any of the following:

1. Coat the dissimilar metal with two coats of heavy-bodied alkali resistant bituminous paint.

2. Place caulking compound, on non-absorptive tape, or gasket between the aluminum and the dissimilar metal.

3. Paint aluminum in contact with mortar, concrete and plaster, with a coat of aluminum paint primer.

2.04 FINISH

A. In accordance with NAAMM AMP 500 Series.

B. Fluorocarbon Finish: AAMA 605.2, high performance coating. Color Finish: Chemically etched medium matte, with integrally colored anodic coating Class I Architectural, 7 mils thick. More than 50 percent variation of the maximum shade range approved will not be accepted in a single component or in adjacent components, stiles, and rails on a continuous series.

PART 3 EXECUTION

3.01 INSPECTION

A. Beginning of installation shall signify acceptance of substrate and adjacent conditions as being proper and acceptable. Corrections of defects due to installation of products on un acceptable substrata will be at Contractor's expense at no additional cost to Owner.

3.02 INSTALLATION

A. Fabricate only from approved shop drawings.

B. Install all doors, frames, sidelites and accessories per manufacturer's written instructions and final shop drawings.

C. Anchor securely in place; install plumb, level and in true alignment. Isolate dissimilar materials to prevent corrosion.

D. Allowable Installation Tolerances: Install work plumb and true, in alignment and in relation to lines and grades shown. Variation of 1/8 inch in eight feet, non-accumulative, is maximum permissible for plumb, level, warp, bow and alignment.

E. Install hardware specified under Section 08 71 00, Door Hardware.

3.03 PROTECTION, CLEANING AND REPAIRING

A. Remove all mastic smears and other unsightly marks, and repair any damaged or disfiguration of the work. Protect the installed work against damage or abuse.

B. Adjust and check each operating item of hardware to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application specified.

C. Install signage (symbol of accessibility) at exterior doors.

D. Clean-up premises of all litter, dirt, and debris created by work of this Section.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the insulated translucent sandwich panel and accessories as shown and specified. Work includes providing and installing:

1. Flat factory prefabricated structural insulated translucent sandwich panels

2. Aluminum installation system

3. Aluminum flashings and fasteners

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit manufacturer’s product data. Include construction details, material descriptions, profiles and finishes of skylight components.

B. Submit shop drawings. Include elevations and details.

C. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.

D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

1. Two samples of anodized aluminum of each color showing finish and maximum shade range. Glass showing color and finish.

E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.

1. Reports required are:

a. International Building Code Evaluation Report

b. Flame Spread and Smoke Developed (UL 723) – Submit UL Card

c. Burn Extent (ASTM D 635)

d. Color Difference (ASTM D 2244)

e. Impact Strength (UL 972)

f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)

g. Bond Shear Strength (ASTM D 1002)

h. Beam Bending Strength (ASTM E 72)

i. Fall Through Resistance (ASTM E 661)

j. Insulation U-Factor (NFRC 100)

k. NFRC System U-Factor Certification (NFRC 700)

l. Solar Heat Gain Coefficient (NFRC or Calculations)

m. Condensation Resistance Factor (AAMA 1503)

n. Air Leakage (ASTM E 283)

o. Structural Penetration (ASTM E330)

p. Water Penetration (ASTM E331)

q. Daylight Autonomy

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.

2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.

3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified skylight systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

1.05 PERFORMANCE REQUIREMENTS

A. The manufacturer shall be responsible for the configuration and fabrication of the complete skylight panel system.

1. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.

3. Structural Loads; Provide panel system capable of handling loads listed on the Structural Drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver panel system, components and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.07 WARRANTY

A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. The basis for this specification is for products manufactured by Kalwall Corporation.

B. Other manufacturers may bid this project provided they comply with all of the performance requirements of this specification and submit evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.

2.02 PANEL COMPONENTS

A. Face sheets

1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.

a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.

b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.

2. Interior face sheets:

a. Flame spread: Underwriters Laboratories (UL) listed, 25.

b. Burn extent by ASTM 635 shall be no greater than 1".

3. Exterior face sheets:

a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.

b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.

c. Erosion Protection: Integral, embedded-glass erosion barrier.

B. Grid Core

1. Aluminum I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin- mullion and perimeter. Width of I-beam shall be no less than 7/16".

C. Laminate Adhesive

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".

2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.

3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:

a. 50% Relative Humidity at 68° F: 540 PSI

b. 182° F: 100 PSI

c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI

d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.03 PANEL CONSTRUCTION

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.

1. Thickness 2-3/4 inches

2. Visible Light transmittance (VLT): 0.20

3. Complete insulated panel system shall have NFRC certified U-factor of:

4. Grid pattern: Nominal size 12x24; pattern shoji.

B. Standard panels shall deflect no more than 1.0" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.

C. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.

2.04 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Closure system (Wall):

1. Standard extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.

C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.

D. Finish: Manufacturer’s factory applied finish, which meets the performance requirements of AAMA 2604.

PART 3 EXECUTION

3.01 EXAMINATION

A. Installer shall examine substrates, supporting structure and installation conditions.

B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.02 PREPARATON

A. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

3.03 INSTALLATION

A. Install the skylight system in accordance with the manufacturer's suggested installation recommendations and approved shop drawings.

1. Anchor component parts securely in place by permanent mechanical attachment system.

2. Accommodate thermal and mechanical movements.

3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction

B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

3.04 FIELD QUALITY CONTROL

A. Water Test: Installer to test skylights according to procedures in AAMA 501.2.

B. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

3.05 CLEANING

A. Clean the skylight system interior and exterior, immediately after installation.

B. Refer to manufacturer's written recommendations.

END OF SECTION 08 45 23

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes door hardware.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Submit product data including installation details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: Submit shop drawings with details of door hardware:

D. Samples: Submit samples of exposed door hardware for each type indicated below, in specified finish. Tag with full description for coordination with the Door Hardware Schedule.

1. Door Hardware: As follows:

a. Locks and latches.

b. Operating trim.

2. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

E. Door Hardware Schedule: Submit door hardware schedule prepared by or under the supervision of door hardware supplier. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware. The Architect's review of schedule shall neither be construed as a complete check nor shall it relieve the Contractor of responsibility for errors, deviations, or omissions from the specified requirements to provide complete door hardware for the project.

1. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.

2. 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 each 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. Supply templates to door and frame manufacturer(s) to enable proper and accurate sizing and locations of cutouts for hardware. Detail any conditions requiring custom extended lip strikes, or any other special or custom conditions.

g. Door and frame sizes and materials.

F. Warranties: Submit special warranties specified in this Section.

G. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, removal and replacement of door hardware.

H. Installation Instructions: Provide manufacturer's installation instructions for each type of hardware item for owner's maintenance at completion of work.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed 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.

B. Supplier Qualifications: Door hardware supplier, who has completed a minimum of three (3) projects over the last 5 years which were similar in material, design and extent to that indicated for the project - as determined by the Architect – and which have resulted in construction with a record of successful in service performance, and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

E. Regulatory Requirements: Comply with the following:

1. Provide hardware items complying with the applicable provisions for accessibility and usability by the disabled and handicapped in compliance with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG).”

2. NFPA 101: Comply with applicable provisions for means of egress doors.

F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.

2. Preliminary key system schematic diagram.

3. Address for delivery of keys.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to electrified and mechanical door hardware including, but not limited to, the following:

1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review required testing, inspecting, and certifying procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

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.

1.06 COORDINATION

A. Templates: Furnish templates and door hardware schedules, coordinated for the application of door hardware items with door and frame details, to door opening fabricators and trades performing door opening work to permit the preparation of doors and frames to receive the specified door hardware. The fabricated prep and installation shall be in compliance with the lock manufacturer’s recommendations, requirements and templating. Where the door hardware item scheduled is not adaptable to the finished size of door opening members requiring door hardware, submit an item having a similar operation and quality to the Architect for review. Each door hardware item shall be fabricated to templates.

1.07 WARRANTY

A. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Faulty operation of door hardware.

2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

PART 2 PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section, door hardware sets are keyed to each scheduled door in the door and frame schedule, and the Door Hardware Schedule at the end of Part 3.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products.

2. The hardware supplier shall review each hardware set and compare it with the door types, details, and sizes as shown and verify each hardware item for function, hand, backset, and method of fastening through shop drawing submittals.

2.02 HINGES AND PIVOTS

A. Butt Hinge Products and Manufacturers:

1. Standard Weight, Ball Bearing, 5 Knuckle, Steel: Complying with BHMA A156.1 A8112, one of the following:

a. BB5000; Bommer Industries, Inc. (BI).

b. BB1279; Hager Companies (HAG).

c. TA2714; McKinney Products Company (MCK).

d. FBB179; Stanley Commercial Hardware (STH).

2. Heavy Weight, Ball Bearing, 5 Knuckle, Steel: Complying with BHMA A156.1 A8111, one of the following:

a. BB5004; Bommer Industries, Inc. (BI).

b. BB1168; Hager Companies (HAG).

c. T4A3786; McKinney Products Company (MCK).

d. FBB168; Stanley Commercial Hardware (STH).

3. Heavy Weight, Ball Bearing, 5 Knuckle, Stainless Steel: Complying with BHMA A156.1 A5111, one of the following:

a. BB5006; Bommer Industries, Inc. (BI).

b. BB1199; Hager Companies (HAG).

c. T4A3386-32D; McKinney Products Company (MCK).

d. FBB199(US32D); Stanley Commercial Hardware (STH).

B. General Hinge Characteristics: Where door jamb or trim projects to such an extent that the width of leaf specified will not allow the door to clear such frame or trim, furnish hinges and pivots with leaves of sufficient width to clear. Hinges and pivots shall be template hinges conforming to BHMA A156.1 and in accordance with door and frame material requirements.

C. Butt Hinge Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to and including 60 inches (1524 mm).

2. Three Hinges: For doors with heights of greater than 60 inches (1524 mm) to and including 90 inches (2286 mm).

3. Four Hinges: For doors with heights greater than 90 inches (2286 mm) to and including 120 inches (3048 mm).

4. Provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).

D. Butt Hinge Sizes: 4-1/2 inches (114 mm) h. by 4 inches (102 mm) or 4-1/2 inches (114 mm) w. for doors up to and including 36 inches (914 mm) in width; 5 inches (127 mm) h. by 4 inches (102 mm) or 4-1/2 inches (114 mm) w. for doors greater than 36 inches (914 mm) in width.

E. Hinge Characteristics: Full mortise type with square corners. All butt hinges are to have nonrising pins for interior hinges and all exterior butt hinges are to be made of non-ferrous base metal. Hinges at all locked outswinging doors shall have non-removable pins (NRP). Provide only steel bodied butt and pivot hinges at labeled doors. All butt hinges shall be furnished with button tips.

F. Fasteners: Package all hinges and pivots with machine and wood screws as required by door and frame construction.

2.03 LOCKS AND LATCHES

A. Mortise Lock and Latch Sets: Heavy duty, commercial, mortise bodies complying with BHMA A156.13 Series 1000, Grade 1, with throughbolted lever trim. Furnish mortise type, field reversible, lock and latch sets with 1 or 2 piece anti-friction deadlocking brass or stainless steel latchbolts having a minimum 3/4 inch (19 mm) throw, 2-3/4 inches (70 mm) backset, and UL listed for 3 hour doors. All lock and latch sets, to be furnished complete with heavy gage wrought steel zinc dichromate or chrome plated case, trim, adjustable beveled square cornered armored fronts, steel or stainless steel hubs, and 6 pin Best cylinders. Conceal fastenings, washers and bushings. Provide wrought, or black plastic, box strikes for each lock and latch set with curved lips of sufficient length to protect frames. Provide solid forged or cast levers with wrought roses. Where lock functions are scheduled provide nonhanded guard bolt and stainless steel deadbolt with a minimum 1 inch (25 mm) throw. Use Schlage L mortise locks, Best pin cylinders. Trim will be cast stainless steel with antimicrobial finish unless otherwise specified.

1. Schlage L9000 Series, 17 Design x A Rose; Schlage Lock Company (SCH). Provide handed ANSI 4-7/8” curved lip strikes die punched to match bolts provided with latchset functions only (Part No. XL11-820/XL11-821), provide non-handed standard curve lip strikes for all other functions 10-072.

2.04 DOOR BOLTS

A. Manual Flush Bolts: Provide flush bolts, with 1" wide fronts, in paired sets (top and bottom), with 1/2" diameter flattened bolt tip and standard 12" rod. Flush bolts shall fit ANSI A115.4 door and frame preparation. Flush bolts in wood and metal fire doors shall be A Label UL Listed. Bolts for fire doors to comply with BHMA A156.16, Type L14081, L14251 or L24081. Furnish rods of proper length to afford easy reach from the floor. Furnish manufacturers standard top strikes for top bolts.

1. Manual Flushbolts for Fire Rated Wood Doors: One of the following:

a. No. 790F; Door Controls International (DCI).

b. FB358; Ives: H. B. Ives (IVS).

c. 3913; Triangle Brass Manufacturing Company, Inc. (TBM).

d. 557; Rockwood Manufacturing Company (RM).

2. Manual Flushbolts for Fire Rated Metal Doors: One of the following:

a. No. 780F; Door Controls International (DCI).

b. FB458; Ives: H. B. Ives (IVS).

c. 3917; Triangle Brass Manufacturing Company, Inc. (TBM).

d. 555; Rockwood Manufacturing Company (RM).

B. Self-Latching Flush Bolt Assemblies for Metal Fire Doors: BHMA A156.3, Type 27; one of the following:

1. No. 845 (805 top bolt x 840 automatic bottom bolt); Door Controls International (DCI).

2. FB51P (FB51T constant latching top bolt x FB31B automatic bottom bolt; Ives: H. B. Ives (IVS).

3. 3820 (3820 x 3810); Triangle Brass Manufacturing Company, Inc. (TBM).

4. 1845 automatic flush bolt x constant self-latching top bolt; Rockwood Manufacturing Company (RM).

2.05 CYLINDERS AND KEYING

A. Cylinders: Full faced interchangeable core cylinders with square shouldered (not tapered) compression rings, 6 pin cylinders, standard threaded, keyed into building system, with cams to suit lock functions. Provide cylinders for installation into all locks and key-operated electrical switching devices keyed to the instructions by the Best.

B. Keying System: Final keying to determine lock cylinders, keyed alike sets, level of keying, master key groups, grandmaster keying system shall be as directed by the Owner. Supplier and Contractor shall meet with the Owner and obtain final instructions in writing.

1. Construction Keyed Cylinders: Provide construction keyed cylinders in locks during construction and as may be necessary for security or as may be requested by the Owner. Upon completion of the construction phase, construction keyed cylinders shall be voided mechanically without removal of the cylinder housing from the locks. All construction keyed cylinders shall be individually keyed as required.

2.06 STRIKES

A. Strikes for Locks and Latches: All strikes for locks and latches shall be provided by the lock and latch manufacturer unless otherwise specified or scheduled, refer to Article 'Locks and Latches'.

B. Dustproof Floor Strikes: Complying with BHMA A156.16, Type L04251 or L14021, one of the following:

1. No. 80; Door Controls International.

2. DP2; H.B. Ives.

3. 3910; Triangle Brass Manufacturing Company, Inc. (TBM).

4. 570 x 571; Rockwood Manufacturing Company (RM).

C. Dustproof Threshold Strikes: Complying with BHMA A156.16, Type L2402X or L14011, one of the following:

1. No. 81; Door Controls International.

2. DP1; H.B. Ives.

3. 3911; Triangle Brass Manufacturing Company, Inc. (TBM).

4. 572; Rockwood Manufacturing Company (RM).

2.07 ACCESSORIES FOR PAIRS OF DOORS

A. Tubular Coordinators and Filler Bars: UL listed for use on labeled doors and complying with BHMA A156.3, Type 21A. Provide with filler piece of length as required to close the header area and mounting brackets at stop mounted hardware. Furnish extenders at active leaf levers where required to clear overlapping astragals on doors installed with pocket pivot hinges or jambs with deep jamb stops.

1. No. 600 Series x Filler Bar; Door Controls International (DCI).

2. COR Series Coordinators x FL filler; H. B. Ives (IVS).

3. 1600 Series; Rockwood Manufacturing Company (RM).

B. Coordinator Brackets: UL listed for use on labeled doors and complying with BHMA A156.3, Type 21B. Minimum 7-inch (178-mm) projection.

1. No. 500 Coordinator; Door Controls International (DCI).

2. CORG7; H. B. Ives (IVS).

3. 576; Rockwood Manufacturing Company (RM).

C. Carry Open Bars: UL listed for use on labeled doors and complying with BHMA A156.3, Type 21. Provide carry-open bars for inactive leaves of pairs of doors, unless automatic or selflatching bolts are used.

1. No. CB Carry Bar; Door Controls International (DCI).

2. CB1 Carry Bar; H. B. Ives (IVS).

3. 1100; Rockwood Manufacturing Company (RM).

D. Astragals: UL listed for use on labeled doors, surface applied continuous extruded aluminum minimum 7/8" wide retaining EPDM gaskets for installation on both sides of all meeting stiles of doors:

1. 125NA; National Guard Products, Inc. (NGP).

2. 305CN; Pemko Manufacturing Co., Inc. (PEM).

3. WS235; Ultra Industries; a Macklanburg-Duncan Company (ULT).

E. Lock Protectors: Fabricated from heavy gauge metal and in finish as scheduled. Fabricate lock protectors with no exposed fasteners on face of lock protector. Furnish protectors sized to cover the latch bolt area of the door and lock and narrow enough to clear rose and escutcheon lock trims, offset formed to clear strike projection. Machine lock protectors where required to accommodate rose and escutcheon trims, and cylinders.

1. LG Series Lock Guards; H. B. Ives (IVS).

2.08 CLOSERS

A. Surface-Mounted Closers: Closers shall be certified by ETL laboratories and the manufacturer to a minimum of 8,000,000 cycles and meet BHMA A156.4, Grade 1. Closers shall be warranted by the manufacturer against defects in materials and workmanship for a minimum of 10 years. Closers used in conjunction with overhead stops and holders shall be templated and coordinated to function properly. Properly detail closers to meet application requirements by providing drop plates, brackets, etc. to meet application and installation requirements as indicated. Comply with manufacturers recommendations for size of door closer depending on size of door, stack pressure conditions, exposure to weather, and anticipated frequency of use. Closers shall have adjustable spring power, full rack and pinion, independent closing speed and latch regulating V-slotted valves, fully hydraulic with a high strength cast iron cylinder and solid forged steel arms, bore diameter of 1-1/2”, pinion shaft diameter of 5/8”, adjustable back check, cushion and built-in stop feature where scheduled, hold open arms where scheduled, delayed action where scheduled, arm finish to match closer cover finish scheduled. Provide metal covers of clean line design with plated or primed for paint finish as scheduled and that require removal in order to make adjustments to closer.

1. 4111/4011; LCN Closers (LCN).

2. 4041: LCN Closers (LCN).

3. 2030 series concealed in aluminum storefront; LCN Closers (LCN).

2.09 PROTECTIVE TRIM UNITS

A. Kick and Armor Plates: Fabricate protection plates from minimum 0.050 inch (1.3 mm) thick stainless steel, beveled top and 2 sides (B3E), square corners, complying with BHMA A156.6, and fastened with oval head Phillips fasteners countersunk into plate surface.

1. Series 8400; Ives: H. B. Ives (IVS).

2. K1050 Doorplate Series; Rockwood Manufacturing Company (RM).

3. KA050-2 Armor Plate and KOO50 for Kickplates; Triangle Brass Manufacturing Company, Inc. (TBM).

B. Size: Furnish kick and armor plates sized 2 inches (51 mm) less than door width. Furnish kickplates in 12 inches (305 mm) heights, furnish armor plates in 48 inches (1219 mm) heights unless otherwise indicated. Provide protective plates with cutouts for locks, louvers and windows to the extent indicated. Mount protective plates flush with bottom of door.

2.10 STOPS AND HOLDERS

A. Concealed Overhead Door Holders: Heavy duty, concealed mounting, full mortised, bronze bodied, slide track design, with heavy shock absorber spring providing 5 to 7 degree compression before deadstop, non-metal slide and shock blocks, 110 degree maximum opening, complying with BHMA A156.8 Type C11511 for hold open and Type C11541 for stop function. Provide stop, or hold open, functions as scheduled.

1. 1000 Series; Architectural Builders Hardware Mfg., Inc. (ABH).

2. 100 Series; Glynn-Johnson (GJ).

3. Checkmate Heavy Duty 1 Series; Rixson-Firemark, Inc. (RIX).

B. Exposed Overhead Door Holders: Heavy duty, surface mounted, bronze bodied, slide track design, with heavy shock absorber spring providing 5 to 7 degree compression before deadstop, non-metal slide and shock blocks, 110 degree maximum opening, complying with BHMA A156.8 Type C12511 for hold open and Type C12541 for stop function. Provide stop, or hold open, functions as scheduled.

1. 9000 Series; Architectural Builders Hardware Mfg., Inc. (ABH).

2. 90 Series; Glynn-Johnson (GJ).

3. Checkmate Heavy Duty 9 Series; Rixson-Firemark, Inc. (RIX).

C. Silencers for Metal Door Frames: BHMA A156.16, Type L03011; grey rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame, specifically designed to form an air pocket to absorb shock and reduce noise of door closing. Provide 2 silencers for each pair of doors, 3 silencers for each single door.

1. 8S; Door Controls International (DCI).

2. SR64; H. B. Ives (IVS).

3. 1229A; Triangle Brass Manufacturing Company, Inc. (TBM).

4. 608; Rockwood Manufacturing Company (RM).

D. Wall Stops: Cast disc type with concave rubber bumper, having a 2-1/2 inch (63.5 mm) diameter base with nominal 1 inch (25 mm) projection and concealed attachment to substrate.

1. For Attachment to Gypsum Wallboard: Complying with BHMA A156.16, Type L12251 or L12101.

a. WS402CCV, WS407CVX; H.B. Ives (IVS).

b. 1274CCS; Triangle Brass Manufacturing Company, Inc. (TBM).

2.11 DOOR GASKETING

A. Smoke Gasket:

Self adhesive flexible silicone type, continuous gaskets for installation at all heads and jambs of doors:

1. 5050C; National Guard Products, Inc. (NGP).

2. S88BL; Pemko Manufacturing Co., Inc. (PEM).

3. 188BK; Zero International, Inc. (ZRO).Types

B. Perimeter Gasket:

Rigid jamb weatherstrip seals gaps to reduct sound infiltration, continuous gaskets for installation at all heads and jambs of door.

1. 303_S (PG) Standard Perimeter Gasketing; Pemko Manufacturing Co., Inc. (PEM).

2.12 FABRICATION

A. Manufacturer's Nameplate: Provide each door hardware item without exposed manufacturers labels, names, or designs.

B. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturer’s specified fastener for each application intended. Provide Phillips oval-head screws with finished heads to match surface of door hardware item being attached. Machine screws and expansion shields shall be used for attaching hardware to concrete and masonry. Use through-bolts for renovation work only where existing door blocking and reinforcements are unknown.

1. Concealed Fasteners: All new doors and door frames have been specified with adequate blocking and reinforcement provisions to eliminate exposed through-bolting of hardware items. Doors installed with exposed through-bolts will be rejected and replaced by the Contractor at no cost to the Owner. Where through bolts are used on existing doors provide sleeves for each through bolt.

2.13 FINISHES

A. Standard: Comply with BHMA A156.18.

B. Appearance of Finished Work: Finishes of the same designation, that come from 2 or more sources, shall match when the items are viewed at arm's length and approximately 2' apart. Unless otherwise scheduled, match each hardware item in a single hardware set with the scheduled latch or lock set finish. Painting of BHMA 600 (USP) surfaces is required and is specified under Section 09 90 00 "Paint."

C. Designations: The abbreviations used to schedule hardware finishes are generally BHMA (Federal Standards where indicated in parenthesis) designations. Comply with base material and finish requirements indicated by the following:

1. BHMA 600 (USP): Primed for painting.

2. BHMA 626 (US26D): Satin chromium plated.

3. BHMA 628 (US28): Satin aluminum, clear anodized.

4. BHMA 630 (US32D): Satin stainless steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mounting Heights: Mount door hardware units at the following heights, unless specifically indicated on the drawings or required to comply with governing regulations:

1. Locks and Latches: 38 inches to center of lever from finish floor.

2. Door Pulls: 34 inches from finish floor to center of grip. Pull bases centered on door stiles, unless otherwise indicated.

3. Door Pulls: Pull bases centered on top and bottom door rails and spaced from lock edge of door stile as indicated, or recommended, by the pull manufacturer.

4. Push Plates: 40 inches from finish floor to center of plate. Coordinate with pull location.

5. Butt Hinges: 10 inches to bottom of lowest hinge from finish floor; 5 inches to top of upper hinge from top of door; space intermediate hinges equally between lower and upper hinges.

6. Deadbolts: Not more than 44 inches from finish floor to operating trim.

B. Install each door hardware item to comply with manufacturer's written instructions. Install overhead surface closers for maximum degree of opening obtainable. Place on room side of corridor doors, stair side of stair doors, secondary corridor side of doors between corridors. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be finished, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Section 09 90 00 "Paint". Do

not install surface-mounted items until finishes have been completed on substrates involved.

C. Do not install permanent key cylinders in locks until the time of preliminary acceptance by the Owner. At the time of preliminary acceptance, and in the presence of the Owner's representative, permanent key all lock cylinders. Record and file all keys in the key control system specified, and turn system over to Owner for sole possession and control.

D. Thresholds: Thresholds shall be secured with a minimum of 3 fasteners per single door width and 6 fasteners per double door width with a maximum spacing of 12 inches. Minimum screw size shall be No. 10 length, dependent on job conditions, with a minimum of 3/4 inch thread engagement into the floor or anchoring device used. Screw heads to be countersunk and flush with face of threshold. Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 07 09 00 "Joint Sealants".

3.02 ADJUSTING

A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every hardware component. Replace hardware components that cannot be adjusted to operate as intended.

3.03 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation. Clean hardware components as necessary to restore proper finish. Provide protection during the progress of the work and maintain conditions that ensure door hardware is in perfect working order and without damage or deterioration at time of Substantial Completion.

3.04 DOOR HARDWARE SCHEDULE – SCHEDULED DOORS

A. Door Hardware Schedule follows at end of this Section.

DOOR HARDWARE

The Owner is seeking best bid on items specified. Any questions or concerns regarding the items or equals specified must be brought to the attention of the Owner’s Representative before bid submittal. Owner will make all final decisions regarding the products to be used. If, after bid acceptance, Contractor presents hardware items that are not named equals, there may be a charge to the Contractor for evaluation of those products.

Hinge quantity will vary with size of door; follow manufacturer’s recommendations. Hinges on all Exterior Doors to be nonferrous stainless-steel material and have non-removable pins.

All cylinders to be full-faced interchangeable core cylinders with square shouldered (not tapered) compression rings, 6 pin, standard threaded, keyed into the Owner’s standard, with cams to suit lock functions. Provide cylinders for installation into all locks.

HARDWARE GROUPS

GROUP #1

1 1/2 Pair Hinges	BB1279	Hager
1 Lockset	F07 (storage function)	Schlage
1 Cylinder	to match system	Best
1 Closer	4041	LCN
1 Kickplate	K1050 12” bevel 4 sides	Rockwood
1 Overhead Stop	90 Series	GJ
1 Smoke Gasket	S88BL	Pemko
3 Mutes	SR64	Ives

GROUP #2

1 1/2 Pair Hinges	BB1279	Hager
1 Lockset	F01 (passage function)	Schlage
1 Cylinder	to match system	Best
1 Closer	4041	LCN
1 Kickplate	K1050 12” bevel 4 sides	Rockwood
1 Overhead Stop	90 Series	GJ
1 Smoke Gasket	S88BL	Pemko
3 Mutes	SR64	Ives

GROUP #3

1 1/2 Pair Hinges (each leaf)	BB1279	Hager
1 Lockset (right leaf)	F20 (entrance function)	Schlage
1 Wall Stop (each leaf)	WS407CVX	Ives
1 Set of Flush Bolts (left leaf)	FB51P	Ives
1 Dustproof Strike (left leaf)	DP2	Ives
1 Astragals (right leaf)	305CN	Pemko
3 Mutes (each leaf)	SR64	Ives

GROUP #4

1 1/2 Pair Hinges (each leaf)	BB1279	Hager
1 Lockset (right leaf)	F20 (entrance function)	Schlage
1 Overhead Stop (each leaf)	90 Series	GJ
1 Set of Flush Bolts (left leaf)	FB51P	Ives
1 Dustproof Strike (left leaf)	DP2	Ives
1 Astragals (right leaf)	305CN	Pemko
3 Mutes (each leaf)	SR64	Ives

GROUP #5

1 1/2 Pair Hinges (each leaf)	BB1279	Hager
1 Lockset (right leaf)	F20 (entrance function)	Schlage
1 Overhead Stop (each leaf)	90 Series	GJ
1 Closer (each leaf)	4041	LCN
1 Kickplate (each leaf)	K1050 12” bevel 4 sides	Rockwood
1 Astragals (right leaf)	305CN	Pemko
1 Smoke Gasket	S88BL	Pemko
1 Threshold	14/1A	Pemko
3 Mutes (each leaf)	SR64	Ives

GROUP #6

1 1/2 Pair Hinges (each leaf)	BB1279	Hager
1 Lockset (right leaf)	F20 (entrance function)	Schlage
1 Wall Stop (each leaf)	WS407CVX	Ives
1 Closer (each leaf)	4041	LCN

1 Kickplate (each leaf)	K1050 12” bevel 4 sides	Rockwood
1 Astragals (right leaf)	305CN	Pemko
1 Smoke Gasket	S88BL	Pemko
1 Threshold	14/1A	Pemko
3 Mutes (each leaf)	SR64	Ives

GROUP #7

1 1/2 Pair Hinges	BB1279	Hager
1 Lockset	F01 (passage function)	Schlage
1 Cylinder	to match system	Best
1 Wall Stop	WS407CVX	Ives

GROUP #8

1 1/2 Pair Hinges	BB1279	Hager
1 Lockset	F20 (entrance function)	Schlage
1 Overhead Stop	90 Series	GJ
1 Closer	4041	LCN
1 Kickplate	K1050 12” bevel 4 sides	Rockwood
1 Perimeter Gasket	303AS	Pemko
1 Drip Cap	346C	Pemko
1 Threshold	14/1A	Pemko
1 Latch Guard	321	Rockwood
3 Mutes	SR64	Ives

GROUP #9

1 1/2 Pair Hinges	BB1279	Hager
1 Lockset	F07 (storage function)	Schlage
1 Cylinder	to match system	Best
1 Wall Stop	WS407CVX	Ives

GROUP #10

1 1/2 Pair Hinges	BB1279	Hager
1 Lockset	F01 (passage function)	Schlage
1 Cylinder	to match system	Best
1 Overhead Stop	90 Series	GJ
1 Closer	4041	LCN
1 Kickplate	K1050 12” bevel 4 sides	Rockwood
1 Smoke Gasket	S88BL	Pemko
3 Mutes	SR64	Ives

GROUP #11

1 1/2 Pair Hinges	BB1279	Hager
1 Lockset	F07 (storage function)	Schlage
1 Overhead Stop	90 Series	GJ
1 Closer	4041	LCN
1 Kickplate	K1050 12” bevel 4 sides	Rockwood
1 Perimeter Gasket	303AS	Pemko
1 Drip Cap	346C	Pemko
1 Threshold	14/1A	Pemko
1 Latch Guard	321	Rockwood
3 Mutes	SR64	Ives

GROUP #12

1 1/2 Pair Hinges	BB1279	Hager
1 Lockset	F07 (storage function)	Schlage
1 Cylinder	to match system	Best
1 Closer	4041	LCN

1 Kickplate	K1050 12” bevel 4 sides	Rockwood
1 Wall Stop	WS407CVX	Ives
1 Smoke Gasket	S88BL	Pemko
3 Mutes	SR64	Ives

GROUP #13

1 1/2 Pair Hinges	BB1279	Hager
1 Lockset	F01 (passage function)	Schlage
1 Cylinder	to match system	Best
1 Closer	4041	LCN
1 Kickplate	K1050 12” bevel 4 sides	Rockwood
1 Wall Stop	WS407CVX	Ives
1 Smoke Gasket	S88BL	Pemko
3 Mutes	SR64	Ives

GROUP #14

1 1/2 Pair Hinges	BB1279	Hager
1 Lockset	F02 (privacy) W “Occupied” indicator	Schlage
1 Cylinder	to match system	Best
1 Wall Stop	WS407CVX	Ives

GROUP #15

1 1/2 Pair Hinges	BB1279	Hager
1 Lockset	F04 (office function)	Schlage
1 Cylinder	to match system	Best
1 Wall Stop	WS407CVX	Ives

GROUP #16

1 1/2 Pair Hinges (each leaf)	BB1279	Hager
1 Lockset (right leaf)	F01 (passage function)	Schlage
1 Wall Stop	WS407CVX	Ives
1 Closer (right leaf)	4041	LCN
1 Set of Flush Bolts (left leaf)	FB51P	Ives
1 Dustproof Strike (left leaf)	DP2	Ives
3 Mutes (each leaf)	SR64	Ives

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies glass, related glazing materials and accessories. Glazing products specified apply to factory or field glazed items.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 LABELS

A. Temporary Labels:

1. Provide temporary label on each light of glass identifying manufacturer or brand and glass type, quality and nominal thickness.

2. Label in accordance with NFRC (National Fenestration Rating Council) label requirements.

3. Temporary labels shall remain intact until glass is approved by the Owner.

4. Permanent labels:

a. Locate in corner for each pane.

b. Label in accordance with ANSI Z97.1:

1) Tempered glass

2) Organic coated glass

1.04 PERFORMANCE REQUIREMENTS

A. Glass Thickness:

1. Select thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7 and the CBC

2. Test in accordance with ASTM E 1300

3. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers

1.05 SUBMITTALS

A. Manufacturer’s Certificates:

1. Certificate on shading coefficient

2. Certificate on “R” value when value is specified

B. Warranty: Submit written guaranty, conforming to General Condition requirements, and to “Warranty of Construction” Article in this Section.

C. Manufacturer’s Literature and Data:

1. Glass, each kind required

2. Insulating glass units

3. Glazing cushion

4. Sealing compound

D. Samples:

1. Size: 6 inches by 6 inches

2. Tempered Low-E glass

3. Insulated glass

E. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer’s test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.

B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.

C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.

1.07 PROJECT CONDITIONS

A. Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field measured products.

1.08 WARRANTY

A. Warranty: Conform to terms of "Warranty of Construction"

1. Insulating glass units to remain sealed for 10 years.

1.09 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extend referenced. Publications are referenced in text by basic designation only.

B. American Society for Testing and Materials (ASTM):

C794-10 Adhesion-in-Peel of Elastomeric Joint Sealants

C864-05 Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

C920-11 Elastomeric Joint Sealants

C964-07 Standard Guide for Lock-Strip Gasket Glazing

C1036-06 Flat Glass

C1048-12 Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass

C1376-10 Pyrolytic and Vacuum Deposition Coatings on Flat Glass

E84-10 Surface Burning Characteristics of Building Materials

E119-10 Standard Test Methods for Fire Test of Building Construction and Material

E413-16 Classification for Rating Sound Insulation

E2190-10 Insulating Glass Unit

C. Code of Federal Regulations (CFR):

16 CFR 1201 Safety Standard for Architectural Glazing Materials; 2010

D. National Fenestration Rating Council (NFRC)

E. Glass Association of North America (GANA):

1. Glass Manual (Latest Addition)

2. Sealant Manual (2009)

F. American Society of Civil Engineers (ASCE):

ASCE 7-16 Wind Load Provisions

PART 2 PRODUCTS

2.01 GL1: INTERIOR HEAT-TREATED TEMPERED GLASS

A. 1–3/16” Laminated Insulating Acoustical Unit

1. ASTM C1048, Kind FT, Type I, Class 1, Quality q3

2. Thickness, 6 mm (1/4 inch), color, Low E coated, tempered

3. Air space, 13.2 mm (1/2 inch)

4. Thickness, 4.7 mm (3/16 inch), tempered

5. 1.5 mm (0.060 inch) clear thick interlayer PVB

6. Thickness, 4.7 mm (3/16 inch), tempered

B. Performance: STC 42, Estimated OITC 35, VT 0.46,

2.02 GL2: INSULATED TEMPERED GLASS - EXTERIOR

A. Low-E Insulated Tempered Glass:

1. ASTM C1048, Kind FT, Type I, Class 1, Quality q3 with low emissivity pyrolytic coating having an E of 0.15

2. 1-inch insulated unit with exterior pane of (1/4 inch) Viracon tempered clear VE 13-45 glass and interior pane of 6mm (1/4 inch) clear tempered glass with 13.2 mm (1/2 inch) air space

2.03 GL3: TRANSLUCENT KALWALL GLAZING PANEL

Refer to Section 08 45 23

2.04 GL4: 3/4 HOUR FIRE PROTECTION RATED GLASS

A. 1–3/16" Laminated Insulating Acoustical Unit

1. ASTM C1048, Kind FT, Type I, Class 1, Quality q3

2. Thickness, 6 mm (1/4 inch), color, Low E coated, tempered

3. Air space, 13.2 mm (1/2 inch)

4. Thickness, 4.7 mm (3/16 inch), tempered

5. 1.5 mm (0.060 inch) clear thick interlayer PVB

6. Thickness, 4.7 mm (3/16 inch), tempered

B. Performance: STC 42, Estimated OITC 35, VT 0.46,

2.05 GLAZING ACCESSORIES

A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal accessories exposed in the finished work shall have a finish that will not corrode or stain while in service.

B. Setting Blocks: ASTM C864:

1. Channel shape; having 1/4 inch internal depth

2. Shore a hardness of 80 to 90 Durometer

3. Block lengths: two inches except four to six inches for insulating glass

4. Block width: Approximately 1/16 inch less than the full width of the rabbet

5. Block thickness: Minimum 3/16 inch, sized for rabbet depth, as required

C. Spacers: ASTM C864:

1. Channel shape having a 1/4 inch internal depth

2. Flanges not less 3/32 inch thick and web 1/8 inch thick

3. Lengths: One to one to three inches

4. Shore a hardness of 40 to 50 Durometer

D. Sealing Tapes:

1. Semi-solid polymeric based material exhibiting pressure sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.

2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.

E. Glazing Gaskets : ASTM C864:

1. Soft, closed-cell with locking key for sash key

2. Flanges may terminate above the glazing beads or terminate flush with top of beads.

F. Glazing Sealants: ASTM C920, silicone neutral cure:

1. Type S

2. Class 25

3. Grade NS

4. Shore A hardness of 25 to 30 Durometer

G. Color:

1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames shall match color of the finished aluminum and be non-staining.

2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted shall be black.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:

1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.

2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer's approved shop drawings.

B. Advise Contractor of conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation: Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. For sealant glazing, prepare glazing surfaces in accordance with GANA-02 Sealant Manual.

B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.

C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.

D. Verify that components used are compatible.

E. Clean and dry glazing surfaces.

F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

3.03 INSTALLATION – GENERAL

A. Install in accordance with GANA-01 Glazing Manual and GANA-02 Sealant Manual unless specified otherwise.

B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.

C. Set glazing without bending, twisting, or forcing of units.

D. Do not allow glass to rest on or contact any framing member.

E. Glaze doors and operable sash, in a securely-fixed or closed-and-locked position, until sealant, glazing compound, or putty has thoroughly set.

F. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.

G. Insulating Glass Units:

1. Glaze in compliance with glass manufacturer's written instructions.

2. When glazing gaskets are used, they shall be of sufficient size and depth to cover glass seal or metal channel frame completely.

3. Do not use putty or glazing compounds.

4. Do not grind, nip, cut, or otherwise alter edges and corners of fused glass units after shipping from factory.

3.04 REPLACEMENT AND CLEANING

A. Clean new glass surfaces removing temporary labels, paint spots, and defacement.

B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.

C. Leave glass, putty, and other setting material in clean, whole, and acceptable condition.

3.05 PROTECTION

A. Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

3.06 GLAZING SCHEDULE

A. Tempered Glass:

1. Install in full and half glazed doors unless indicated otherwise.

2. Use clear, tempered glass on interior side lights and doors unless otherwise indicated or specified.

B. Tempered Glass Low E Glass:

1. Install Sealed Edge Unit (SEU) Low-E tempered in exterior pane of dual glazed storefronts.

END OF SECTION

DIVISION 3 – CONCRETE

03 30 00	Cast-In-Place Concrete	Clear Seal

DIVISION 4 – MASONRY

Not Used

DIVISION 5 – METALS

05 36 00	Metal Decking	
	Exposed Deck	PT-3
05 50 00	Structural and Miscellaneous Metal	
	Exposed Framing Connectors:	PT-3
	Steel Framing:	PT-3
	Exterior Guard Bollards:	PT-7
	Interior Counter Supports:	Powder Coat @ Toilet Rooms, PT-1
	Interior Guard Rails:	PT-6
	Elevator Pit Ladder	PT-8
05 51 00	Metal Stairs	
	Stringers	PT-6
	Risers	PT-6
	Guards and Rails	PT-6

DIVISION 6 – WOOD AND PLASTIC

06 40 23	Interior Architectural Millwork	
	Cabinetwork	
	Faces:	Natural Select Cherry, whitewashed
	Locks:	626 Brushed Chrome
	Pulls:	626 Brushed Chrome
	Countertop: (Toilet Room)	Solid Surface, Corian, Limestone Prima
	Countertop: (Breakroom)	Solid Surface, Corian, Domino Terrazzo
	Window Sills	Solids Surface, Corian, Everest

DIVISION 7 – THERMAL MOISTURE PROTECTION

07 40 00	Siding Panels	
	Metal Panel (MP-1)	
	Panel Thickness:	
	Orientation:	Horizontal
	Appearance:	Wood Grain; Non-embossed
	Reveal Width:	1/4"
	Reveal Spacing:	6” o.c
	Gloss Index:	(20-35)
	Color Extension	Suddle Tan
	Color Interior	Igloo White
	Metal Panel (MP-2)	
	Panel Thickness:	
	Orientation:	Horizontal

	Appearance:	MBCI 7.2 Insul-Rid; Non-embossed
	Reveal Width:	1/2"
	Reveal Spacing:	2” o.c
	Gloss Index:	(20-35)
	Color Extension	Midnight Bronze
	Color Interior	Igloo White

07 62 00 Sheet Metal Flashing and Trims

Coping:	Custom: Per Architect Selection, match MP-2
Gutters:	Custom: Per Architect Selection, match MP-2
Downspouts:	Custom: Per Architect Selection, match MP-2
Exterior Exposed Trim:	Custom: Per Architect Selection, match adjacent materials
Flashing and Counter Flashing	Mill

07 90 00 Joint Sealants

Color:	To match adjacent surfaces per Architect selection

DIVISION 8 – DOORS AND WINDOWS

08 11 13 Hollow Metal Door Frames

Paint:	Per Architect Selection (09 90 00)

08 14 00 Wood Doors and Frame

Interior Flush:	MarshField, Plain Sliced Cherry, MISF 54-02

08 31 13 Access Doors and Frames — Paint to match adjacent surfaces

08 41 13 Aluminum-Framed Storefronts

Framing Color:	Anodized Aluminum, clear

08 45 23 Insulated Translucent Fiberglass Sandwich Panel Wall System

Aluminum Framing	Bone white #21B
Facing Sheets	Crystal/White

08 71 00 Door Hardware

Locksets:	US26D, Brushed Chrome
Closers:	US10
Butts:	US10, Stainless steel
Exit Devices:	US10
Weather-stripping	Aluminum, clear

08 80 00 Glazing

GL1: Interior Tempered	Color: Viracon Green
GL2: Exterior Insulated Tempered	Color: Viracon VEI-45
GL3: Kalwall Window	Color: Crystal/White
GL4: 3/4 Hour Rated Glass	Color: Viracon Green

DIVISION 9 – FINISHES

09 30 13 Porcelain Tile

CT1 (wall):	Daltile, Color Wheel Collection, Linear, 0790, Matte Artic White Light Polished, 4” x 12”
CT2 (floor):	Daltile, Power Grey, RV90, Matte, 12” x 24”
CT3 (drinking fountain)	Daltile, Color Wheel Collection – Linear, Matte Arctic White 0790, 2-1/8” X 8-9/16”
CT4 (backsplash)	Daltile,Color Wheel Collection, Herring bone, 0790, Matte Artic White, 1”x3”
GRT1:	Per Architect’s selection
GRT2:	Per Architect’s selection

09 51 00 Acoustical Ceilings

ACT1:	Armstrong Cirrus Angled, Tegular, 24" x 24" x 7/8" Color: White finish. NCR 0.70
ACT2:	Vinyl covered gypsum panels, 24" x 24" x 1/2" square edge. USG or Capaul. Color: White Stipple. NCR 0.55
Type1: Exposed Grid	Color: Standard White

09 65 00 Resilient Base and Accessories

VCT1	Armstrong, LUXE, Plank, A6716
Stair Landings	Nora Rubber Flooring, Norament xp, 5110 Ara
Nora Cold Weld:	5110
RB1 (base):	Burke, 3M, 217 Charcoal, 6” high

09 68 13 Carpet Tile

CPT1 Office Area (Dark Gray) From Darker to Lighter Colors

a. Interface, Collection: Walk the Plank, Style # 126440AK00, Size: 25cmx1m, Color: Hickory_20%
b. Interface, Collection: Walk the Plank, Style # 126440AK00, Size: 25cmx1m, Color: Cyprus_40%
c. Interface, Collection: Walk the Plank, Style # 126440AK00, Size: 25cmx1m, Color: Ash_40%

CPT2 Main Office Area (Blue) From Light Gray to Dark Blue

a. Interface, HN820, Collection: Human Nature, Style # 124980SK0H, Size: 25cmx1m, Color: Limestone_30%
b. Interface, Collection: Reclaim, Style # 127530AK00, Size: 25cmx1m, Color: Antique Gray_30%
c. Interface, Collection: Reclaim, Style # 127530AK00, Size: 25cmx1m, Color: Weathered Blue_40%

09 90 00 Painting

PT-1 - Interior	Dunn Edwards, DEW341, Swiss Coffee
PT-2 - Interior (Accent)	Dunn Edwards, DEW136, Beautiful Blue
PT-3 - Exposed Structure	Dunn Edwards, DEW367, Touch of Mint
PT-4 - Interior Doors	Dunn Edwards, DEW393, Violet Clues

PT-5 - Interior Door Frames	Dunn Edwards, DEW387, Coffee Ball
PT-6 - Interior Rails	Dunn Edwards, DEW342, Baby's Breath
PT-7 - Exterior Bollards	Dunn Edwards, DEW5396, Fuzzy Duckling
PT-8 – Exterior Doors	Dunn Edwards, DEW630, Renwick Brown
PT-9 – Exterior Door Frames	Dunn Edwards, DEW630, Renwick Brown

DIVISION 10 – SPECIALTIES

10 14 00 Signage

Interior Signage:

Background Color:	Beige
Text Color:	White

Exterior Signage:

Building Address:	Anodized Aluminum, black
Site Signs:	Per ADA, CBC and Transportation Standards

10 26 00 Wall Protection

Corner Guard	Stainless Steel, Stain Finish

10 28 00 Toilet Accessories

Accessories:	No. 4 Stainless Steel Satin Finish
Grab Bars:	Stainless Steel
Mirror:	Stainless Steel Framing

10 44 00 Fire Extinguisher Cabinets

Finish:	Larsen, Architectural Series, Solid Door with vertical engraved letters, #8 Stainless Steel

DIVISION 12 – FURNISHING

12 24 00 Blinds	Alustra Folio, Cafe

DIVISION 13 – SPECIAL CONSTRUCTION

13 34 19 Metal Building Systems

Roof Panel:	Panel Profile: 16" Loc Seam, 24ga. Coating: Smartkote PVDF Color: Warm White
Insulation System and Straps	Color: Silver Aspen

DIVISION 14 – CONVEYING EQUIPMENT

14 24 00 Elevator

Flooring:	Armstrong, Luxe, A6746
Wall Panel:	Plastic Laminate Color, Wood Grained
Reveals:	20 ga, match frame finish
Base:	6" high stainless steel, #4 satin
Handrail:	1 1/2" diameter stainless steel, #4 satin, with end caps, 3 sides

Ceiling:	Nine (9) painted panels per Architect selection with center light
Lighting:	LED in each panel
Doors:	Stainless steel
Jamb	Stainless steel

GENERAL NOTES – Schedule for Finishes:

A. See Architectural Finishes Schedule, specifications and interior elevations for additional finishes information.
B. Paint exposed interior columns, beams and purlins of metal building PT3.
C. Paint exposed soffits and gypsum board ceilings PT1.
D. Miscellaneous metals to be painted per Architect selection.
E. Paint electrical and communications equipment rooms prior to and after installation of equipment, PT1.
F. Paint exposed electrical and communications equipment, piping, conduit, duct and other equipment. Paint all exposed metals, conduits and other parts for finished appearance.
G. Prepare backing and install Owner supplied fixtures, equipment and furniture.
H. Paint interior guardrails, PT6.
I. Paint exterior bollards, PT7.
J. Paint exposed exterior structural steel, PT3.
K. Paint hollow metal door frames, high gloss, PT4.
L. Paint remaining hollow metal door frames per architect's selection (PT8, PT9).

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies steel studs wall systems, ceiling or soffit suspended or furred framing, wall furring, fasteners, and accessories for the screw attachment of gypsum board, plaster bases or other building boards.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 TERMINOLOGY

A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.

B. Underside of Structure Overhead: The underside of structure overhead shall be the underside of the roof/floor construction supported by beams.

C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Manufacturer's Literature and Data:

1. Studs, runners and accessories.

2. Furring channels.

3. Screws, clips and other fasteners.

C. Shop Drawings:

1. Typical ceiling suspension system.

2. Typical metal stud and furring construction system including details around openings, access panels and corner details.

3. Typical support for external attachments

1.05 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

A. In accordance with the requirements of ASTM C754.

1.06 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society For Testing And Materials (ASTM)

A123-09.....Zinc (Hot-dip Galvanized) Coatings on Iron and Steel Products

A653/A653M-09 .....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

A641-09.....Zinc-Coated (Galvanized) Carbon Steel Wire

C11-10 .....Terminology Relating to Gypsum and Related Building Materials and Systems

C645-09 .....Non-Structural Steel Framing Members

C754-09 .....Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

C841-03 (R2008) .....Installation of Interior Lathing and Furring

C954-07 .....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

E580-09.....Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint.

PART 2 PRODUCTS

2.01 PROTECTIVE COATING

A. Galvanize steel studs, runners (track), rigid (hat section) furring channels, "Z" shaped furring channels, and resilient furring channels, with coating designation of G-60, per ASTM A123.

2.02 STEEL STUDS AND RUNNERS (TRACK)

A. ASTM C645, modified for thickness specified and sizes as shown.

1. Use ASTM A653 steel, 0.8 mm (0.0329 inch) thick bare metal (33 mil).

2. Runners same thickness as studs.

B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24 inch) centers.

C. Doubled studs for openings as shown.

D. Studs 3600 mm (12 feet) or less in length shall be in one piece.

2.03 FURRING CHANNELS

A. Rigid furring channels (hat shape): ASTM C645.

B. Resilient furring channels:

1. Not less than 0.45 mm (0.0179 inch) thick bare metal.

2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens fastener surface but shall not contact anchorage surface other channel leg is attached to.

C. "Z" Furring Channels:

1. Not less than 0.45 mm (0.0179 inch) thick bare metal, with 32 mm (1-1/4 inch) and 19 mm (3/4 inch) flanges.

2. Web furring depth to suit thickness of insulation with slotted perforations.

D. Rolled Steel Channels: ASTM C754, cold rolled; or, ASTM C841, cold rolled.

2.04 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

A. ASTM C754, except as otherwise specified.

B. Fasteners for steel studs thicker than 0.84 mm (0.033 inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.

C. Clips: ASTM C841 (paragraph 6.11), manufacturer's standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.

D. Concrete ceiling hanger inserts (anchorage for hanger wire and hanger straps): Steel, zinc-coated (galvanized), manufacturers standard items, designed to support twice the hanger loads imposed and the type of hanger used.

E. Tie Wire and Hanger Wire:

1. ASTM A641, soft temper, Class 1 coating.

2. Gage (diameter) as specified in ASTM C754 or ASTM C841.

F. Attachments for Wall Furring:

1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.

2. For concrete walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396 inch) thick galvanized steel with corrugated edges.

PART 3 EXECUTION

3.01 INSTALLING STUDS

A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.

B. Space studs not more than 610 mm (24 inches) on center.

C. Cut studs 6 mm to 9 mm (1/4 to 3/8 inch) less than floor to underside of structure overhead when extended to underside of structure overhead.

D. Where studs are shown to terminate above suspended ceilings, extend studs to underside of structure overhead.

E. Extend studs to underside of structure overhead.

F. Frame jambs of openings as shown.

G. Fasten studs as shown.

H. Form building expansion joints as shown.

3.02 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY

A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.

B. Wall furring-Stud System:

1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.

2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.

3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.

C. Direct attachment to concrete; rigid channels or "Z" channels:

1. Install rigid (hat section) furring channels at 600 mm (24 inches) on center, horizontally or vertically.

2. Install "Z" furring channels vertically spaced not more than 600 mm (24 inches) on center.

3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.

4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).

5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.

6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.

D. Installing Wall Furring-Bracket System: Space furring channels not more than 400 mm (16 inches) on center.

3.03 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES

A. Provide for attachment and support of electrical outlets, plumbing, heating fixtures, access panel frames, wall bumpers, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.

B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs. Including locations for future County supplied and installed accessories and equipment such as; toilet accessories, caulk boards, projection screens and similar.

3.04 INSTALLING FURRED AND SUSPENDED CEILINGS OR SOFFITS

A. Install furred and suspended ceilings or soffits in accordance with ASTM C754 or ASTM C841 except as otherwise specified or shown for screw attached gypsum board ceilings and for plaster ceilings or soffits.

1. Space framing at 600 mm (24 inch) centers for gypsum board anchorage.

B. Use clips, bolts, or wire ties for direct attachment to steel framing.

C. Existing concrete construction exposed:

1. Use power actuated fasteners either eye pin, threaded studs or drive pins for type of hanger attachment required.

2. Install fasteners at approximate mid height of concrete beams or joists. Do not install in bottom of beams or joists.

D. Do not fasten to steel decking.

E. Construct and install ceiling bracing system as shown and in accordance with ASTM E580.

3.05 TOLERANCES

A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8 inch) from the layout line.

B. Plumb and align vertical members within 3 mm (1/8 inch.)

C. Level or align ceilings within 3 mm (1/8 inch.)

- - - E N D - - -

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Provide gypsum board systems including gypsum board, joint treatment, acoustical accessories, and general accessories for complete installation.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Furnish manufacturer's literature for gypsum board, insulation, and acoustical accessories.

C. Manufacturer’s Certification: Furnish manufacturer's certification indicating products comply with Contract Documents and applicable codes.

1.04 PROJECT CONDITIONS

A. Do not begin installation of interior gypsum board until space is enclosed, space is not exposed to other sources of water, and space is free of standing water.

B. Maintain areas to receive gypsum board at minimum 50 degrees F for 48 hours prior to application and continuously after application until drying of joint compound is complete; comply with ASTM C840.

C. Immediately remove from site gypsum board for interior use exposed to water, including gypsum board with water stains, with signs of mold, and gypsum board with mildew.

1.05 MOCK-UP

A. Knock-down and swirl texture finishes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. National Gypsum Co.

B. Georgia-Pacific Corp.

C. United States Gypsum Co., USG Corp.

2.02 PERFORMANCE REQUIREMENTS

A. General: Perform gypsum board work in accordance with ASTM C840 unless otherwise specified.

2.03 MATERIALS

A. Exterior Gypsum Board:

1. ASTM C1177/ C1177M, water-resistant core, 16 mm (5/8 inch) thick.

B. Gypsum Board: Comply with ASTM C840; maximum permissible lengths; ends square cut, tapered edges on boards to be finished.

1. Typical: ASTM C1396, Type X, fire rated gypsum board, unless otherwise indicated.

2. Tile Substrates: Cementitious backer units specified in Section 09 30 13 - Tiling.

C. Gypsum Board Accessories: Comply with ASTM C840.

1. Provide protective coated steel corner beads and edge trim; type designed to be concealed in finished construction by tape and joint compound.

2. Corner Beads: Manufacturer's standard metal beads.

3. Edge Trim: “J”, "L", "LK", or "LC" casing beads.

4. Reinforcing Tape, Joint Compound, Adhesive, Water, Fasteners: Types recommended by system manufacturer and conforming to ASTM C475.

a. Typical Joint Compound: Chemical hardening type for bedding and filling, ready-mixed or powder vinyl type for topping.

5. Control Joints: Back to back casing beads.

a. Back control joints with 4 mil thick polyethylene air seal.

D. Acoustical Accessories:

1. Acoustical Sealant: ASTM C919, type recommended for use in conjunction with gypsum board. Paintable, non-shrinking and non-cracking where exposed, non-drying, non-skinning, non-staining, and non-bleeding where concealed. Provide as required for acoustical ratings and at non-fire-rated partitions to seal edges of gypsum board.

2. Electrical Box Pads: Provide at outlet, switch and telephone boxes in walls with acoustical insulation.

a. Manufacturers for Non-Fire Rated Partitions:

1) Harry A. Lowry & Associates (800.772.2521)/Lowry's Electrical Box Pads.

2) Tremco Sheet Caulking (650.572.1656).

PART 3 EXECUTION

3.01 INSTALLATION

A. Openings: Obtain dimensions and locations from other trades and provide openings and enclosures for accessories, specialties, equipment, and ductwork.

B. Gypsum Board Installation: Install in accordance with ASTM C840 and manufacturer's recommendations.

1. Use screws when fastening gypsum board to furring and to framing.

2. Erect gypsum board with ends and edges occurring over firm bearing.

a. Ensure joints of second layer do not occur over joints of first layer in double layer applications.

3. Place control joints to be consistent with lines of building spaces and as directed by Architect.

a. Provide where system abuts structural elements.

b. Provide at dissimilar materials.

c. Wings of "L", "U" and "T" shaped ceilings.

4. Place corner beads at external corners; use longest practical lengths.

5. Place edge trim where gypsum board abuts dissimilar materials.

6. Tape, fill, and sand exposed joints, edges, corners and openings to produce surface ready to receive finishes; feather coats onto adjoining surfaces.

7. Finishing: Comply with Gypsum Association (GA) “Levels of Gypsum Board Finish”.

a. Level 4, three-coat finish to achieve special smooth surface ready for applied paint finishes.

b. Orange peel and swirl texture knock down per mock-up approved by Architect.

8. Remove and replace defective work.

C. Acoustical Accessories Installation:

1. Place acoustical insulation tight within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

2. Place acoustical sealant within partitions in accordance with manufacturer's recommendations; install acoustical sealant at gypsum board perimeter at:

a. Wood Framing: One or two beads.

b. Base layer and face layer.

c. Penetrations of partitions.

3. Tolerance: Maximum 1/4" space between gypsum board at floor, ceiling, and penetrations.

4. Install electrical box pads with pads molded and pressed on back side of box, closing openings, in accordance with manufacturer's instructions, for complete acoustical barrier.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for furnishing and installing ceramic tile, accessories and related materials as indicated on the Drawings and as specified herein.

1. Toilet room wall tile and base.

2. Drinking fountain alcove.

3. Backsplash, break room.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 REFERENCES

A. American National Standards Institute (ANSI): Standard Specifications for the Installation of Ceramic Tile.

4. ANSI A108.4: Installation of ceramic tile with Water-Resistant Organic Adhesive.

5. ANSI A108.5: Installation of ceramic tile, with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

6. ANSI A108.10: Installation of Grout in Tilework.

7. ANSI A118.1: Dry-Set Portland Cement Mortar.

8. ANSI A118.4: Latex Portland Cement Mort ar.

9. ANSI A118.6: Ceramic Tile Grout.

10. ANSI A137.1: Standard Specifications for Ceramic Tile.

B. Tile Council of America (TCA): “Handbook for Ceramic Tile Installation”.

1.04 SYSTEM DESCRIPTION

A. Design Requirements: Floor tile tested both wet and dry shall have minimum static coefficient of friction of 0.60 in accordance with ASTM C1028.

1.05 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Samples:

1. Tile: Submit three full-sized samples of each color, size and type of tile specified

2. Trim Shapes: Each color, type, and shape

C. Product Data:

1. Pictorial information or samples showing manufacturer's full line of standard patterns and colors.

2. Upon completion of ceramic tile Work, submit two copies of a list of recommended maintenance products and procedures.

D. Mock-Up

1. One full toilet room wall with accessories shall be installed prior for Owner approval, prior to completion of remaining tile work.

2. Tile not meeting TCA standards and visual observations of architect for lippage and square shall be removed.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver tile in manufacturer's original cartons, grade-sealed by manufacturer in accordance with ANSI A137.1, and with grade seals unbroken.

B. Deliver dry-set mortar in moisture-proof containers.

C. Manufactured mortars and grouts shall be from one manufacturer for each system, shall contain hallmarks certifying compliance with specified TCA and other referenced standards and shall be recommended by tile manufacturer for the application intended.

D. Organic adhesive containers shall bear hallmark of either Adhesive and Sealant Council or Tile Contractors of America certifying compliance with ANSI A136.1.

E. Store materials in accordance with manufacturer's directions and under cover in manner to prevent damage or contamination.

F. Handle materials carefully to avoid chipping and breakage.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Ambient Temperature: At least 50 degrees F and rising, when setting and grouting with Portland-cement mortar for at least 7 days after completion of installation.

B. Follow manufacturer's requirements for ambient temperature when setting and grouting with other than Portland-cement mortar.

C. Moisture Conditions: In accordance with tile and installation materials manufacturers' requirements.

D. Protect adjoining work surfaces before tile work begins.

E. Close spaces in which tile is being set to traffic and other work; keep closed until firmly set.

PART 2 PRODUCTS

2.01 MATERIALS

A. Tile, General:

1. Tile shall conform to ANSI A137.1, Standard Grade, and shall be the product of Daltile Company or approved equal.

2. Units shall be factory made. Furnish bases, caps, stops, returns, trimmers, and other shapes for a complete installation within limits of selected manufacturer's type group. Vertical internal corners and external corners shall be bull-nosed, including all transitions. Corners shall use special shapes that avoid straight edges, end of tile runs shall be bull-nosed. Finish shall match that of wall tile.

B. Ceramic Tile Type:

1. See Section 09 06 00. Schedules of Finishes.

C. Trim Shapes and Bases:

1. Provide bull-nose, returns, trimmers, and other shapes, both standard and special, to finish installation.

2.02 SETTING MATERIALS

A. Concrete Primer: As recommended by waterproofing membrane manufacturer.

B. Waterproofing Membrane: Elastomeric-based, polyurethane coating, 3M Company "Scotch-Clad Brand Deck Coating Base Coat," or accepted equal.

C. Dry-Set Mortar: Conforming to ANSI A118.1.

D. Latex Portland Cement Mortar: Conforming to ANSI A118.4.

E. Organic Adhesive: In conformance with ANSI A136.1, Type I, low VOC.

F. Water: Clean and potable.

G. Setting Blocks.

H. Raimondi - Leveling System

I. Tile Trim - Schluter Schiene.

J. Corner Trim - Schluter Rondec

2.03 GROUTING MATERIALS

A. Latex-Portland Cement Grout, or accepted equal, mastic grout: Special latex emulsions with commercial Portland cement grout, replacing all or part of water according to directions specified by latex manufacturer.

B. Grout: Custom Building Products, Polyblend (color to be selected by Architect), sanded grout at floor (1/8-inch joints), non-sanded grout at walls (1/8-inch joints).

C. Elastomeric Sealant: One part, mildew-resistant silicone and low VOC.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that conditions are satisfactory for the installation of ceramic tile and does not adversely affect the quality and execution of tile installation.

B. Condition of surfaces to receive tile:

1. Surfaces shall be firm, dry, clean and free of oily or waxy films.

2. Grounds, anchors, plugs, hangers, bucks, and electrical and mechanical work in or behind tile shall be installed prior to proceeding with tile Work.

C. Do not commence the installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install tile in accordance with the requirements of the specified TCA Method from the TCA "Handbook for Ceramic Tile Installation" appropriate to the tile and surface specified herein.

1. Set tile in a manner to produce solid bedding, smooth even surfaces, and uniform joints, accurately aligned and symmetrically arranged. Avoid use of tile less than half size. Cut and drill tile neatly without marring the tile and grind rough exposed edges.

2. Whenever possible, turn cut to inside corner. Terminate tile at center lines of doors, unless otherwise indicated.

3. Establish lines of borders where applicable, prior to spreading setting bed, centering field work in both directions. Lay tile from center line of wall or floor surface outward, with adjustments made at junction with other floor or wall surfaces.

4. Omit tile where floor or wall area is covered by permanently built-in equipment such as toilet fixtures and recessed accessories.

5. Patch existing tilework, layout shall match existing tile pattern. Align joints vertically and horizontally.

B. Wall Tile: Install in conformance with ANSI A108.4, using TCA Method W242. Utilize tile leveling systems. Use stainless steel trim system at all edges and terminations.

C. Curing: Apply non-staining laminated and reinforced Kraft paper having a bituminous or latex binder over floor tile as soon as pointing, grouting and cleaning are completed.

1. Lap the sheets at least 4 inches, and seal the laps against the escape of moisture.

2. Leave curing paper in place until job is ready for final cleaning.

3. Keep traffic off floors during the curing period (7 days).

4. Do not permit cement grouts to dry out until cured a minimum of 72 hours.

3.03 CLEANING

A. Clean surfaces after installation and grouting as recommended by tile manufacturer.

B. Remove grout haze, observing grout manufacturer's recommendations as to use of acid and chemical cleaners.

C. Rinse tile work thoroughly with clean water before and after using chemical cleaners. Do not use acids or abrasive soaps on tile, except as approved by tile manufacturer.

D. Replace damaged, cracked, stained, or broken surfaces before time of final acceptance.

3.04 PROTECTION

A. Apply a protective coat of neutral cleaner solution, one part cleaner to one part water, to clean, completed tile walls and floors.

B. Maintain curing paper cover on floor tile to protect from construction dirt.

C. Place board walkways on newly tiled floors for at least 7 days where floors must be used as passageways by workmen.

D. Just before final acceptance of tile work, remove paper and rinse protective coat of neutral cleaner from tile surfaces.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling systems

B. Acoustical panels.

C. Non-fire rated assembly.

D. Perimeter trim

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Provide product data on metal grid system components and acoustic units.

C. Submit two samples 6x6 inch in size, illustrating material and finish of acoustic units.

D. Submit two samples each, 12 inches long of suspension system main runner, cross runner and edge trim.

E. Manufacturer's Literature and Data:

1. Ceiling suspension system, each type, showing complete details of installation.

2. Acoustical units, each type.

F. Manufacturer's Certificates:

1. Acoustical units, each type, in accordance with specification requirements.

2. Drilled Expansion Anchors: ICBO Evaluation Report.

1.04 APPLICABLE STANDARDS

The latest edition of publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

A. American Society for Testing and Materials (ASTM):

A526/A526M	Steel, Zinc-Coated (Galvanized by the Hot-Dip Process, Commercial Quality)
A641	Zinc-coated (Galvanized) Carbon Steel Wire
A653	Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

C423	Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
C634	Standard Terminology Relating to Environmental Acoustics
C635	Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
C636	Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
E84	Standard Test Method for Surface Burning Characteristics of Building Materials
E119	Fire Tests of Building Construction and Materials
E597	Determining a Single-Number Rating of Airborne Sound Isolation for Use in Multi-unit Building Specifications
E580	Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint
E1111	Standard Test Method for Measuring the Interzone Attenuation of Ceiling Systems (for open plan products)
E1264	Classification for Acoustical Ceiling Products
E1414	Standard Test Method for Airborne Sound Attenuation between Rooms Sharing a Common Ceiling Plenum
E1477	Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
G21	Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi (for HumiGuard Plus products)

B. Federal Specification (Fed. Spec):

FF-F-395B	Pin, Drive, Guided and Pin Drive, Power Actuated (Fasteners for Power Actuated Hand Fastening Tools)

C. International Conference of Building Officials (ICBO):

D. California Building Code (CBC): Chapter 25, Section 2504 and Table A.

1.05 QUALITY ASSURANCE

A. Qualifications of Installer: Minimum of three project installations of extent comparable to proposed project.

B. Single Source Responsibility: To ensure proper interface and color match, all acoustical panel units and grid components shall be produced or supplied by a single manufacturer. Materials supplied by more than one manufacturer are not permissible.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver with manufacturer's labels indicating brand name, patter, size, and thickness.

B. Protect against exposure to moisture, sunlight, surface contamination and other unacceptable conditions.

C. Store cartons open at each end to stabilize moisture content and temperature in accordance with manufacturer's recommended limitations.

D. Do not begin installation until sufficient materials to complete a room are received.

1.07 PROJECT CONDITIONS

A. Do not install ceilings until building is enclosed, sufficient heat is provided, dust generating

Activities have terminated and overhead mechanical work is completed, tested and approved.

B. Allow wet work to dry prior to commencement of installation.

C. Maintain a uniform temperature minimum of 60 degrees and humidity of 20 percent to 40 percent prior to and during installation of materials or as recommended by the manufacturer.

D. Coordinate acoustical ceiling work with installers of related work including, but not necessarily limited to, building insulation, gypsum drywall, light fixtures, mechanical systems, and electrical systems.

1.08 MAINTENANCE

A. Extra Material: Deliver extra material to owner; furnish extra material described below matching products installed. Package with protective covering for storage and identify with appropriate labels.

1. Acoustical Ceiling Units: Furnish quantity of full-sized units equal to 5% of the amount installed.

2. Exposed Suspension Systems Components: Furnish quantity of each suspension component equal to 2% of the amount installed.

1.09 WARRANTY

A. Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels or grid that fails within the warranty period. Failures include, but are not limited to:

1. Acoustical Panels: Sagging and warping.

2. Grid System: Rusting and manufacturers' defects.

B. Warranty period for acoustical panels shall be one (1) year for standard products.

C. Warranty period for grid system shall be ten (10) years from date of Acceptance of the

Work.

D. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to the run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – Suspension Systems

A. Acoustical Ceiling Panels: When existing is not available, acceptable manufacturers for approval include Armstrong Ceiling Systems; Chicago Metallic Corporation; USG Interiors; or approved equal.

B. Suspension System: When existing is not available, acceptable manufacturers for approval include Chicago Metallic, USG Donn Corp., or approved equal.

2.02 SUSPENSION SYSTEM MATERIALS

A. Grid: ASTM C635. Heavy duty, non-fire rated, exposed T, components die cut and interlocking. Catalog numbers of acceptance manufacturer are indicated on drawings.

B. Accessories: Stabilizer bars, clips, splices and edge moldings required for suspended grid system.

C. Grid Material: Commercial quality cold rolled steel with galvanized coating.

D. Grid Finish: Off-white color, baked enamel.

E. Support Channels and Hangers: Galvanized steel, size and type to suit application to rigidly secure acoustic ceiling system including integral mechanical and electrical components as detailed on drawings.

F. Compression strut: ASTM A513, telescoping design as detailed on drawings, galvanized ¾ inch diameter 14 gage rigid steel tubing with crimped end attached to roof framing and secured to ½ inch diameter 14 gage rigid steel tubing with crimped end to main runners or equivalent pre-manufactured compression post supplied by ceiling grid manufacturer.

G. Hanger Wire: ASTM C641, Class 1 coating (galvanized), soft temper, No 12 gage.

2.03 ACCEPTABLE MANUFACTURERS – Acoustic Units

A. Armstrong Ceiling Systems

B. USG Interiors, Inc.

C. Chicago Metallic Ceiling Systems

D. Substitutions: Under provision of Division 01.

2.04 ACOUSTIC UNIT MATERIALS

A. Acoustic Panels: Provide ACT-1 as called for on the drawings, and conforming to ASTM E 1264 and the following:

1. ACT-1 – Equivalent to Armstrong Cirrus Acoustical tiles.

(1)	Type:	Cirrus
(2)	Form:	Angled Tegular
(3)	Pattern Designation:	Nodular, medium texture, Factory-applied latex paint
(4)	Size:	24x24 inches
(5)	Thickness:	15/16 inches
(6)	Composition:	Wet-formed Mineral Fiber
(7)	Light Reflectance:	0.85 to 0.88
(8)	NRC Range:	0.55 to 0.75
(9)	CAC range:	35 to 39
(10)	Edge:	Angled Tegular
(11)	Surface Color:	White
(12)	Flame Spread:	(0-25) Class A, UL 723
(13)	Smoke Density:	(0- 50) when tested in accordance with NFPA 286

2.05 ACOUSTIC UNIT MATERIALS

A. Acoustic Panels: Provide ACT-2 as called for on the drawings, and conforming to ASTM E 1264 and the following:

2. ACT-2 – Equivalent to Armstrong Ceramaguard Acoustical tiles.

(1)	Type:	Ceramaguard
(2)	Form:	Square Lay-in
(3)	Pattern Designation:	medium texture
(4)	Size:	24x24 inches
(5)	Thickness:	15/16 inches
(6)	Composition:	Wet-formed ceramic and mineral fiber composite
(7)	Light Reflectance:	0.75 to 0.85

(8)	NRC Range:	0.55 to 0.75
(9)	CAC range:	35 to 40
(10)	Edge:	Square Lay-In 15/16
(11)	Surface Color:	White
(12)	Flame Spread:	(0-25) Class A, UL 723
(13)	Smoke Density:	(0- 50) when tested in accordance with NFPA 286

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that existing conditions are ready to receive work.

A. Verify that layout of hangers will not interfere with other work.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

B. Measure each ceiling area and establish the layout of acoustical board to balance border widths at opposite edges of each ceiling. Avoid using less than half widths units at borders, and conform to the layout indicated on Drawings.

3.03 CEILING TREATMENT

A. Treatment of ceilings shall include sides and soffits of ceiling beams, furred work 24 inches wide and over, and vertical surfaces at changes in ceiling heights unless otherwise shown.

B. Lay out acoustical units symmetrically about center lines of each room or space unless shown otherwise on reflected ceiling plan.

C. Moldings:

1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.

2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.

D. Perimeter Seal:

1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.

2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.

3.04 CEILING SUSPENSION SYSTEM INSTALLATION

A. General:

1. Install metal suspension system for acoustical tile and lay-in panels in accordance with ASTM C636 and ASTM E580 as supplemented in this Section and with notes on the drawings entitled Metal Suspension System for Lay-in Panel Ceilings.

2. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

3. Hang systems independent of columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

4. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest effected hangers and related carrying channels to span the extra distance.

5. Compression struts to be installed at each main runner not exceeding 12’-0” o.c. in both directions and not more than 8” from end of main runner. Insert main ¾ inch tube over ½ inch tube with a minimum 6 inch lap. Secure crimped and of main ¾ inch tub to structural framing with metal screws and ½ inch tube to main runner with metal screws. Secure tube sections together with 2 set screws. Install prefabricated compression post according to manufacturer’s recommendations.

6. Locate system on room axis according to reflected plan.

7. Do not eccentrically load system or produce rotation of runners.

8. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junction with other interruptions. Bend to match ceiling curve profile.

B. Seismic Ceiling Bracing System:

1. Construct system is accordance with ASTM E580 and as additionally detailed on plans.

2. Connect bracing wires to structure above as specified for anchorage to structure and to ceiling suspension system as additionally detailed.

3.05 ACOUSTICAL UNIT INSTALLATION

A. Field reveal cut edge of perimeter tiles to match factory reveal edge. Paint cut surface if necessary to match surface of tile.

B. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units one way in room. Fit border neatly against abutting

surfaces.

D. Lay Install acoustic units level, in uniform plane and free from twist, wrap and dents.

3.06 ADJUSTING AND CLEANING

A. Maintain tolerances in accordance with manufacturer requirements.

B. Variation from Flat and Level Surface: 1/8 inch in 10 feet

C. Variation from Plumb of Grid Members caused by eccentric loads: 2 degrees maximum.

3.07 TOLERANCES

A. Replace damaged, discolored, dirty, cracked and broken acoustical units and grid tees.

B. Touch up scratches, abrasion, voids, and other defects in painted surfaces.

C. Leave finished work free from defects.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Vinyl Composition Tile flooring.

B. Resilient base.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE

A. Furnish each style and color of resilient flooring from a single mill run. Submit manufacturer's certified compliance.

B. Maintain complete manufacturer's installation directions for all products at the job site throughout installation.

C. Qualifications of Installer: Minimum of three project installations of extent comparable to proposed Project.

D. Regulatory Requirements:

1. Materials shall have the following flammability ratings, according to ASTM E84:

a. Flame Spread: 75 or less.

b. Smoke Density: 450 or less.

2. Slip Resistance: In accordance with ADA Section A4.5 recommendations, flooring shall have a minimum static coefficient of friction of 0.6 for floors ASTM D2047 " Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine".

1.04 SUBMITTALS

A. Comply with requirements of Section 01 33 00 – Submittal Procedures.

B. Manufacturer's Literature and Data:

1. Description of each product.

2. Resilient material manufacturers recommendations for adhesives, underlayment, primers and polish.

3. Application and installation instructions.

C. Samples:

1. Tile: Three 12 inches by 12 inches (300 mm by 300 mm) tile for each type, pattern and color.

2. Base: Three 6 inch (150 mm) long pieces for each type and color.

D. Extra Material: Deliver to the State at completion of work extra materials as listed below. Furnish all products from same mill runs as the installed products. Deliver in original wrappings, properly identified.

1. Each type and color of flooring: 5%.

2. Each type and color of rubber top-set: 5%.

E. Upon completion of work, submit three (3) copies of manufacturer's maintenance and installation

1.05 DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage: Deliver material to the job site and store in their original unopened containers with all labels intact and legible at time use. Store materials at not less than 70 degrees F. for not less than 24 hours immediately before installation.

B. Store in strict accordance with the manufacturers' recommendations.

C. Protection: Use all means necessary to protect materials of the section before, during and after installation and to protect installed work and material of all other trades.

D. Replacements: In the event of damage, immediately make all repairs and replacements necessary for approval by the State and at no additional cost to the State.

1.06 APPLICABLE STANDARDS: The latest edition of publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

A. American Society for Testing and Materials (ASTM):

D4078	Water Emulsion Floor Finish
D3564	Application of Floor Polishes to Maintain Vinyl Asbestos Tile or Flooring
F510	Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method
F710	Preparing Concrete Floors and other Monolithic Floors to Receive Resilient Flooring
F1066	Vinyl Composition Floor Tile

B. Federal Specifications (Fed. Spec):

SS-T-312B	Tile, Floor: Asphalt, Rubber, Vinyl, and Vinyl
SS-W-40A	Wall Base; Rubber, And Vinyl Plastic
INT AMD 2	Composition
MMM-A-115C-79	Adhesive, Asphalt, Water Emulsion Type (For Asphalt And Vinyl Composition Tiles)

C. National Fire Protection Association (NFPA):

NFPA 253	Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using Radiant Heat Energy Source

D. Resilient Floor Covering Institute (RFCI):

ADH-1	Vinyl Composition Tile Adhesive
ADH-2	Wall Base Adhesive
ID-2	Concrete Treating Compounds Installation Specifications for Vinyl Composition, Solid Vinyl and Asphalt Tile Floorings
CL-1	Cleaners for Use on Resilient Floor Coverings (Revised 1988)
TM-6	Determination of Quality of Cut (Joint Tightness and Corner Openings) of Resilient Tile

1.07 GUARANTEE / WARRANTY

A. Section 01 77 00 - Closeout Procedures.

B. Provide State with a guarantee, signed by the Contractor and cosigned by the installer, stating that resilient base will stay fully adhered to substrate for a minimum period of two (2) years after Completion Date, and that any resulting failures will be repaired at no additional cost to the State.

C. Failures include any and all delamination of the resilient base from the substrate other than for causes of excessive abuse.

PART 2 PRODUCTS

2.01 VINYL COMPOSITION TILE MANUFACTURERS

A. Armstrong World Industries

B. Azrock Industries

C. Tarkett

D. Nova

2.02 GENERAL

A. Furnish product type, materials of the same production run.

B. Use adhesives, underlayment, primers and polish recommended by the floor resilient material manufacturer.

C. Interior Floor Finishes For Corridors, Stairs, and Halls: Flame spread not to exceed 25, Smoke developed not to exceed 450 per ASTM E84.

D. Interior Floor Finishes For Remaining Areas: Flame spread not to exceed 75, Smoke developed not to exceed 450 per ASTM E84.

2.03 VINYL COMPOSITION TILE - SPECIFIC TYPES

A. Vinyl Composition Tile: See Section 09 06 00, Schedules for Finishes, colors to be selected; or approved equal.

1. ASTM F1066, Class 2, Type IV, Composition 1, non-asbestos, 12 inches (300 mm) square, 1/8-inch (3.2 mm) thick.

2. Colors and pattern to be uniformly distributed throughout thickness.

2.05 RESILIENT BASE: Burke, Roppe or approved equal.

A. Tile Base: Fed. Spec. SS-W-40, 1/8 inch (3 mm) thick, 6 inches (100 mm) high unless otherwise noted on Plans, Type I (rubber); Type II, Class 1 or 2 (vinyl plastic); with molded top.

1. Style A (straight) at carpet or carpet tiles.

2. Style B (coved) at concrete and resilient flooring.

B. Provide pre-molded outside corners.

C. Match existing adjacent base in color, height and style.

2.06 ACCESSORIES

A. Adhesives

B. Primer (For Concrete Subfloors): Asphaltic type as recommended by the adhesive and tile manufacturer.

C. Leveling Compound:

1. Provide products with latex or polyvinyl acetate resins in the mix.

2. Determine the type of underlayment selected for use by the condition to be corrected.

D. Polish and Cleaners:

1. Cleaners RFCI CL-1.

2. Polish: ASTM D4078.

E. Transition Strips:

1. 1-1/8 inch (28 mm) wide unless shown otherwise.

2. Bevel from maximum thickness to minimum thickness for flush joint unless shown otherwise.

3. Resilient Edge Strip or Reducer Strip: Fed. Specs. SS-T-312, Solid vinyl.

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

A. Maintain temperature of materials a minimum of 70 degrees F (22 degrees C,) for 48 hours before installation.

B. Maintain temperature of rooms where work occurs between 70 degrees and 80 degrees F (21 degrees and 27 degrees C), for at least 48 hours, before, during and after installation.

C. Do not install flooring until building is permanently enclosed and wet construction in or near areas to receive tile materials is complete, dry and cured.

3.02 SUBFLOOR PREPARATION

A. Examine surfaces on which resilient flooring is to be installed.

B. Correct conditions which will impair proper installation.

C. Fill cracks, joints and other irregularities in concrete with leveling compound and level floors for a maximum wave variation of 1/8-inch in 10 feet (1:1000) (non-accumulative).

1. Do not use adhesive for filling or leveling purposes.

2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.

3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joints.

D. Clean floor of oil, paint, dust, and deleterious substances: Leave floor dry and cured free of residue from existing curing or cleaning agents.

E. Concrete Subfloor Testing:

1. Apply a 1-meter (three foot) square test patch to the prepared concrete subfloor in room or area to be tiled in accordance with RFCI ID-2.

2. After the test patches have remained on the floor for a period of 72 hours, check adherence to surface by scraping test patches for ease of removal.

F. Perform additional subfloor preparation to obtain satisfactory adherence of flooring if subfloor test patches allows easy remove of tile.

G. Prime the concrete subfloor if the primer will seal slab conditions that would inhibit bonding, or if priming is recommended by the tile or adhesive manufacturers.

H. Conduct and Comply with all manufacturer required testing prior to installation.

3.03 INSTALLATION

A. Install in accordance with RFCI INS and manufacturer's instructions for application and installation unless specified otherwise.

B. Mix tile from at least two containers. An apparent line either of shades or pattern

variance will not be accepted.

C. Tile Layout:

1. If layout is not shown on drawings, lay tile symmetrically about center of room or space with joints aligned.

2. No tile shall be less than 6-inches and of equal width at walls.

3. Place tile pattern in the same direction; do not alternate tiles.

D. Trim tiles to touch for the length of intersections at pipes and vertical projections, seal joints at pipes with waterproof cement.

E. Application:

1. Apply adhesive uniformly with no bare spots.

a. Conform to RFC1-TM-6 for joint tightness and for corner intersection unless layout pattern shows random corner intersection.

b. More than 5 percent of the joints not touching or any joint more than 0.005-inch wide will not be accepted.

2. Roll tile floor with a minimum 100-pound roller. No exceptions.

3. The State Representative may have test tiles removed to check for non-uniform adhesion, spotty adhesive coverage, and ease of removal. Install new tile for broken removed tile.

F. Installation of Transition Strips:

1. Locate transition strips under centerline of doors unless otherwise shown.

2. Set resilient edge strips in adhesive. Anchor metal edge strips with anchors and screws specified.

3. Where tile edge is exposed, butt edge strip to touch along tile edge.

4. Where thin set ceramic tile abuts resilient tile, set edge strip against floor file and against the ceramic tile edge.

3.04 TILE LOCATION

A. Unless otherwise specified or shown, install tile on floor under areas where casework and other equipment occurs, except where mounted in wall recesses.

B. Extend tile and sheet vinyl flooring for room into adjacent closets and alcoves.

3.05 BASE INSTALLATION

A. Location:

1. Unless otherwise specified or shown, where base is scheduled, install base over toe space of base of casework, lockers, laboratory, pharmacy furniture island cabinets and where other equipment occurs.

2. Extend base scheduled for room into adjacent closet, alcoves, and around columns.

B. Application:

1. Apply adhesive uniformly with no bare spots.

2. Set base with joints aligned and tightly butted to touch for entire height. Joints not to exceed 5 mils (0.005 inch) as measured in accordance with RFCI TM-6.

3. Before starting installation, layout base material to provide the minimum number of joints with no strip less than 24 inches (600 mm) length.

a. Short pieces to save material will not be permitted.

b. Locate joints as remote from corners as the material lengths or the wall configuration will permit.

C. Form corners and end stops as follows:

1. Use pre-molded corners for external corners

2. Score face of inside corner and notch cove.

D. Roll base for complete adhesion.

3.06 CLEANING AND PROTECTION

A. Clean adhesive marks on exposed surfaces during the application of resilient materials before the adhesive sets. Exposed adhesive is not acceptable.

B. Keep traffic off resilient material 72 hours after installation.

C. Clean and polish materials in the following order:

1. For the first two weeks sweep and damp mopped only.

2. After two weeks, scrub resilient materials with a minimum amount of water and a mild detergent. Leave surface clean and free of detergent residue.

3. Apply wax polish to the floors in accordance with the polish manufacturer's instructions.

D. When construction traffic occurs over tile, cover resilient materials with reinforced craft paper. At entrances and where wheeled vehicles or carts are used, cover tile with plywood, hardboard, or particleboard over paper. All protective surfaces are to be properly secured and maintained.

E. When protective materials are removed and immediately prior to acceptance, replace any damage tile, re-clean resilient materials, lightly re-apply polish and buff floors.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Furnish labor, materials, equipment and services to install carpet tile materials and related components and accessories as shown on the Drawings, as specified herein and as required for a complete and proper installation.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE

A. Regulatory Requirement: Provide carpet tile with a minimum critical radiant flux limit of 0.22 watts/cm2 in compliance with National Fire Protection Association (NFPA) 253.

B. Maintain complete manufacturer's installation directions for all products at the job site throughout installation. Installation shall conform to CRI 104 Standards.

C. Qualifications of Installer: Minimum of three years experience on at least three project installations of extent comparable to proposed Project.

D. Carpet Materials:

1. Face yarns shall be of same dye batch and finish material shall be of same mill run in each unit.

2. Conform to applicable codes for flame/smoke rating requirements in accordance with ASTM E84.

1.04 SUBMITTALS

A. Procedures: In accordance with Section 01 33 00 – Submittals.

B. Product Data:

1. Manufacturer's specifications, installation instructions, maintenance recommendations, and form of guarantee offered for each type of carpet.

C. Certification: Letter of certification that materials proposed comply with specified requirements.

D. Samples:

1. Carpet tile - submit three full size carpet tiles for each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in factory wrapping with manufacturer's registry numbers attached and intact to prevent damage and deterioration during shipment, handling, and storage.

B. Maintain protective coverings in place and in good repair until removal is necessary for the Work.

C. Protect products against damage during shipment, field handling, and installation.

D. Store products inside enclosed storage facilities or closed building, supported above grade and slabs-on-grade.

E. Environmental Requirements:

1. Maintain storage spaces and products in dry condition at all times, and within temperature extremes recommended by manufacturer.

2. Store materials for one day prior to installation in area of installation to achieve temperature stability.

F. Follow manufacturer's special instructions.

1.06 COORDINATION

A. Existing Substrates.

1. Furnish instructions for condition required for such substrates, which are to receive new or replacement carpet.

B. Painting Work in areas to receive carpet shall have been completed prior to installation of carpet.

C. Metal thresholds at fire-rated door openings and elsewhere indicated or scheduled adjacent to carpet areas shall have been installed prior to carpet installation.

1.07 EXTRA MATERIALS

A. Carpet Tile: Furnish the Owner with a minimum of 5 percent of each type and color of material used in this project from same dye lot or production run for compatibility with the installed materials.

B. Deliver to Owner unused carpet pieces over 2 square feet and 8 inches in least dimension.

C. Store where indicated by Owner.

D. Provide the Owner with a signed receipt indicating materials and quantities upon delivery.

1.08 GUARANTEE

A. Guarantee directly or through carpet mill or fiber manufacturer the surface pile in any given area against abrasive wear of more than 10 percent within 15 years for carpet tile as properly installed and maintained. Misuse, damage, or improper cleaning methods shall not apply. Carpet areas, which fail to perform, shall be replaced at no additional cost to Owner.

PART 2 PRODUCTS

2.01 GENERAL

A. Carpet Schedule:

a. See Section 09 06 00, Schedules for Finishes.

B. Carpet shall have a Critical Panel Flux of not less than .45 watts per square centimeter, in accordance with ASTM E648.

C. When tested in accordance with ASTM E662, smoke density shall not exceed 450.

D. Carpet shall meet requirements of DOC FF 1-70.

2.02 ACCESSORY MATERIALS

A. Edge Binder: Molded vinyl type designed for carpet in manufacturer's standard color; Flexco, Mercer, or accepted equal.

B. Carpet Adhesive: Release type recommended by carpet tile manufacturer.

C. Subfloor Filler: Latex base type as recommended by carpet tile manufacturer.

D. Miscellaneous: Tape, thread, and other items necessary for installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions under which carpet is to be installed. Do not install carpet over substrate, which is uneven, cracked, or has other detrimental conditions that could affect the performance and appearance of the carpet. Do not proceed with the Work until unsatisfactory conditions have been corrected.

B. Before installation, inspect carpet tile for manufacturing flaws, shipping damage, and other non-compliant conditions. Do not install carpet found not in compliance with Specifications.

C. Maintain spaces to receive carpet tile at 70 degrees F. minimum, for at least 48 hours previous to, during, and for 48 hours after installation of carpet.

3.02 SUBSTRATE PREPARATION

A. Clean substrates free from dust and other foreign and residual materials, which could inhibit proper bonding.

B. Fill cracks exceeding 1/16 inch in width, holes, and depressions to level surfaces. Maximum allowable variation of 1/4 inch in 10 feet.

C. Prime substrates when and as recommended by manufacturer.

D. Confirm compatibility of adhesive with sealers or curing agency on concrete floors.

3.03 INSTALLATION

A. Install carpet tile and associated materials in accordance with manufacturer's printed instructions.

B. Install carpet tile prior to installation of movable fixtures.

C. Apply adhesive in accordance with manufacturer's printed instructions, and for uniform coverage directly onto floor. Remove excess cement with approved solvent.

D. Cut evenly along walls, cut and fit evenly around projections, corners, pipes, electrical outlets, floor air or heating elements, and trim strips.

E. Securely fasten carpet edging binder to floor wherever carpet tiles meet different flooring material and no threshold or other divider is noted.

F. Extend carpet tile materials under all open-bottomed and raised bottom obstructions, and under removable flanges of obstructions. Extend carpet tiles into closets and alcoves of rooms indicated to receive carpeting, unless another material is specifically identified to be used in that space. Carpet tile shall be installed under all movable furniture and equipment.

G. Neatly trim carpet free from loose thread ends and projecting frays. Finish installation shall be free from visual defects.

H. After each area of carpet has been installed, protect from soiling and damage.

I. Installation shall not receive furniture or heavy traffic for 48 hours after installation.

3.04 CLEANING AND COMPLETION

A. When complete, carpet joint lines shall be straight and free from stagger and offsets not intended.

B. Finished carpet surfaces shall be flat, true to plane, and free from offsets across Joints.

C. Units shall lay fully in place and free from warps, bulges, and lifting at edges.

D. Replace or repair any damaged base and door trim.

E. Vacuum-clean completed installation using equipment of type recommended by carpet manufacturer. Carpet base and walls shall be cleaned and free from stains, blemishes and other foreign materials.

F. In all carpeted areas subject to traffic, provide a temporary non-staining paper pathway in the direction of traffic. Remove temporary pathway upon final acceptance by the Owner.

END OF SECTION 09 68 13

PART 1 GENERAL

1.01 DESCRIPTION

A. Painting and finishing of exposed exterior and interior surfaces as required to complete finishing of the Work as indicated on the Drawings including the following items:

1. Mechanical diffusers.

2. Visible interior of ductwork.

3. Electrical Sub-panels painted to match adjacent wall surface.

4. Visible piping and electrical components.

B. The Work includes painting and finishing of new and existing interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.

1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

C. Surfaces Not to be Painted:

1. Factory pre-finished items as specified in various Sections.

2. Pre-finished wall, ceiling, and floor coverings.

3. Painting specified elsewhere and included in respective Sections, including but not necessarily limited to, shop priming.

4. Code-Required Labels: Keep equipment identification and fire rating labels free of paint.

5. Surfaces concealed in walls and above ceilings except as specifically indicated otherwise.

6. Ducts, piping, conduit, and equipment concealed in walls and ceilings, unless specifically indicated otherwise.

D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

E. Paint exposed surfaces whether or not colors are designated in "schedules", except where natural finish of material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas. If color of finish is not designated, Architect will select these from standard colors available for materials systems specified.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data:

1. Not less than 30 days before beginning work, submit a complete list of materials proposed for use, together with manufacturer's specifications.

2. Paint materials and products shall be subject to the Architect's acceptance.

C. Samples:

1. Custom and Stock Colors: Submit 8x8 inch brush-out samples for Architect's review of each color and texture. Provide a listing of material and application for each coat of each finish sample.

2. Samples shall be resubmitted as requested until required sheen, color, and texture is achieved.

3. Label and identify each sample as to location and application.

D. Field Samples: On actual wall surfaces and other exterior and interior building components in areas designated by Architect, duplicate painted finishes of prepared samples in 4 ft. sq. areas. Simulate finished lighting conditions for Architect's and Owner's review of in-place Work. Colors may require adjustment at no additional cost to Owner.

1.04 QUALITY ASSURANCE

A. Include on label of containers:

1. Manufacturer's name

2. Type of paint

3. Manufacturer's stock number

4. Color

5. Instructions for reducing, where applicable

B. Field Quality Control:

1. Request review by the Architect of first finished room, space, or item of each color scheme required for color, texture, and workmanship.

2. Use first acceptable room, space, or item as the Project standard for each color scheme.

C. Regulatory Requirements:

1. Comply with the regulations of the Southern California Air Quality Management District (SCAQMD) for Volatile Organic Contents (VOC's).

2. Paint shall be certified by the manufacturer as “non-lead” (less than 0.06 percent lead by weight in the dried film) as defined in Part 1303 of the Consumer Product Safety Act.

3. Work to be painted may contain excessive levels of lead-based paint. Contractor shall retain and pay for the services of a Testing Agency to perform and report on tests for such suspected material

1.05 DELIVERY AND STORAGE

A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:

1. Name or title of material

2. Manufacturer's stock number and date of manufacturer

3. Manufacturer's name

4. Contents by volume, for major pigment and vehicle constituents

5. Thinning instructions

6. Application instructions

7. Color name and number

B. Storage of Materials:

1. Store only acceptable project materials on project site.

2. Store in a suitable location.

3. Restrict storage to paint materials and related equipment.

4. Comply with health and fire regulations.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:

1. Comply with manufacturer’s recommendations as to environmental conditions under which coatings and coating systems can be stored and applied.

2. Do not apply paint in rain, fog or mist; or when relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by paint manufacturer's printed instructions.

3. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

1.07 WARRANTY

A. Color and Life of Film:

1. At the end of 1 year, colors of surfaces shall have remained free from serious fading, and variations (if any) shall be uniform.

2. Materials shall have their original adherence at end of 1 year and there shall be no evidence of blistering, running, peeling, scaling, chalking, streaking, or stains at end of this period.

1.08 MAINTENANCE

A. Extra Materials:

1. At completion of the Work, deliver to the Owner extra stock of paint equaling approximately 5 percent of each color used in each coating material used.

2. Stock shall be in tightly sealed and clearly labeled containers.

PART 2 PRODUCTS

2.01 MATERIALS

A. Product numbers specified in Article 3.06, “Paint Systems”, are as manufactured by Sherwin Williams, unless otherwise indicated. Equivalent products manufactured by Sinclair Paint Co., Benjamin Moore, Dunn-Edwards, ICI Paints, Fuller O’Brien or Glidden are acceptable.

B. Materials selected for coating system of each type of surface shall be the product of a single manufacturer.

C. Thinner: As recommended by each manufacturer for his respective product for use only within recommended limits.

D. Colors used shall be selected for their permanence and non-fading qualities. In addition, colors that are used over concrete and plaster surfaces shall be lime-proof.

E. Unsuitability of Specified Products: Claims concerning unsuitability of any materials specified will not be entertained, unless such claim is made in writing to the Architect before the Work is started.

F. Texturing: Match texture of adjacent textures when new materials abut textured areas.

2.02 MATERIAL QUALITY

A. Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.

B. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.

2.03 COLORS

A. Colors: Colors to be selected by Architect from manufacturer’s color chart.

B. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

C. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish material proposed for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.04 MIXING AND TINTING

A. Deliver paints ready mixed to jobsite.

B. Accomplish job mixing and job tinting only when acceptable to the Architect.

C. Mix only in mixing pails placed in suitable sized nonferrous or oxide-resistant metal pans.

D. Use tinting colors recommended by manufacturer for specific type of finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.

B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.02 SURFACE PREPARATION

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

B. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.

C. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces. Do not paint until all interior gypsum board is installed, taped and sanded.

D. Gypsum Board:

1. Fill narrow, shallow cracks and small holes with spackling compound.

2. Rake deep, wide cracks and deep holes.

   a. Dampen with clear water.

   b. Fill with thin layers of drywall joint cement.

3. Allow to dry.

4. Sand smooth after drying; do not raise nap of paper on gypsum board.

5. See Section 09 25 00 for requirements for gypsum board finishing.

E. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

1. Touch-up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.

F. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum-based solvent.

G. Surfaces which cannot be prepared or painted as specified shall be immediately brought to the attention of the Architect in writing.

1. Starting of work without such notification will be considered acceptance by the Contractor of surface involved.

2. Contractor shall replace unsatisfactory work caused by improper or defective surfaces, as directed by the Architect, at no additional cost to the Owner.

3.03 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.04 APPLICATION

A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds,

and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.

3. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.

4. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

C. Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.

1. Re-coat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn through or other defects due to insufficient sealing.

E. Stipple Eggshell Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.

F. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

3.05 CLEAN-UP AND PROTECTION

A. Clean-up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.

1. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

B. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

1. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

2. At the completion of work of other trades, touch up and restore all damaged or defaced painted surfaces.

3.06 PAINT SYSTEMS

A. General:

1. Exterior paint systems are specified and identified by number and interior paint systems by letter.

2. Only major areas are scheduled, but miscellaneous and similar items and areas within room or space shall be treated with suitable system.

3. Number of coats scheduled is minimum.

a. Additional coats shall be applied at no additional cost if necessary to completely hide base material, produce uniform color, and provide satisfactory finish result.

4. This specification shall serve as a guide and is meant to establish procedure and quality.

B. Acceptance of Final Colors: Final coat of paint for both exterior and interior shall not be applied until colors have been accepted by the Architect based on Field Samples noted in 1.03.C above.

C. Interior Coating Systems: Provide the following finish coating systems for the various substrates, as shown on the Finish Plan. Provide coats as indicated and sufficient to cover.

1. Gypsum Wallboard:

a. Flat: (ceilings, except as noted)

1) Prime Coat: 220-22 PVA Sealer.

2) Second Coat: One coat 209-00 Alkyd Wall Primer Sealer.

3) Finish Coat: One coat 202-XX Flat Latex Wall Finish.

b. Stipple Eggshell: (walls, except as noted)

1) Prime Coat: One coat 220-22 PVA Sealer.

2) Second Coat: 209-05 Satin Latex Stipple.

3) Finish Coat: One coat 212-XX Eggshell Latex Enamel.

2. Galvanized Metal (trim and access doors, except structural steel, etc.):

a. Semi-gloss:

1) Prime Coat (delete if shop primed): One coat 621-04 BLOX-RUST Alkyd Metal Primer.

2) Two coats 619-6X Ultra-Color Alkyd Semi-Gloss Enamel.

3. Ferrous Metal or Aluminum (miscellaneous)

a. Semi-gloss:

1) Prime Coat (delete if shop primed): 15 Red Oxide Primer

2) Second Coat: 1790 Latex Enamel Undercoater

3) Finish Coat: 4000 Acrylic Latex Enamel

D. Other Coating Systems:

1. Plaster

a. Semi-gloss:

1) Prime Coat: 18 Epoxy Water-Base Primer

2) Finish Coat: 4400 Acrylic Emulsion

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies interior and exterior identification signs, building identification signs, parking and regulatory signs.

B. Interior signs.

1. Toilet Rooms
2. Lobby Entry
3. Exterior Address and Identifications Signage
4. Building Dimensional Signs
5. No Smoking distance at building access doors
6. Accessible Signs at Entries
7. Accessible Parking Stalls
8. Fire Extinguishers
9. Exit Signage

1.03 MANUFACTURER'S QUALIFICATIONS

A. Sign manufacturer shall provide evidence that they regularly and presently manufactures signs similar to those specified in this section as one of their principal products.

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Manufacturer's Literature:

1. Showing the methods and procedures proposed for the concealed anchorage of the signage system to each surface type.
2. Manufacturer’s printed specifications, anchorage details, installation and maintenance instructions.

C. Shop Drawings:

1. Sign location plan, showing location, type and total number of signs required.
2. Scaled drawings for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.

D. Samples:

1. All sign colors.

1.05 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Deliver materials to job in manufacturer's original sealed containers with brand name marked thereon. Protect materials from damage.

B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.

C. Deliver signs only when the site and mounting services are ready for installation work to proceed.

D. Store products in dry condition inside enclosed facilities.

1.07 QUALITY ASSURANCE

A. Regulatory Requirements: Products shall meet requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and local amendments and modifications.

B. 2019 CBC – California Building Code

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Signs of type, size and design shown on the drawings and as specified.

B. Signs complete with lettering, framing and related components for a complete installation.

C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

D. Do not scale drawings for dimensions. Contractor to verify and be responsible for all dimensions and conditions shown by these drawings. Owner’s Representative to be notified of any discrepancy in drawing, in field directions or conditions, and/or of any changes required for all such construction details.

E. The Sign Contractor, by commencing work of this section, assumes overall responsibility, as part of his warranty of work, to assure that assemblies, components and parts shown or required within the work of the section, comply with the Contract Documents. The Contractor shall further warrant: That all components, specified or required to satisfactorily complete the installation are compatible with each other and with conditions of installations.

2.02 SIGN MATERIALS

A. General: For items exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names or roughness.

B. Aluminum:

1. Sheet and Plate: ASTM B209.

2. Extrusions and Tubing: ASTM B221.

3. Castings: ASTM B26.

C. Concrete Post Footings: See Section 03 30 00, CAST-IN-PLACE CONCRETE.

D. Steel:

1. Posts: ASTM A53 Grade B, Schedule 40 pipe, Galvanized G90.

2. Sheet: ASTM A1008, ASTM A591 electrolytic zinc coated.

E. Stainless Steel:

1. Sheet: ASTM A480.

2. Posts: ASTM 6063.

3. Billets: ASTM A314.

F. Dimensional Signage:

1. Cast aluminum brushed

2. 2 inch deep stud mounts

3. Arial Bold

G. Sign Face: High impact polyester acrylate resins, pressure molded into a single polymerized component, using manufacturer’s co-molding process.

H. Tactile Graphics and Text: Provide tactile copy and grade 2 Braille raised 1/32 inch minimum from plaque surface using manufacturer’s co-molding process.

1. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated for size, style, spacing, content, position, and colors.

I. Colors: High contrast semi-matte integral colors for graphics. All integral resins are U.V. stabilized resins utilizing automotive grade pigments.

J. Traffic Regulatory Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following minimum requirements:

1. Steel Sheet: 0.0625 inch thick, painted.

K. Posts: As shown on the drawings.

1. 3 inch square aluminum tubing, painted.

2. 2 inch round standard pipe, galvanized.

L. Accessories:

1. Anchors and inserts: Provide hot-dipped galvanized anchors and inserts for exterior installations. Use toothed steel devices for drilled in anchors. Furnish inserts to be set into concrete or masonry work. Furnish galvanized through bolts for attachment to posts.

M. Letterforms: All letterforms and arrows shall be vinyl applied graphics. Clear film with printed graphics applied to the sign panel is not acceptable.

N. Symbol of accessibility: Adhesive Mylar symbol of main building access doors (3).

2.03 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Baked Enamel: Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating and painting.

D. Depth: 0.25-inch thickness.

E. Panel Appearance: Colors per 2016 CBC requirements.

F. Surface Texture: Matte Non-Glare.

G. Letter Style: Sans Serif.

2.04 FABRICATION

A. Design components to allow for expansion and contraction for a minimum material temperature range of 56 °C (100 °F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.

B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners whenever and wherever possible.

C. Shop fabricate so far as practicable. Joints fastened flush to conceal reinforcement, or welded where thickness or section permits.

D. Contact surfaces of connected members be true. Assembled so joints will be tight and practically unnoticeable, without use of filling compound.

E. Signs shall have fine, even texture and be flat and sound. Lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern. Plane surfaces be smooth flat

and without oil-canning, free of rack and twist. Maximum variation from plane of surface plus or minus 0.3 mm (0.015 inches). Restore texture to filed or cut areas.

F. Level or straighten wrought work. Members shall have sharp lines and angles and smooth surfaces.

G. Extruded members to be free from extrusion marks. Square turns and corners sharp, curves true.

H. Drill holes for bolts and screws. Conceal fastenings where possible. Exposed ends and edges mill smooth, with corners slightly rounded. Form joints exposed to weather to exclude water.

I. Coat aluminum exterior signs with low VOC acrylic polyurethane. Paint coatings are to be UV and graffiti resistant and able to maintain a consistent color and durability.

J. All painted surfaces properly primed. Finish coating of paint to have complete coverage with no light or thin applications allowing substrate or primer to show. Finished surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections. All exposed surfaces (front and back including edges) shall be painted.

K. All signs are to be constructed in a manner where front faces are free of exposed fasteners.

L. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

M. No signs are to be manufactured until final sign message schedule and location review has been completed by the Owner & forwarded to contractor.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.

B. Scheduling of installation by the client implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer’s acceptance of substrate and conditions.

3.02 INSTALLATION

A. Install product in accordance with supplier’s instructions.

B. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance.

C. Install product level, plumb, and at heights indicated.

D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.

E. Install signs within the following tolerances and in accordance with manufacturer's recommendations:

1. Interior Signs: Within 1/4 inch vertically and horizontally of intended location.

3.03 CLEANING AND PROTECTION

A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 5 feet.

B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner’s acceptance. Remove construction debris from project in accordance with provisions in Division 1.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish labor, materials, equipment and services to install stainless steel corner guards and related components as shown on the Drawings, as specified herein and as required for a complete and proper installation.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Manufacturer’s catalog cuts and data sheets, including installation details and instructions for specified item.

C. Shop Drawing: Length, attachment method and width.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store corner guards and fasteners in manufacturer’s original packaging, identified with manufacturer’s name and type of product, and size.

B. Store indoors, protected from moisture and other sources of damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards: Refer to Section 09 06 00, Schedule of Finishes.

B. Fasteners: Manufacturer’s standard, removable, corrosion-resistant fasteners of size and length suitable for the conditions of installation.

2.02 FABRICATION

A. General: Fabricate wall protection systems to comply with requirements indicated for design, dimensions, detail, finish and member sizes.

B. Preassemble components in shop as much as possible to minimize field assembly.

2.03 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applications and designations of finishes.

PART 3 EXECUTION

3.01 EXAMINATION

A. After application of wall base and finish painting of walls is complete, examine areas and conditions under which corner guards are to be installed.

B. If unsatisfactory conditions exist, do no proceed with the Work until such conditions have been corrected.

3.02 PREPARATION

A. Prior to application, clean side of corner guards that will be in contact with wall surface. Perform additional preparation procedures as required by manufacturer's instructions.

3.03 INSTALLATION

A. Install corner guards in strict accordance with manufacturer's instructions, using only approved mounting hardware, and locating all components firmly into position, level and plumb.

B. Install corner guards at locations shown on Drawings.

C. Install corner guards with bottom edge at top of wall base, extending to underside of ceiling.

3.04 ADJUSTING AND CLEANING

A. Prior to time of final acceptance, strip corner guards of protective coverings, and clean in accordance with manufacturer's instructions.

B. Remove and replace any defective, misaligned, or damaged units, at no additional cost to the Owner.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Furnish labor, materials, equipment and services to install toilet and related accessories and components as shown on the Drawings, as specified herein and as required for a complete and proper installation, including, but not limited to the following:

1. Toilet room accessories.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Accessories and their installation shall conform to applicable requirements for the disabled.

B. Design Criteria: Grab bars shall be capable of withstanding a force of 900 pounds, minimum, when installed in accordance with the manufacturer's instructions.

C. Accessories shall be the product of a single manufacturer unless otherwise specified.

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Manufacturer's descriptive and technical data and illustrations, marked to indicate specific product types, variations, and materials.

C. Shop Drawings: Indicate layouts and installation details necessary for proper preparation of toilet partitions and other construction supporting grab bars or other accessory items.

D. Test data or certification that grab bars meet the specified design criteria.

E. Maintenance data, operating instructions, and keys required for each type of accessory and lock.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Quality designation and guarantee label shall be attached to each mirror, or manufacturer's certification that mirrors meet specified requirements shall be submitted.

B. Protection:

1. Maintain protective coatings or coverings on units until installation is complete.

2. Remove protective coverings at final cleanup of installation.

C. Handle so as to prevent damage to finished surfaces.

D. Store materials in original protective packaging to prevent soiling, physical damage, or wetting.

1.06 PROJECT CONDITIONS

A. Coordinate submission of installation instructions so that backing, blocking, framing and formwork can be properly installed, and work of other trades will not be delayed.

1.07 WARRANTY

A. Warrant mirrors for 5 years against silver spoilage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Stainless Steel Sheet: ASTM A167, commercial grade, Type 304, standard gage.

B. Stainless Steel Tubing: ASTM A269, commercial grade, seamless welded.

C. Sheet Steel: ASTM A366, cold-rolled stretcher leveled; with G90 galvanized coating.

D. Mirrors: ¼ inch thick polished float glass, silver-coated and electrolytically copper-plated.

1. Protect edges with vinyl tape or other protective coating.

E. Adhesive: Epoxy type contact cement.

F. Attachment Devices: Hot dip galvanized; furnish backing plates, brackets, and hardware required for a complete installation as recommended by accessory manufacturer for component and substrate.

1. Fastening shall be concealed and theft-proof when available.

G. Locks: Provide locks and furnish keys for standard lockable items.

H. Grab Bars: 1-1/4 to 1-1/2 inches O.D., mandrel bent, with welded end flanges, exposed mounting, and peened or other approved safety-grip finish; anchor plates for each bar.

2.02 FINISHES

A. Provide manufacturer’s finish for each item indicated in accessory schedule, stainless-steel where available.

1. Where there are choices of available finishes, not including satin stainless steel, provide chart for Architect’s selection.

B. Exposed Finishes: Stainless steel No. 4, satin finish; satin chrome finish acceptable where stainless steel not available for accessory item scheduled.

2.03 ACCESSORY SCHEDULE

A. Model numbers indicated in the Schedule below are those of Bobrick Washroom Equipment, Inc. (unless noted otherwise) and are used to establish a standard of quality, utility. Equivalent products of other manufacturers may also be acceptable, subject to conformance with the requirements specified herein and indicated. All accessories brushed stainless steel, unless otherwise noted.

1. Provide one item for each location indicated on Drawings.

2. All items shall be satin finish, unless otherwise specified or indicated.

B. Schedule (itemized below as referenced on Drawings):

1. B-3944-130, Towel Mate – Semi Recessed combination towel dispenser waste receptacle (PTD).

2. B-3013 – Recessed Toilet-Seat-Cover Dispenser. (SCD)

3. B2888 – Surface Mounted Multi-Roll Toilet Tissue Dispenser. (TPD)

4. B-5806 – 1-1/4 inch (32mm) Diameter Stainless Steel Grab Bars with Snap-Flange Cover. (GB1, GB2)

5. B-165 – Mirror with Stainless Steel Channel Frame. Rectangular. (MR1)

6. B254 – Partition Mounted Sanitary Napkin Disposal. (SND)

7. B2112 – Surface Mounted 40 oz Soap Dispenser. (SD)

8. Robe Hook (RH)

2.04 FABRICATION

A. Corners: Weld and grind smooth; leave no open miters.

B. Form exposed surfaces from one sheet of stock, free of joints.

C. Provide steel anchor plates and anchor components for installation on building finish.

D. Form surfaces flat without distortion; maintain flat surfaces without scratches or dents.

E. Back paint components where contact is made with building finishes, to prevent electrolysis.

F. Hot-dip galvanize components; package complete with anchors and fittings.

G. Locked dispensing units: Key alike for all accessories.

PART 3 EXECUTION

3.01 EXAMINATION

A. Check openings scheduled to receive recessed units for correct dimensions, plumbness of blocking or frames, and preparation that would affect installation of accessories.

B. Check areas to receive surface-mounted units for conditions that would affect quality and execution of Work.

C. If unsatisfactory conditions exist, do not commence the installation until such conditions have been corrected.

3.02 INSTALLATION

A. Install accessories in locations and at heights indicated.

B. Install true, plumb and level, securely and rigidly anchor accessories to substrate in accordance with manufacturer's instructions.

C. Use tamper-proof, security type fasteners.

D. Attach grab bars to backing installed in wall to withstand loads prescribed by CBC.

E. Install accessories in strict dimensional tolerance to CBC and Accessibility codes, diagrams and standards.

3.03 ADJUSTMENT AND CLEANING

A. Remove protective coatings in accordance with the manufacturer's instructions.

B. Adjust accessories for proper operation.

C. After completion of installation, clean and polish all exposed surfaces.

D. Deliver keys and instruction sheets to the Owner’s Representative.

3.04 COMPLETION

A. When complete, accessories shall be set plumb and level, accurately aligned, and securely attached.

B. Exposed surfaces shall be clean and free from scratches, dents, tool marks, stains, discoloration, and other defects and damage.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This section covers recessed fire extinguisher cabinets.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Manufacturer's Literature and Data: Fire extinguisher cabinet including installation instruction and rough opening required.

C. Provide 3-dimensionsal signage at classroom extinguisher cabinets to allow for conspicuous location in accordance with CBC 906.6.

1.04 APPLICATION PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

A. American Society of Testing and Materials (ASTM):

D4802-10.....Poly (Methyl Methacrylate) Acrylic Plastic Sheet

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHER CABINET

A. Semi-Recessed type with flat trim. See Section 09 06 00 as reference.

2.02 FABRICATION

A. Form body of cabinet from 0.9 mm (0.0359 inch) thick sheet steel.

B. Fabricate door and trim from 1.2 mm (0.0478 inch) thick sheet aluminum with all face joints fully welded and ground smooth.

1. Glaze doors with 6 mm (1/4 inch) thick ASTM D4802, clear acrylic sheet, Category B-1, Finish

2. Design doors to open 180 degrees.

3. Provide continuous hinge, pull handle, and adjustable roller catch.

2.03 FINISH

A. Finish interior of cabinet body with baked-on semigloss white enamel.

B. Finish door, frame with manufacturer's standard clear satin anodized aluminum.

PART 3 EXECUTION

A. Install fire extinguisher cabinets in prepared openings and secure in accordance with manufacturer's instructions.

B. Install cabinet so that bottom of cabinet is 975 mm (39 inches) above finished floor.

C. Install signage as required to indicate obscured extinguisher locations.

END OF SECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Fixed blade extruded-aluminum exterior mounted louvered sunshades including attachment brackets and trim.

B. The drawings show the extent of the work, the dimensioned profile and depth of the sunshade to be provided.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: For exterior sunshades and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Manufacturer's Literature and Product Data:

1. Manufacturers standard details and fabrication methods.

2. Data on finishing, components, and accessories.

3. Instructions: Submit detail specifications and instructions for installation, and adjustments.

4. Recommendations for maintenance and cleaning of exterior surfaces.

D. Samples:

1. Two samples of anodized aluminum of each color showing finish and maximum shade range.

E. Structural Calculations: Submit analysis of shade connection to mounting bracket by a professional engineer considering design loads such as dead, live, snow, wind, thermal movement, and any collateral loads (e.g. light fixtures or signage) that my be mounted to sunshade.

1.04 QUALITY ASSURANCE

A. Approval by the Architect is required of products of proposed manufacturer, or supplier, and will be based upon submission by Contractor certification.

B. Certify manufacturer regularly and presently manufactures aluminum sun shading devices as one of their principal products.

C. Finish Warranty: Furnish manufacturer’s twenty (20) year limited warranty against adhesion loss, and standard ten (10) year limited warranty against gloss retention.

1.05 PERFORMANCE REQUIREMENTS

A. Design: Design sunshades, including comprehensive engineering analysis by a qualified engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Sunshades shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of sunshade components and mounting brackets, or permanent damage to fasteners and anchors.

1. Wind Loads: Determine loads based on a uniform pressure of 30 lb./sq. ft. (1435 Pa), acting perpendicular to sunshade surfaces.

C. Thermal Movements: Provide sun control system that allows for thermal movements resulting from a maximum change in ambient and surface temperature as indicated without buckling, overstressing of components, failure of connections, or other detrimental effects.

1. Temperature Range: 120° F (49° C) ambient and 180° F (82° C) at material surfaces.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver aluminum material to the site in packages or containers; labeled for identification with the manufacturer's name, brand and contents.

B. Store aluminum material in weather-tight and dry storage facility.

C. Protect from damage from handling, weather and construction operations before, during and after installation.

1.07 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society for Testing and Materials (ASTM):

B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate

B221-08.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

F468-10.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

F593-02(R2008).....Stainless Steel Bolts, Hex Cap Screws, and Studs

C. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series .....Metal Finishes Manual

D. American Architectural Manufacturer's Association (AAMA):

2604-10 .....High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels

E. American Welding Society (AWS):

D1.2-08 .....Structural Welding Code Aluminum

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum Extrusion Blades: ASTM B211, Alloy 6063-T5.

B. Aluminum Plate ASTM B211, Alloy 6061-T6.

C. Fasteners: Fasteners shall be stainless steel. Provide types, gauges and lengths to suit unit installation conditions.

D. Anchors and Inserts: Use non-Ferrous metal or hot dip galvanized anchors and inserts for installation and elsewhere as required for corrosion resistance. Use stainless steel or zinc galvanized expansion bolt devices for drill-in place anchors.

2.02 FABRICATION

A. Provide fixed Sunshades and accessories of design, material, sizes, depth, arrangement, and thickness as indicated or as required for optimal performance with respect to strength; durability; and uniform appearance.

B. Include supports, anchorage, and accessories required for complete assembly, including all attachment clips and necessary hardware for attachment to structure.

C. No blade fasteners shall be visible after installation of sections. Provide cover plates at each outrigger end to conceal fasteners. Only mounting hardware shall be visible after installation.

2.03 FIXED, EXTRUDED-ALUMINUM EXTERIOR SUNSHADES

A. Airfoil Profile Blade Louvered Sun Control System

1. Blade Profile: Airfoil

2. Blade Angle: horizontal

3. Blade Spacing: see drawings

4. Outrigger Thickness: Not less than 0.125 inch (2.54 mm) for structural shapes, not less than 0.25 inch (6.35 mm) for flat materials.

2.04 SUNSHADE CONSTRUCTION

A. Components

1. All fascia and blades shall be 6063-T5 aluminum-extruded members.

a. Blade infill shall be custom designed with integral screw boss that is hidden from view visible after installation. Size and spacing is to be as shown on the architectural details.

b. Blades to be miter cut and fitted to outrigger plates at mitered corner conditions.

2. Outrigger components shall be 6061-T6 aluminum plates.

a. Outriggers shall be tapered or shaped aluminum flat plates, screwed to aluminum extrusion blades via countersunk fastener holes. Connections of aluminum extrusions to outriggers should be flush with no protruding fasteners visible after installation. Outriggers are pre-drilled for mounting to the structural sunshade clip tab via stainless steel expansion slip connection to compensate for thermal expansion.

3. Clip brackets shall be of carbon steel.

a. Connection of sunshade to building shall be friction type with the ability to properly level the shade during installation.

4. Outrigger cover plates shall be furnished of 6061-T6 aluminum plates at each end of sunshade run to cover extrusion fasteners.

B. Assembly: Components to be shop assembled in large practical sections to allow for immediate installation. Sections indicated on shop drawings to be assembled and shipped as units with cover plates and support arms, if required, shipped loose.

1. Fasteners shall be bagged in groups clearly identifying bolt locations and bag contents for easy installation. Manufacturer to provide anti-seze compound for any field bolted stainless hardware to facilitate proper erection.

2.05 ALUMINUM FINISH FOR SHADES

A. NAAMM "Metal Finishes Manual" Chapter 1 NAMM-2604-05. Apply finishes in factory after product assembly. Remove scratches and blemishes from exposed surfaces, which will be visible after completing finishing process.

B. Factory applied super durable powder coating. Finish shall have enhanced resistance to fading, chalking, gloss retention that meets or exceeds AAMA 2604.

C. Pretreatment

1. Manufacturer to pre-sand, sandblast, or timesave all surfaces to be painted in a linear direction.

2. Applicator to pretreat the aluminum with solutions to remove organic an dinorganic surface slils, remove residual oxides, followed by an optional chrome

phospahate conversion coating – at minimum 30mg/ft2 – to ensure adhestion of paint to the aluminum (AAMA 6.0).

D. Application: One primer coat, one color coat, for a minimum of 1.2 mills of dry film thickness.

E. Color: See section 09 06 00.

2.06 STEEL CLIP FINISH

A. General: Comply with NAAMM "Metal Finishes Manual" Chapter 4. Apply finishes in factory after product assembly. Remove scratches and blemishes from exposed surfaces, which will be visible after completing finishing process.

B. Factory applied super durable powder coating. Finish shall have enhanced resistance to fading, chalking, and loss of gloss that meets or exceeds AAMA 2604.

C. Pretreatment:

1. Manufacturer to degrease parts to remove any dirt, oils, or other debris.

2. Applicator to pretreat with a chrome phospahate conversion coating – at minimum 30mg/ft2 – to ensure proper adhesion to metal surface (AAMA 6.0).

D. Application: One coat epoxy zinc rich primer, one color coat, for a minimum 1.2 mills of dry film thickness.

E. Color: Provide color as indicated to match sunshade.

F. Finish Warranty: Furnish manufacturer’s twenty (20) year limited warranty against adhesion loss, and standard ten (10) year limited warranty against gloss retention.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation of the work.

B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated, and fitted to the structure.

C. Anchor Sunscreen to building substructure as indicated on the sunshade shop drawings. Use concealed anchorages where possible, with locations as directed by manufacturer instructions.

D. Erection Tolerances:

1. Clips or Mounting Brackets:

a. Elevation clip Variation from level: 1/8" maximum in any column to column space or 20'-0" runs, non-cumulative.

b. Offsets in projection of clips front leading edge 1/16"+/-.

c. Veneer or Wall construction tolerance around clip projection. 1/4”+ outward.

d. Clip Plumbness: 1/16” in 6”

e. Clip projection level: 1/16” in 12”

2. Shade Sections

a. Projection Level: 1/8” in 4’-0”

b. Horizontal Level: 1/8” max in any column to column space or in 20’-0” runs, non-cumulative.

c. Shade section to section variation 1/32” at adjoining sections.

E. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.

F. Set units level, plumb and true to line, with uniform joints.

3.02 Cleaning

A. Clean exterior sunshades surfaces to prevent buildup of dust and debris. Clean sunshades as outlined in AAMA 609/610-02, “Cleaning and Maintenance Guide for Architecturlly Finishes Aluminum” or NAAM Metal Finishes Manual “Cleaning Procedures” 1-13/1-14.

B. Remove all mastic smears and other unsightly marks, and repair any damaged or disfiguration of the work. Protect the installed work against damage or abuse.

3.03 Protection

A. Protect Sunshade materials after installation to prevent damage by other trades. Special attention shall be taken to ensure no equipment or personell stands on top of sunshade system, nor sunshade system is used to hang any type of tarp or similar barricade or signage other than the design intent.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Cloth shades are specified in this section. Blinds shall be furnished complete, including brackets, fittings and hardware. Wireless motorized operation.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Samples:

1. Shade cloth, each type, 600 mm (24 inch) square, including cord and ring, showing color, finish and texture.

C. Manufacturer's literature and data; showing details of construction and hardware for: Cloth window shades and Vertical blinds.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualification: Blind manufacturer shall provide evidence that the manufacture of blinds are a major product, and that the blinds have performed satisfactorily on similar installations.

1.05 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced to in the text by the basic designation only.

B. Prior Specifications (Fed. Spec.):

AA-V-00200B ..... Venetian Blinds, Shade, Roller, Window, Roller, Slat, Cord, and Accessories

C. American Society for Testing and Materials (ASTM):

A167-99 (R2009)..... Stainless and heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

B221/B221M-08 ..... Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

D635-10 ..... Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position

D648-07 ..... Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position

D1784-08 ..... Rigid Poly (Vinyl Chloride) (PVS) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

PART 2 PRODUCTS

1.01 MATERIALS – ROLLER SHADES

A. Basis of Design: Hunter Douglas, Designer Roller Shades, Cordless mannal

B. Shade Cloth: translucent.

C. Staples (For Cloth Window Shades): Nonferrous metal or zinc-coated steel.

D. Stainless Steel: ASTM A167

E. Extruded Aluminum: ASTM B221/B221M.

F. Colors; See Section 09 06 00.

1.02 FABRICATION – ROLLER SHADES

A. Fabricate shades to fit measurements of finished openings obtained at site.

B. Cloth Window Shades: Rolling type, constructed of shade cloth mounted on rollers. Shade cloth shall have plain sides, and with hem at bottom to accommodate wood slat. Separate shades are required for each individual sash within opening. Length of shades shall exceed height of window approximately 300 mm (12 inches) measured from head to sill, in addition to material required to make-up hem:

C. Provide rollers with spindles, nylon bearings, tempered steel springs, and all other related accessories required for positive action. Provide rollers of diameter recommended by shade manufacturer. Staple shade cloth to wood rollers to prevent wrinkling or folding, and on line parallel to axis of rollers so that shade will hang plumb. Space staples not over 90 mm (3-1/2 inches) on centers. Use of tacks is prohibited.

D. Eyelets shall have clear openings large enough to accommodate cords. Edges of eyelets shall not cut into cloth when set.

PART 3 EXECUTION

1.01 INSTALLATION

A. Cloth Window Shades: Mount window shades on end of face brackets, set on metal gussets, or casing of windows as required. Provide extension face brackets where necessary at mullions.

1. Locate rolers in level position as high as practicable at heads of windows to prevent infiltration of light over rollers.

2. Where extenstion brackets are necessary, on mullions or elsewhere, for alignment of shades, provide metal lugs, and rigidly anchor lugs and brackets.

3. Place brackets and rollers so that shades will not interfere with window and screen hardware.

4. Shade installation methods not specifically described, are subject to approval of the Owner.

5. Install one roller shade per curtain wall lite and per interior vertically glazed lite. Except spandrel glass.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Provide seismic restraint in accordance with the requirements of this section in order to maintain the integrity of nonstructural components of the building so that they remain safe and functional in case of seismic event.

B. Definitions: Non-structural building components are components or systems that are not part of the building's structural system whether inside or outside, above or below grade. Non-structural components of buildings include:

1. Electrical Elements: Power and lighting systems; selector and controller panels; fire protection and alarm systems; and telephone and communication systems.

2. Mechanical Elements: Heating, ventilating, and air-conditioning systems; roof drainage piping; sprinkler systems.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY CONTROL

A. Shop-Drawing Preparation:

1. Have seismic-force-restraint shop drawings and calculations prepared by a professional structural engineer experienced in the area of seismic force restraints. The professional structural engineer shall be registered in California.

2. Submit design tables and information used for the design-force levels, stamped and signed by a professional structural engineer registered in California.

B. Coordination:

1. Do not install seismic restraints until seismic restraint submittals are approved by the Owner.

2. Coordinate and install trapezes or other multi-pipe hanger systems prior to pipe installation.

C. Seismic Certification: Permanent equipments and components are to have Special Seismic Certification in accordance with requirements of section 13.2.2 of ASCE 7, and shall comply with section 13.2.6 of ASCE 7.

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Submit a coordinated set of equipment anchorage drawings prior to installation including:

1. Description, layout, and location of items to be anchored or braced with anchorage or brace points noted and dimensioned.

2. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, bolts, welds etc. clearly identified and specified.

3. Numerical value of design seismic brace loads.

4. For expansion bolts, include design load and capacity if different from those specified.

C. Submit prior to installation, a coordinated set of bracing drawings for seismic protection of piping, with data identifying the various support-to-structure connections and seismic bracing structural connections, include:

1. Single-line piping diagrams on a floor-by-floor basis. Show all suspended piping for a given floor on the same plain.

2. Type of pipe (Copper, steel, cast iron, insulated, non-insulated, etc.).

3. Pipe contents.

4. Structural framing.

5. Location of all gravity load pipe supports and spacing requirements.

6. Numerical value of gravity load reactions.

7. Location of all seismic bracing.

8. Numerical value of applied seismic brace loads.

9. Type of connection (Vertical support, vertical support with seismic brace etc.).

10. Seismic brace reaction type (tension or compression): Details illustrating all support and bracing components, methods of connections, and specific anchors to be used.

D. Submit prior to installation, bracing drawings for seismic protection of suspended ductwork and suspended electrical and communication cables, include:

1. Details illustrating all support and bracing components, methods of connection, and specific anchors to be used.

2. Numerical value of applied gravity and seismic loads and seismic loads acting on support and bracing components.

3. Maximum spacing of hangers and bracing.

4. Seal of registered structural engineer responsible for design.

E. Submit design calculations prepared and sealed by the registered structural engineer specified above in paragraph 1.03A.

1.05 APPLICABLE PUBLICATIONS

A. The Publications listed below (including amendments, addenda revisions, supplements and errata) form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only.

B. American Society of Civil Engineers (ASCE 7) Latest Edition.

C. California Building Code (CBC) 2019

E. National Uniform Seismic Installation Guidelines (NUSIG)

F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Seismic Restraint Manual - Guidelines for Mechanical Systems, 1998 Edition and Addendum

1.06 REGULATORY REQUIREMENT

A. CBC, 2019.

B. Exceptions: The seismic restraint of the following items may be omitted:

1. Equipment weighing less than 400 pounds, which is supported directly on the floor or roof.

2. Equipment weighing less than 20 pounds, which is suspended from the roof or floor or hung from a wall.

3. Gas piping less than 2 ½ inches inside diameter.

4. Piping in boiler plants and equipment rooms less than 1 ¼ inches inside diameter.

5. All other piping less than 2 ½ inches inside diameter, except for automatic fire suppression systems.

6. All piping suspended by individual hangers, 12 inches or less in length from the top of pipe to the bottom of the support for the hanger.

7. All electrical conduits, less than 2 ½ inches inside diameter.

8. All rectangular air handling ducts less than six square feet in cross sectional area.

9. All round air handling ducts less than 28 inches in diameter.

10. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of support for the hanger.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 CONSTRUCTION, GENERAL

A. Provide equipment supports and anchoring devices to withstand the seismic design forces, so that when seismic design forces are applied, the equipment cannot displace, overturn, or become inoperable.

B. Provide anchorages in conformance with recommendations of the equipment manufacturer and as shown on approved shop drawings and calculations.

C. Construct seismic restraints and anchorage to allow for thermal expansion.

3.02 EQUIPMENT RESTRAINT AND BRACING

A. See drawings for equipment to be restrained or braced.

3.03 MECHANICAL DUCTWORK AND PIPING; ELECTRICAL BUSWAYS, CONDUITS, AND CABLE TRAYS; AND TELECOMMUNICATION WIRES AND CABLE TRAYS

A. Support and brace mechanical ductwork and piping; conduits and cable trays; and telecommunication wires and cable trays to resist directional forces (lateral, longitudinal and vertical).

B. Brace duct and breeching branches with a minimum of 1 brace per branch.

C. Provide supports and anchoring so that, upon application of seismic forces, piping remains fully connected as operable systems which will not displace sufficiently to damage adjacent or connecting equipment, or building members.

D. Piping Connections: Provide flexible connections where pipes connect to equipment. Make the connections capable of accommodating relative differential movements between the pipe and equipment under conditions of earthquake shaking.

3.04 CEILINGS AND LIGHTING FIXTURES

A. At regular intervals, laterally brace suspended ceilings against lateral and vertical movements, and provide with a physical separation at the walls.

B. Independently support and laterally brace all lighting fixtures.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Holeless Hydraulic Elevator for a full and complete code compliant and operational elevator and associated building systems, including electrical, mechanical, fire protection, plumbing, shaft, structural and special systems.

B. Products Supplied But Not Installed Under this Section:

1. Pit Ladder

2. Inserts mounted in concrete walls at pit and steel tube column supports at shaft partition walls for rail attachments.

3. Any additional items required to meet operation and code requirements.

C. Work Supplied Under Other Sections:

1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.

2. Hoistway ventilation shall be in accordance with local and national building code requirements.

3. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.

4. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.

5. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway.

6. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version.

7. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.

8. Electrical service and disconnects.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 INDUSTRY AND GOVERNMENT STANDARDS:

A. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities

B. ADAAG - Accessibility Guidelines for Buildings and Facilities

C. ANSI/NFPA 70, National Electrical Code

D. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows

E. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

F. CBC, California Building Code, 2019

G. American Society of Mechanical Engineers (ASME)

A17.2.....Inspectors Manual for Electric Elevators and Escalators

H. National Fire Protection Association:

NFPA 72.....National Fire Alarm and Signaling Code

NFPA 252.....Fire Test of Door Assemblies

1.04 DESCRIPTION OF ELEVATOR

A. Elevator Equipment: Holeless Hydraulic Elevator

B. Equipment Control: Per selected manufacturer

C. Quantity of Elevators: 1

D. Landings: 2

E. Openings: 2 Front Openings

F. Travel: 13 feet 5 inches

G. Rated Capacity: 2500 lbs

H. Rated Speed: 100 fpm

I. Clear Inside Dimensions (W x D): Per plan

J. Cab Height: 8' 0"

K. Clear height under suspended ceiling: Cab Height + 60" to Max 16

L. Entrance Width and Type: Side per plan

M. Entrance Height: 7' 0" Entrance Width: 3’ 0” minimum

N. Main Power Supply: 208, 480 Volts + 10%, three-phase, per electrical drawings controls specification.

O. Operation: Simplex

P. Machine Location: Machine Room

Q. Control Space Location: Machine Room

R. Maintenance Service Period: 12 months

1.05 PERFORMANCE REQUIREMENTS

A. The elevators shall be capable of meeting the highest standards of the industry and specifically the following:

1. Contract speed is high speed in either direction of travel with rated capacity load in the elevator. Speed variation under all load conditions, regardless of direction of travel, shall not vary more than five (5) percent.

2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per second and the maximum acceleration and retardation shall not exceed 0.2G per second.

3. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration.

B. The door operator shall open the car door and hoistway door simultaneously at 2.5-feet

C. Floor level stopping accuracy shall be within 3 mm (1/8 in.) above or below the floor, regardless of load condition.

D. System Performance

1. Vertical Vibration (maximum): 15-17 mg

2. Horizontal Vibration (maximum): 10-12 mg

3. Jerk Rate (maximum): 3.3 – 5.25 ft/sec3

4. Acceleration (maximum) 1.6 – 2.6 ft/sec2

5. In Car Noise: = 55 dB(A)

6. Leveling Accuracy: ±0.1 inches

7. Starts per hour (maximum): 240

1.06 SUBMITTALS

A. Comply with Section 01 13 00 - Submittal Procedures.

B. Product Data: Submit manufacturer's product literature for each proposed system.

1. Cab design, dimensions and layout.

2. Layout, finishes, and accessories and available options.

3. Controls, signals and operating system.

4. Color selection charts for cab and entrances.

5. Furnish certificates as required under: Paragraph "QUALIFICATIONS".

C. Shop Drawings:

1. Clearances and travel of car.

2. Clear inside hoistway and pit dimensions.

3. Location and layout of equipment and signals.

4. Car, guide rails, buffers and other components in hoistway.

5. Maximum rail bracket spacing.

6. Maximum loads imposed on building structure.

7. Hoist beam requirements.

8. Location and details of hoistway door and frames.

9. Electrical characteristics and connection requirements.

10. Controller

11. Starters and Overload Current Protection Devices.

12. Electric Door Operator; HP rating and RPM of motor.

13. Hoistway Door Interlocks.

14. Car Buffers; maximum and minimum rated load, maximum rated striking speed and stroke.

15. Cab Ventilation Unit; HP rating and CFM rating.

16. Sill details including sill support.

17. Door operator, infrared curtain units.

18. Cuts or drawings showing details of controllers and supervisory panels.

D. WIRING DIAGRAMS

1. Provide three complete sets of field wiring and straight line wiring diagrams showing all electrical circuits in the hoistway, machine room and fixtures. Install one set coated with an approved plastic sealer and mounted in the elevator machine room as directed by the Owner.

2. In the event field modifications are necessary during installation, diagrams shall be revised to include all corrections made prior to and during the final inspection. Corrected diagrams shall be delivered to the Owner within 30 days of final acceptance.

3. Provide the following information relating to the specific type of microprocessor controls installed:

   a. Owner's information manual, containing job specific data on major components, maintenance, and adjustment.

   b. System logic description.

   c. Complete wiring diagrams needed for field troubleshooting, adjustment, repair and replacement of components. Diagrams shall be base diagrams, containing all changes and additions made to the equipment during the design and construction period.

   d. Changes made during the warranty period shall be noted on the drawings in adequate time to have the finalized drawings reproduced for mounting in the machine room no later than six months prior to the expiration of the warranty period.

E. Operation and maintenance data:

1. Provide manufacturer's standard maintenance and operation manual.

F. Diagnostic Tools

1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor. In those cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the competed project During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacement for the tool at no additional cost to the Owner. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and install by the Elevator Contractor. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.

1.07 QUALITY ASSURANCE

A. Manufacturer: Minimum of fifteen years experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.

B. Installer: The equipment manufacturer shall install the elevator.

C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.

1.08 DELIVERY, STORAGE AND HANDLING

A. Comply with manufacturer’s recommendations for delivery, storage and handling.

1.09 WARRANTY

A. Submit all labor and materials furnished in connection with elevator system. The one year Warranty shall commence after final inspection, completion of performance test, and upon full acceptance of the installation and shall concur with the guarantee period of service.

1.10 MAINTENANCE SERVICE

A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 months

after date of substantial completion. Replacement parts shall be produced by the original equipment manufacturer.

B. Maintenance service be performed during regular working hours of regular working days and shall include emergency 24-hour call back service.

C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Provide holeless hydraulic elevator systems subject to compliance with the design and performance requirements of this specification.

1. Other acceptable holeless hydraulic elevator manufacturer with minimum 15 years experience in manufacturing, installing, and servicing elevators of the type required for the project.

2.02 PUMP UNIT ASSEMBLY

A. Completely integrate the pump unit for the control of the elevator and self-contain in a unit fabricated of structural steel. The unit shall consist of a hydraulic fluid pump driven by an induction motor together with oil control valves, piping, etc. Enclose unit on four open sides of the power unit frame with not less than 16 gauge steel removable panel sections. Provide a minimum 50 mm (2 in.) air space between the top of the panels and bottom of tank. Line panels on the interior side with one-inch rigid acoustical insulation board.

B. Control valves shall be electronically controlled. Hydraulic fluid flow shall be controlled to insure speed variation of not more than five (5) percent under all load conditions.

C. Hydraulic system working pressure shall not exceed 500 psi under any load condition.

D. Pump shall be positive displacement, rotary screw type, specifically designed for hydraulic elevator service, having a steady discharge without pulsation to give smooth and quiet operation. Pump output shall be capable of lifting elevator car with rated capacity, with a speed variation of no more than five (5) percent between no load and full load. Pump shall operate under flooded suction in an accurately machined case with the clearance required to assure maximum efficiency. Hydraulic fluid by-pass shall discharge directly into storage tank.

E. Motor shall be squirrel-cage, drip proof, ball bearing, and induction type, with a synchronous speed not in excess of 1800 RPM. Design motor specifically for elevator service, not to exceed nameplate full load current by more than 10% and be continuously rated 120 starts per hour without exceeding a rise of 40 degrees C. Include closed transition SCR soft start.

F. Connect motor and pump with multiple V-belt. Size belts and sheaves for duty involved and design to prevent any metallic contact between motor and pump shaft. Provide isolation units of rubber in shear to prevent transmission of pump and motor vibration to the building. Install expanded metal sheave guard that can be easily removed for servicing and inspection.

G. Hydraulic equipment may be installed within the oil storage tank if applicable for elevator size, speed, and duty rating.

H. Design motor, pump, tank, and piping to accommodate future travel, if specified.

2.03 HYDRAULIC SYSTEM

A. Construct the storage tank of sheet steel, welded construction, and a steel cover with suitable means for filling, a minimum one-inch protected vent opening, an overflow connection, and a valve drain connection. Tank shall act as a storage tank only, and sized to pass through machine room door as shown on drawings. Provide marked gauge to monitor hydraulic fluid level. Tank shall be of capacity to hold volume of hydraulic fluid required to lift elevator to top terminal landing, plus a reserve of not less than ten gallons. Provide a baffle in the bottom of the tank to prevent entry of any sediment or foreign particles into hydraulic system. Baffle shall also minimize aeration of hydraulic fluid. Permissible minimum hydraulic fluid level shall be clearly indicated. Hydraulic fluid shall be of good grade to assure free flow when cool, and have minimum flash point of 400 degrees F. Provide initial supply of hydraulic fluid for operation of elevator.

1. Thermostatically control the viscosity of the hydraulic fluid with thermal cooling unit and temperature thermostat to maintain the fluid temperature in the reservoir, pump and valves at a constant operating viscosity.

2. Provide a data plate on the tank framing indicating the characteristics of the hydraulic fluid used.

B. Furnish and install connections between the storage tank, pump, muffler, operating valves, and cylinder complete with necessary valves, pipe supports, and fittings. All connections between the discharge side of the pump, check valve, muffler, cylinder, lowering valves shall be of schedule 40 steel with threaded, flanged, or welded mechanical couplings. Size of pipe and couplings between cylinder and pumping unit shall be such that fluid pressure loss is limited to 10 percent.

C. Do not subject valves, piping, and fittings to working pressure greater than those recommended by the manufacturer.

D. Support all horizontal piping. Place hangers or supports within 305 mm (12 in.) on each side of every change of direction of pipeline and space supports not over 3.0 meters (10 ft) apart. Secure vertical runs properly with iron clamps at sufficiently close intervals to carry weight of pipe and contents. Provide supports under pipe to floor.

1. Provide all piping from machine room to hoistway, including necessary supports or hangers. If remote piping is underground or in damp inaccessible areas, install hydraulic piping thru PVC sleeve pipe.

E. Install pipe sleeves where pipes pass through walls or floors. Set sleeves during construction. After installation of piping, equip the sleeves with snug fitting inner liner of either glass or mineral wool insulation.

F. Install blowout-proof, non-hammering, oil-hydraulic muffler in the hydraulic fluid supply pressure line near power unit in machine room. Design muffler to reduce to a minimum any pulsation or noises that may be transmitted through the hydraulic fluid into the hoistway.

G. Arrange control valves to operate so hydraulic fluid flow will be controlled in positive and gradual manner to ensure smooth starting and stopping of elevator.

H. Provide safety check valve between cylinder and pump connection which will hold elevator with specified load at any point when pump stops or pressure drops below minimum operating levels.

I. Provide an automatic shut-off valve in the oil supply line at the cylinder inlet. Weld pipe protruding from cylinder at inlet and thread to receive shut-off valve. Activate the automatic shut-off valve when there is more than a ten percent increase in high speed in the down direction. When activated, this device shall immediately stop the descent of the elevator, and hold the elevator until it is lowered by use of the manual lowering feature of the valve. Arrange the manual lowering feature of the automatic shut-off valve to limit the maximum descending speed of the elevator to 15 fpm. The exposed adjustments of the automatic shut-off valve shall have their means of adjustment sealed after being set to their correct position.

J. Provide external tank shut-off valve to isolate hydraulic fluid during maintenance operations.

K. Provide all pump relief and other auxiliary valves to comply with the requirements of the ASME A17.1 Section 3.19 and to insure smooth, safe, and satisfactory operation of elevator.

L. Furnish and adjust by-pass and relief valve in accordance with ASME A17.1 Rule 3.19.4.2.

M. Install check valve to hold the elevator car with rated load at any point when the pump stops.

N. Provide shut-off valves in the pit near the cylinder and in the machine room capable of withstanding 150 percent of design operating pressure. Each manual valve shall have an attached handle.

O. Conveniently locate the manual lowering valve, easily accessible, and properly identified with a red arrow and not concealed within the storage tank. Mark the operating handle in red.

P. Provide a low oil control feature which shall shut off the motor and pump and return the elevator to the lowest landing. Upon reaching the lowest landing, doors will open automatically allowing passengers to leave the car. Then doors shall close. All control buttons, except the door open button, shall be made ineffective.

Q. Provide oil-tight drip pan for assembled pumping unit, including storage tank. Pan shall be not less than 16 gauge sheet steel, with one-inch sides.

R. The entire hydraulic system, including muffler, shall be tested to withstand a pressure equal to twice the calculated working pressure.

S. Submit certification that test has been performed.

2.04 EQUIPMENT: HOISTWAY COMPONENTS

A. Materials, devices and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items. Items not meeting this requirement, but meet technical specifications which can be established through reliable test reports or physical examination of representative samples, will be considered.

B. When two or more devices of the same class of materials or equipment are required, these units shall be products of one manufacturer.

C. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for the final assembled unit.

D. Motor nameplates shall state manufacturers' name, rated horsepower, speed, volts, amperes and other characteristics required by NEMA Standards and shall be securely attached to the item of equipment in a conspicuous location.

E. The elevator equipment, including controllers, door operators, and supervisory system shall be non-proprietary, the product of manufacturers of established reputation, provided such items are capably engineered and produced under coordinated specifications to ensure compatibility with the total operating system. Mixing of manufactures related to a single system or group of components shall be identified in the submittals.

F. Where key operated switches are furnished in conjunction with any component of this elevator installation, furnish four (4) keys for each individual switch or lock. Provide different key tumblers for different switch and lock functions. Each and every key shall have a tag bearing a stamped or etched legend identifying its purpose. Barrel key switches are not acceptable, except where required by code.

2.05 EQUIPMENT: HOISTWAY COMPONENTS

A. Buffers: Car and Counterweight

B. Hoistway Operating Devices:

1. Emergency stop switch in the pit

2. Terminal stopping switches.

3. Emergency stop switch on the machine

C. Positioning System: System consisting of magnets and proximity switches.

D. Guide Rails and Attachments: Steel rails with brackets and fasteners.

E. The counterweight frame will be equipped with a safety device designed to stop the counterweight in the event of actuation of the over speed governor.

2.06 EQUIPMENT: HOISTWAY ENTRANCES

A. Hoistway Entrances

1. Frames: Sheet steel, bolted construction.

2. Typical Sill Finish: Mill Aluminum

3. Lobby Sill Finish: Mill Aluminum

4. Doors: Hollow metal construction with vertical internal channel reinforcements.

5. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.

6. Lobby Entrance Finish: Stainless Steel

7. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors.

8. Plate Mounting: Refer to manufacturer drawings.

2.07 EQUIPMENT: CAR COMPONENTS

A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.

B. Car Safeties: Device will be provided and mounted under the car platform, securely bolted to the Car Frame. The safety will be actuated by a centrifugal governor mounted at the top of the hoistway. The Safety is designed to operate in case the car attains excessive descending speed.

C. Platform, Heavy Loading Type: The car platform shall be arranged to accommodate one-piece loads weighing up to 25% of the rated capacity.

D. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each roller guide assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.

E. Canopy: Reinforced 16-guage milled steel. White baked enamel finish standard.

F. Cab Finish:

1. Car Wall Panels: Plastic Laminate

2. Baseboard: Stainless Steel - Satin

3. Ceiling and Lighting:

a. Round LED Down Light Drop Ceiling - LF-88: Satin Finished Stainless Steel three panel suspended ceiling with two holes per panel for Round LED lights.

7. Handrail:

a. Flat Solid Metal handrail of 3/8-inch thick by 4 inches tall. Material to be satin stainless steel finish. Rails to be located on side and back wall of car enclosure.

8. Flooring: Flooring per Schedule for Finishes.

9. Threshold: Aluminum

10. Protective pad hooks and quilted fire retardant protective pads: Pad Buttons will be provided with non-suspended ceiling.

11. Provide electrical contact on the car-top exit.

G. Emergency Car Signals

1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.

2. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the

elevator car and provide current to the alarm bell in the event of building power failure.

H. Ventilation: Fan.

2.08 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: Provide vandal resistant car operating panel with all push buttons, key switches, and message indicators for elevator operation.

1. Flush mounted car operating panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have white illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be white DOT-matrix. All texts, when illuminated, shall be white. The car operating panel shall have a brushed stainless steel finish.

2. Additional features of car operating panel shall include:

a. Car Position Indicator within operating panel white.

b. Elevator Data Plate marked with elevator capacity and car number on car top.

c. Help buttons with raised markings.

d. In car stop switch per local code.

e. Firefighter's hat.

f. Firefighter's Phase II Key-switch.

g. Call Cancel Button.

h. Emergency Two Way Communication Device

i. Independent Service

j. Firefighter's Phase II emergency in-car operating instructions.

k. Landing Passing Signal

B. Hall Fixtures: Wall mounted vandal resistant hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Wall mounted hall fixtures shall have a brushed stainless steel finish.

1. Vandal Resistant Hall fixtures shall feature round, mechanical, illuminated buttons in flush fixture housings. Hall fixtures shall correspond to options available from that landing.

C. Emergency Two Way Communication Device: An Emergency Two Way Communication device shall be furnished in the car-operating panel. Necessary wires for the device shall be included and connected to the car traveling cable.

1. Provide ADA compliant communication device. Communications equipment and connections to the building service system shall be furnished and installed by others.

D. Car Lantern and Chime: A [vandal resistant] directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound. The chime will sound once for up and twice for down.

G. Hall call cutout key-switches to disable activation of hall buttons, locate at landing

H. Access key-switch at top floor in entrance jamb.

I. Access key-switch at lowest floor in entrance jamb.

J. Landing Passing Signal: A chime bell shall sound in the car to tell a passenger that the car is either stopping at or passing a floor served by the elevator.

K. Auxiliary car operating panel (Option only available with center opening and rear door arrangements)

L. Vandal Resistant Auxiliary car operating panel shall have a Scottish Quad Textured Stainless Steel finish (Option only available with center opening and rear door arrangements)

M. Open 3 seconds, fully open.

2.09 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation: Provide microprocessor-based control system, which utilizes on-board diagnostics for servicing, trouble-shooting, and adjusting without requiring the use of an outside service tool. If an on-board diagnostic system is not provided, a handheld service tool (or laptop), owner's license, operation manual, and tool instructions must be provided in addition to the control system.

1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

B. Car Operating Features

1. On/Off Light Switch

2. Car-Stall Protection

3. Firefighters

4. Ascending Car uncontrolled Movement Protection.

5. Top of Car Inspection

6. Load Weight Bypass

7. Intercom provisions.

8. Provision for Card Reader in Car (Future Card Reader)

9. Express Priority Service with key switches at landing

10. Emergency Hospital Service

11. Provisions for Elevator Management System

12. Automatic Standby Power Operation with Manual Override.

    a. This operation shall return each car automatically to a designated landing when the system is initially switched to standby power. One or more cars are returned at a time. Preference is given to loaded cars over empty cars in order to reduce passenger-waiting times. A car must respond by beginning to move toward the designated landing within a pre-determined time. If a car does not respond, it is automatically placed in a "Not Available" mode while other cars are moved. If a car was not returned to the designated landing on the first try, a second attempt is made. If the second attempt is not successful, the car will remain in a "Not Available" mode and can only be moved by manual means. Once each car has returned to the designated landing, the doors will remain open for a predetermined amount of time.

    b. When all cars have successfully returned to the designated landing or have attempted to move twice, automatic selection of the car(s) to run on normal operation will occur.

    c. If for any reason a car selected for normal operation under stand by power is delayed for 60 seconds, the car will be placed in a "Not Available" mode and another car will be selected for normal operation based on the priorities listed above.

    d. Manual Override of Standby Power Operation is achieved by a manual input for each car via a rotary selector, individual key switch for each car switch. A manually selected car may be run either in a return operation to a designated landing or in normal operation under standby power. If a manually selected car has not yet returned to the designated landing, it will perform this operation first then immediately go into normal operation.

    e. If a manually selected car is delayed, no other car can be selected in the group unless it is manually selected.

    f. If Manual Override changes car selection while a car is running in return or normal operation under standby power, the newly selected car will not be permitted to run until the car that is running has stopped, opened its doors, and gone into the Standby Power Wait state.)

C. Elevator Control System for Inspections and Emergency

1. Provide devices within controller to run the elevator in inspection operation.

2. Provide devices on car top to run the elevator in inspection operation.

3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.

4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.

5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.

6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.

7. Provide the means for the control to reset elevator earthquake operation.

2.10 EQUIPMENT: DOOR OPERATOR AND CONTROL

A. Door Operator: A closed loop permanent magnet PWM high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.

B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.

C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.

D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.

E. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

2.11 TWO-STOP AUTOMATIC OPERATION

A. Provide two-stop automatic operation for passenger elevators.

B. Design system so that when the car is standing at either terminal landing, pressing on car button for the other terminal landing shall automatically dispatch car to that landing. Pressing a call button at either landing shall call the car automatically to that landing. If a call is registered while the car is making its trip that call shall remain registered until the car responds to that call. Provide time limit relay arranged to hold car at landing at which it has stopped for predetermined time after car stops. After all car and hall calls have been answered, car shall remain parked at landing where last used with car and hoistway doors closed, until another call is registered.

C. Pressing the call button at the floor at which car is parked shall automatically open car and hoistway doors.

D. Car lights and fan in the elevator shall not shut off when elevator is idle. Arrange circuits so that power to lights and outlets on top and bottom of car shall not be interrupted.

2.12 SEISMIC REQUIREMENTS

A. Support and maintain pump unit, controller, rails, rail brackets, conduit, buffers, piping, scavenger pumps and jack unit assembly in place as to effectively prevent any part from sliding, rotating or overturning or jumping under conditions imposed by

seismic forces not less than that required to produce an acceleration of gravity horizontally and 1/2 gravity vertically acting simultaneously. Design the total system to continue operation without interruption under specified seismic acceleration, as outlined in H-18-8.

B. Support all vertical conduits and duct systems within the hoistway at points above the center of gravity of riser. Provide lateral guides at regular intervals.

C. Car guide rail brackets and rail clip bolts shall be guarded against snagging on the side of the rail adjacent to the point of suspension of the traveling cables.

D. Provide car guide rails with at least one intermediate bracket between brackets located at each floor so that bracket spacing does not exceed 2400 mm (8 ft). If intermediate brackets cannot be installed because of lack of structural support, reinforce rails with 225 mm (9 in.) channel or approved equal backing.

E. Guide rails shall not be less than 22.5 kg/m (15 lb/ft).

F. The stresses in parts of structural members made of steel shall not exceed 88 percent of the minimum elastic strength of the material used in the fastenings.

G. Provide car enclosure ceiling panels and fluorescent tubes with latching devices that shall restrain the panels and fluorescent tubes. Devices shall be readily removable for cleaning or replacing panels and re-lamping.

H. Submittals are required for all equipment anchors, supports, restraints and detectors. Submittals shall include weight, dimensions, center of gravity, standard connections, calculations, manufacturer's recommendations, behavior problems (vibration, thermal, expansion, etc.,) so that design can be properly reviewed.

I. Provide an Earthquake Detection device in machine room to activate “GO SLOW ELEVATORS” operation. The following are references:

1. Emergency Service:

a. Earthquake emergency operation Section 304(d)

b. Title 8, Industrial Relations, Division 01

c. Department of Industrial Relations, Chapter 4

d. Division of Industrial Safety, Sub Chapter 6, Elevator Safety Order

2.13 WORKMAN’S LIGHTS AND OUTLETS

A. Provide duplex GFCI protected type receptacles and lamp, with guards on top of elevator car and beneath platform.

B. The receptacles shall be in accordance with Fed. Spec. W-C-596 for Type D7, 2-pole, 3-wire grounded type rated for 15 amperes and 125 volts.

2.14 CAR LEVELING DEVICE

A. Car shall be equipped with a two-way leveling device to automatically bring the car to within 3 mm (1/8 in.) of exact level with the landing for which a stop is initiated regardless of load in car or direction.

B. If the car stops short or travels beyond the floor, the leveling device, within its zone shall automatically correct this condition and maintain the car within 3 mm (1/8 in.) of level with the floor landing regardless of the load carried.

C. Provide encoded steel tape, steel tape with magnets or steel vanes with magnetic switches. Submit design for approval.

2.15 EMERGENCY STOP SWITCHES

A. Provide an emergency stop switch for each top-of-car device, pit, machine spaces, service panel and firefighters' control panel inside the elevator. Mount stop switches in the pit adjacent to pit access door, at top of the pit ladder 1220 mm (48 in.) above the bottom landing sill and 1220 mm (48 in.) above the pit floor adjacent to the pit ladder.

B. Each stop switch shall be red in color and shall have "STOP" and "RUN" positions legibly and indelibly identified.

2.16 MAIN CAR OPERATING PANEL

A. Locate the main car operating panel in the car enclosure on the front return panel for passenger/service elevators and the front of the side wall for freight elevators. The top floor car call push button shall not be more than 1220 mm (48 in.) above the finished floor. Car call push buttons and indicator lights shall be round with a minimum diameter of 25 mm (1 in.), LED white light illuminated.

B. One piece front faceplate, with edges beveled 15 degrees, shall have the firefighters' service panel recessed into the upper section and the service operation panel recessed into the lower section, fitted with hinged doors. Doors shall have concealed hinges, be in the same front plane as the faceplate and fitted with cylinder type key operated locks. Secure the faceplate with stainless steel tamperproof screws.

C. All terminology on the main car operating panel shall be raised or engraved. Use 6 mm (1/4 in.) letters to identify all devices in upper section of the main car operating panel. The handicapped markings with contrasting background shall be recessed .030 inch in the faceplate, square or rectangular in shape, with the finished face of the 12 mm (1/2 in.) numerals and markings flush with the faceplates. Surface mounted plates are not acceptable.

D. The upper section shall contain the following items in order listed from top to bottom:

1. Engrave elevator number, 25 mm (1 in.) high with black paint for contrast.

2. Engrave capacity plate information with black paint for contrast with freight loading class and number of passengers allowed.

3. Emergency car lighting system consisting of a rechargeable battery, charger, controls, and LED illuminated light fixture. The system shall automatically provide emergency light in the car upon failure or interruption of the normal car lighting service, and function irrespective of the position of the light control switch in the car. The system shall be capable of maintaining a minimum illumination of 1.0 foot-candle when measured 1220 mm (48 in.)above the car floor and approximately 305 mm (12 in.) in front of the car operating panel, for not less than four (4) hours.

4. LED illuminated digital car position indicator with direction arrows. Digital display floor numbers and direction arrows shall be a minimum of 50mm (2 in.) high.

5. Firefighters' Emergency Operation Panel shall conform to the requirements of ASME A17.1 Section 2.27. Firefighters' Panel shall be 1676 mm (66 in.) minimum to 1830 mm (72 in.) maximum to the top of the panel above finished floor.

6. Firefighters' Emergency Indicator Light shall be round with a minimum diameter of 25 mm (1 in.).

7. Medical Emergency switch marked "MEDICAL EMERGENCY" with two positions labeled "ON" and "OFF" and Medical Emergency Indicator Light located next to the key switch shall be round with a minimum diameter of 25 mm (1 in.). Instruction for Medical Emergency operation shall be engraved below the key switch and light.

8. Independent Service switch, see Section 2.30 for detailed description.

9. Provide a Door Hold button on the faceplate next to the independent service key switch. It shall have "DOOR HOLD" indelibly marked on the button. Button shall light when activated. When activated, the door shall stay open for a maximum of one minute. To override door hold timer, push a car call button or door close button. Door Hold button is not ADA required and Braille is not needed.

10. Complete set of round car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12mm (1/2 in.) high in the face of the call button. Stack buttons in a single vertical column for low rise buildings up to six floors with front openings only.

11. Door Open and Door Close buttons shall be located below the car call buttons. They shall have "OPEN" and "CLOSE" legibly and indelibly identified by letters in the face of the respective button. The Door Open button shall be located closest to the door jamb as required by ADA.

12. Red Emergency Alarm button that shall be located below the car operating buttons. Mount the emergency alarm button not lower than 890 mm (35 in.) above the finished floor. It shall be connected to audible signaling devices as required by A17.1 Rule 2.27.1.2. Provide audible signaling devices including the necessary wiring.

13. Emergency Help push button shall activate two way communications by Auto Dial telephone system as required by ASME A17.1 Rule 2.27.1.1.3. Help button shall be LED white light illuminated and flash when call is acknowledged. Legibly and indelibly label the button "HELP" in the face of the button with 12 mm (1/2 in.) high letters.

14. Provide a corresponding Braille plate on the left side of each button. The handicapped markings with contrasting background shall be recessed .030 inch in the faceplate, square or rectangular in shape, with the finished face of the 12 mm (1/2 in.) numerals and markings flush with the faceplates. Surface mounted plates are not acceptable.

E. The service operation panel, in the lower section shall contain the following items:

1. Light switch labeled "LIGHTS" for controlling interior car lighting with its two positions marked "ON" and "OFF".

2. Inspection switch that will disconnect normal operation and activate hoistway access switches at terminal landings. Switch shall be labeled “INSPECTION” with its two positions marked “ON” and “OFF”.

3. Three position switch labeled “FAN” with its positions marked “HIGH”, “LOW” and “OFF” for controlling car ventilating blower.

4. Two position, spring return, toggle switch or push button to test the emergency light and alarm device. It shall be labeled “TEST EMERGENCY LIGHT AND ALARM”.

2.17 AUDIO VOICE SYSTEM

A. Provide digitized audio voice system activated by stopping at a floor. Audio voice shall announce floor designations, direction of travel, and special announcements. The voice announcement system shall be a natural sounding human voice that receives messages and shall comply with ADA requirements for audible car position indicators. The voice announcer shall have two separate volume controls, one for the floor designations and direction of travel, and another for special announcements. The voice announcer shall have a full range loud speaker, located on top of the cab. The audio voice unit shall contain the number of ports necessary to accommodate the number of floors, direction messages, and special announcements. Install voice announcer per manufacturer’s recommendations and instructions. The voice announcer units shall be the product of a manufacturer of established reputation. Provide manufacturer literature and list of voice messages.

1. Fire Service Message

2. Medical Emergency Service Message

3. “Please do not block doors.”

4. Provide special messages as directed by Owner.

2.18 AUTO DIAL TELEPHONE SYSTEM

A. Furnish and install a complete ADA compliant intercommunication system.

B. Provide a two-way communication device in the car with automatic dialing, tracking and recall features with shielded wiring to car controller in machine room. Provide dialer with automatic rollover capability with minimum two numbers.

C. “HELP” button shall illuminate and flash when call is acknowledged. Button shall match floor push button design.

D. Provide “HELP” button tactile symbol engraved signage and Braille adjacent to button mounted integral with car operating panels.

E. The auto dial system shall be located in the auxiliary car operating panel. The speaker and unit shall be mounted on the backside of the perforated stainless steel plate cover.

F. Each elevator shall have an individual phone number.

G. If the operator ends the call, the phone shall be able to redial immediately.

2.19 CORRIDOR OPERATING DEVICE FACEPLATES

A. Fabricate faceplates for elevator operating and signal devices from not less than 3 mm (1/8 in.) thick flat stainless steel with all edges beveled 15 degrees. Install all faceplates flush with surface on which they are mounted.

B. Corridor push button faceplates shall be at least 127 mm (5 in.) wide by 305 mm (12 in.) high. The centerline of the landing push buttons shall be 1067 mm (42 in.) above the corridor floor.

C. Elevator Corridor Call Station Pictograph shall be engraved in the faceplate.

D. Fasten all car and corridor operating device and signal device faceplates with stainless steel tamperproof screws.

E. Design corridor push button faceplates so that pressure on push buttons shall be independent of pressure on push button contacts.

F. Engraved legends in faceplates shall have lettering 6 mm (1/4 in.) high filled with black paint.

G. Provide a corresponding Braille plate on the left side of each button. The handicapped markings with contrasting background shall be recessed .030 inch in the faceplate, square or rectangular in shape, with the finished face of the 12 mm (1/2 in.) numerals and markings flush with the faceplates. Surface mounted plates are not acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.

B. Do not proceed with work until unsatisfactory conditions are corrected.

C. Prior to start of Work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.

D. Prior to start of Work, verify projections greater then 2 inches (4 inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less then 75 degrees from horizontal.

E. Prior to start of Work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.

F. Prior to start of Work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.

G. Prior to start of Work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including Sleeves and penetrations.

H. Verify installation of GFCI protected 15-amp in pit and adjacent to each signal control cabinet in control space.

I. Before fabrication, take necessary job site measurements, and verify where work is governed by other trades. Check measurement of space for equipment, and means of access for installation and operation. Obtain dimensions from site for preparation of shop drawings.

J. Ensure the following preparatory work, provided under other sections of the specification has been provided. If the Elevator Contractor requires changes in size or location of trolley beams, or their supports, trap doors, etc., to accomplish their work, he must make arrangements, subject to approval of the Owner and include cost in their bid. Where applicable, locate controller near and visible to its respective hydraulic pump unit. Work required prior to the completion of the elevator installation:

1. Supply of electric feeder wires to the terminals of the elevator control panel, including circuit breaker.

2. Provide light and GFCI outlets in the elevator pit and machine room.

3. Furnish electric power for testing and adjusting elevator equipment.

4. Furnish circuit breaker panel in machine room for car and hoistway lights and receptacles.

5. Supply power for cab lighting and ventilation from an emergency power panel specified in Division 26, ELECTRICAL.

6. Machine room enclosed and protected from moisture, with self-closing, self-locking door and access stairs.

7. Provide fire extinguisher in machine room.

K. Supply for installation, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.

L. Operating Devices

1 Provide one riser of landing call buttons located as shown on contract drawings.

2. Fixtures for intermediate landings shall contain "UP" and "DOWN" buttons. Fixtures for terminal landings shall contain a single "UP" or "DOWN" button.

3. Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.

4. The direction of each button shall be legibly and indelibly identified by arrows not less than 12 mm (1/2 in.) high in the face of each button.

5. Two or more risers of landing call buttons, if specified, shall be cross-connected so that either "UP" or "DOWN" buttons at a floor shall be capable of registering a call to that floor for the entire elevator group. Registration of a landing call shall illuminate "UP" or "DOWN" buttons simultaneously, and upon satisfaction of that call, both buttons shall be extinguished simultaneously.

6. Landing push buttons shall not re-open the doors while the car and hoistway doors are closing at that floor, the call shall be registered for the next available elevator. Calls registered shall be canceled if closing doors are re-opened by means of "DOOR OPEN" button or infrared curtain unit.

M. Lantern/Position Indicator

1. Provide each car with combination corridor lantern/position indicator digital display mounted over the hoistway entrances at each and every floor. Provide each terminal landing with "UP" or "DOWN", minimum 64 mm (2 1/2 in.) high digital arrow lanterns and each intermediate landing with "UP" and "DOWN" digital arrow lanterns. Each lens shall be LED illuminated of proper intensity, so shielded to illuminate individual lens only. The lenses in each lantern shall be illuminated green to indicate "UP" travel and red to indicate "DOWN" travel. Lanterns shall signal in advance of car arrival at the landing indicating the direction of travel whether or not corridor button has been operated at that floor. Hall calls shall receive immediate assignment to individual cars and hall lantern shall sound and illuminate. Corridor lanterns shall not be illuminated when a car passes a floor without stopping. Each lantern shall be equipped with a clearly audible electronic chime which shall sound once for "UPWARD" bound car and twice for "DOWNWARD" bound car. Audible signal shall not sound when a car passes the floor without stopping. Provide adjustable sound level on audible signal. Car riding lanterns are not acceptable.

2. Provide alpha-numeric digital position indicators directly over hoistway landing entranceways between the arrival lanterns at each and every floor. Indicator faceplate shall be stainless steel. Numerals shall be not less than 50 mm (2 in.) high with direction arrows. Cover plates shall be readily removable for re-lamping. The appropriate direction arrow shall be illuminated during entire travel of car in corresponding direction.

3. Provide LED illumination in each compartment to indicate the position and direction the car is traveling by illuminating the proper alpha-numeric symbol. When the car is standing at a landing without direction established, arrows shall not be illuminated.

3.02 PREPARATION

A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.03 INSTALLATION

A. Perform work with competent Certified Elevator Mechanics and Apprentices skilled in this work and under the direct supervision of the Elevator Contractor’s experienced foreman.

B. Set hoistway entrances in alignment with car openings, and true with plumb sill lines.

C. Erect hoistway sills, headers and frames prior to erection of rough walls and doors. Erect fascias and toe guards after rough walls are finished.

D. Install machinery, guides, controls, car and all equipment and accessories in accordance with manufacturer's instructions, applicable codes and standards.

E. Isolate and dampen machine vibration with properly sized sound-reducing anti-vibration pads.

F. Grout sills and hoistway entrance frames.

3.04 CONSTRUCTION

A. Interface with Other Work:

1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.

2. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.

    a. Ensure adequate support for entrance attachment points at all landings.

    b. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.

    c. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.

    d. Coordinate interface of elevators and fire alarm system.

    e. Coordinate interface of dedicated telephone line.

    f. Coordination installation of pit ladder.

    g. Coordination installation of Shut Trip by electrical contractor.

3.05 WORKMANSHIP AND PROTECTION

A. Installations shall be performed by Certified Elevator Mechanics and Apprentices to best possible industry standards. Details of the installation shall be mechanically and electrically correct. Materials and equipment shall be new and without imperfections.

B. Recesses, cutouts, slots, holes, patching, grouting, refinishing to accommodate installation of equipment shall be included in the Contractor's work. All new holes in concrete shall be core drilled.

C. Structural members shall not be cut or altered. Work in place that is damaged or defaced shall be restored equal to original condition.

D. Finished work shall be straight, plumb, level, and square with smooth surfaces and lines. All machinery and equipment shall be protected against dirt, water, or mechanical injury. At final completion, all work shall be thoroughly cleaned and delivered in perfect unblemished condition.

E. Sleeves for conduit and other small holes shall project 50 mm (2 in.) above concrete slabs.

F. Exposed gears, sprockets, and sheaves shall be guarded from accidental contact in accordance with ASME A17.1 Section 2.10.

3.06 TESTING AND INSPECTIONS

A. Perform recommended and required testing in accordance with authority having jurisdiction. Perform adjustments and modifications required by the authority having justification without and additional Cost to Owner weather or not specified or defined by the construction documents. This project (elevator, hoist way and elevator lobbies) shall be bid and constructed to meet all Federal, State and Local laws and regulatory requirements and technical requirements for this type of elevator regardless of items specified or defined in the drawings, including all electrical, mechanical, plumbing, fire protection and special systems. This shall include

supports for elevator, guide rails, hoist beams, machine supports and elevator shaft construction.

B. Pre-test the elevators and related equipment in the presence of the Owner or his authorized representative for proper operation before requesting final inspection. Conduct final inspection at other than normal working hours, if required by Owner.

1. Procedure outlined in the Inspectors Manual for Hydraulic Elevators, ASME A17.2 shall apply.

a. Final test shall be conducted in the presence of and witnessed by an ASME QEI-1 Certified Elevator Inspector.

2. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: properly marked test weights, oil pressure gauge, voltmeter, amp probe, thermometers, direct reading tachometer, megohm meter, vibration meter, sound meter, light meter, stop watch, and a means of two-way communication.

3. If during the inspection process the Inspector determines the need, the following instruments shall be available within a four-hour period: Megohm meter, vibration meter, sound meter, and a light meter.

C. Inspection of workmanship, equipment furnished, and installation for compliance with specification.

D. Full-Load Run Test: Elevators shall be tested for a period of one hour continuous run with full contract load in the car. The test run shall consist of the elevator stopping at all floors, in either direction of travel, for not less than five or more than ten seconds per floor.

E. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. Speed shall be determined by certified tachometer. The actual measured speed of the elevator with all loads in either direction shall be within five (5) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.

F. Temperature Rise Test: The temperature rise of the pump motor shall be determined during the full load test run. temperatures shall be measured by the use of thermometers. Under these conditions, the temperature rise of the equipment shall not exceed 50 degrees Centigrade above ambient temperature. Test shall start when all machine room equipment is within 5 degrees Centigrade of the ambient temperature. Other tests for heat runs on motors shall be performed as prescribed by the Institute of Electrical and Electronic Engineers.

G. Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car and with contract load in car in both directions of travel. Accuracy of floor level shall be within plus or minus 3 mm (1/8 in.) of level with any landing floor for which the stop has been initiated regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus 3 mm (1/8 in.) of level with the landing floor regardless of change in load.

H. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and ground faults and the insulation resistance of the system shall be determined by use of megohm meter, at the discretion of the Elevator Inspector conducting the test.

I. Safety Devices Tests: Safety devices shall be tested as required by ASME A17.1 Section 8.10.

J. Overload Devices: Test all overload current protection devices in the system at final inspection.

K. Limit Stops:

1. The position of the car when stopped by each of the normal limit stops with no load and with contract load in the car shall be accurately measured.

2. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. Elevator shall be operated at inspection speed for both tests. Normal limit stopping devices shall be inoperative for the tests.

L. Setting of Car Door Contacts: The position of the car door at which the elevator may be started shall be measured. The distance from full closure shall not exceed that required by ASME A17.1. The test shall be made with the hoistway doors closed or the hoistway door contact inoperative.

M. Setting of Interlocks: The position of the hoistway door at which the elevator may be started shall be measured and shall not exceed ASME A17.1 requirements.

N. Operating and Signal System: The elevator shall be operated by the operating devices provided and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.

O. Performance of the Elevator supervisory system shall be witnessed and approved by the representative of the Owner.

P. Evidence of malfunction in any tested system or parts of equipment that occurs during the testing shall be corrected, repaired, or replaced at no additional cost to the Owner, and the test repeated.

Q. If equipment fails test requirements and a re-inspection is required, the Contractor shall be responsible for the cost of re-inspection; salaries, transportation expenses, and per-diem expenses incurred by the representative of the Owner.

3.07 DEMONSTRATION

A. Prior to substantial completion, instruct Owner’s Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures.

3.08 INSTRUCTION OF PERSONNEL

A. Provide competent instruction to the Owner regarding the operation of equipment and accessories installed under this contract, for a period equal to one eight hour work day. Instruction shall commence after completion of all work and at the time and place directed by the Owner.

B. Written instructions in triplicate relative to care, adjustments and operation of all equipment and accessories shall be furnished and delivered to the Owner in independently bound folders. DVD recordings will also be acceptable. Written instructions shall include correct and legible wiring diagrams, nomenclature sheet of all electrical apparatus including location of each device, complete and comprehensive sequence of operation, complete replacement parts list with descriptive literature, and identification and diagrammatic cuts of equipment and parts. Information shall also include electrical operation characteristics of all circuits,

relays, timers, and electronic devices, as well as R.P.M. values and related characteristics for all rotating equipment.

C. Provide supplementary instruction for any new equipment that may become necessary because of changes, modifications or replacement of equipment or operation under requirements of paragraph entitled "Warranty of Construction".

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Definitions:

1. Exposed: Piping and equipment exposed to view in finished rooms.

2. Option or optional: Contractor's choice of an alternate material or method.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE

A. Products Criteria:

1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.

2. Equipment Service: Products shall be supported by a service organization which maintains a complete inventory of repair parts and is located reasonably close to the site.

3. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.

4. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.

5. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

6. Asbestos products or equipment or materials containing asbestos shall not be used.

B. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Owner prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

C. Guaranty: Warranty of Construction, according to Division 01 requirements.

D. Supports for sprinkler piping shall be in conformance with NFPA 13 and section 13 05 41.

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Manufacturer's Literature and Data:

1. Equipment and materials identification.

2. Fire-stopping materials.

3. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.

4. Wall, floor, and ceiling plates.

C. Coordination Drawings: Provide detailed layout drawings of all piping systems. Provide details of the following.

1. Sprinkler head layout.

2. Hangers, inserts, supports, and bracing.

3. Pipe sleeves.

4. Penetrations of floors, walls, or ceilings.

D. Maintenance Data and Operating Instructions:

1. Maintenance and operating manuals in accordance with Division 01, OPERATING AND MAINTENANCE MANUALS, for systems and equipment.

2. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment.

1.05 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society for Testing and Materials (ASTM):

A36/A36M-2001 .....Carbon Structural Steel

A53/A53M .....Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

A575-96.....Steel Bars, Carbon, Merchant Quality, M-Grades R (2002)

E84-2003.....Standard Test Method for Burning Characteristics of Building Materials

E119-2000.....Standard Test Method for Fire Tests of Building Construction and Materials

C. National Fire Protection Association (NFPA):

13-2013 ..... Installation of Sprinkler Systems

25-2014 ..... Inspection, Testing and Maintenance of Water-Based Fire Protection Systems

101-2015 ..... Life Safety Code

PART 2 PRODUCTS

2.01 EQUIPMENT AND MATERIALS IDENTIFICATION

A. Valve Tags and Lists:

1. Valve tags: Engraved black filled numbers and letters not less than 13 mm (1/2-inch) high for number designation, and not less than 6.4 mm (1/4-inch) for service designation on 19 gage 38 mm (1-1/2 inches) round brass disc, attached with brass "S" hook or brass chain.

2. Valve lists: Typed or printed plastic-coated card(s), sized 216 mm (8-1/2 inches) by 280 mm (11 inches) showing tag number, valve function and area of control, for each service or system. Punch sheets for a 3-ring notebook.

3. Provide detailed plan for each floor of the building indicating the location and valve number for each valve. Identify location of each valve with a color-coded thumb tack in ceiling.

2.02 FIRESTOPPING

A. Section 07 84 00, FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping.

2.03 GALVANIZED REPAIR COMPOUND

A. Mil. Spec. DOD-P-21035B, paint form.

2.04 PIPE PENETRATIONS

A. Install sleeves during construction for other than blocked out floor openings for risers in mechanical bays.

B. To prevent accidental liquid spills from passing to a lower level, provide the following:

1. For sleeves: Extend sleeve 25 mm (one inch) above finished floor and provide sealant for watertight joint.

2. For blocked out floor openings: Provide 40 mm (1-1/2 inch) angle set in silicone adhesive around opening.

3. For drilled penetrations: Provide 40 mm (1-1/2 inch) angle ring or square set in silicone adhesive around penetration.

C. Penetrations are not allowed through beams or ribs or beam flanges. Any deviation from this requirement must receive prior approval of Structural Engineer.

D. Sheet Metal, Plastic, or Moisture-resistant Fiber Sleeves: Provide for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.

E. Sleeves are not required for wall hydrants for fire department connections or in drywall construction.

F. Sleeve Clearance: Sleeve through floors, walls, partitions, and beam flanges shall be one inch greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation. Interior openings shall be caulked tight with fire stopping material and sealant to prevent the spread of fire, smoke, and gases.

G. Sealant and Adhesives: Shall be as specified in Section 07 90 00, JOINT SEALER.

2.05 WALL, FLOOR AND CEILING PLATES

A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.

B. Thickness: Not less than 2.4 mm (3/32-inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025-inch) for up to 80 mm (3-inch pipe), 0.89 mm (0.035-inch) for larger pipe.

C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Provide a watertight joint in spaces where brass or steel pipe sleeves are specified.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate location of piping, sleeves, inserts, hangers, and equipment. Locate piping, sleeves, inserts, hangers, and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.

B. Protection and Cleaning:

1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Owner. Damaged or defective items in the opinion of the Owner, shall be replaced.

C. Concrete and Grout: Use concrete and shrink compensating grout 25 MPa (5000 psi) minimum, specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

D. Install gages, valves, and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.

E. Switchgear Drip Protection: Every effort shall be made to eliminate the installation of pipe above electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints.

F. Inaccessible Equipment:

1. Where the Owner determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Owner.

2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.02 OPERATING AND PERFORMANCE TESTS

A. Prior to the final inspection, perform required tests as specified in section 01 00 00 General Requirement and submit the test reports and records to the Owner’s Representative.

B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Owner.

3.03 INSTRUCTIONS TO COUNTY PERSONNEL

A. Provide in accordance with section 01 00 00 General Requirement.

END OF SECTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide all supervision, engineering, design, labor, materials and equipment necessary to install a complete wet-pipe sprinkler system.

B. Design, installation and testing shall be in accordance with NFPA 13 except for specified exceptions.

C. The design and installation of a hydraulically calculated automatic wet system complete and ready for operation, for all portions of building.

D. Design, installation and testing shall be in accordance with utility, city and county connection requirements, including backflow, lateral, thrust blocks, valves, sensors, alarms and ports for complete, compliant for protecting system.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE

A. Installer Reliability: The installer shall possess a valid State of California C-16 fire sprinkler contractor's license. The installer shall have been actively and successfully engaged in the installation of commercial automatic sprinkler systems for the past ten years.

B. Materials and Equipment: All equipment and devices shall be of a make and type listed by UL and approved by FM, or other nationally recognized testing laboratory for the specific purpose for which it is used. All materials, devices, and equipment shall be approved by the County.

C. Submittals: Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Prepare detailed working drawings that are signed by a NICET Level III or Level IV Sprinkler Technician or stamped by a Registered Professional Engineer practicing in the field of Fire Protection Engineering. As Owner review is for technical adequacy only, the installer remains responsible for correcting any conflicts with other trades and building construction that arise during installation. Partial submittals will not be accepted. Material submittals shall be approved prior to the purchase or delivery to the job site. Suitably bind submittals in notebooks or binders and provide index referencing the appropriate specification section. Submittals shall include, but not be limited to, the following:

1. Qualifications:

a. Provide a copy of the installing contractor’s fire sprinkler and state contractor’s license.

b. Provide a copy of the NICET certification for the NICET Level III or Level IV Sprinkler Technician who prepared and signed the detailed working drawings unless the drawings are stamped by a Registered Professional Engineer practicing in the field of Fire Protection Engineering.

2. Drawings: Submit detailed 1:100 (1/8 inch) scale (minimum) working drawings conforming to NFPA 13. Include a site plan showing the piping to the water supply test location.

3. Manufacturers Data Sheets:

   a. Provide for materials and equipment proposed for use on the system. Include listing information and installation instructions in data sheets. Where data sheet describes items in addition to that item being submitted, clearly identify proposed item on the sheet.

4. Calculation Sheets: Submit hydraulic calculation sheets in tabular form conforming to the requirements and recommendations of NFPA 13.

5. Valve Charts: Provide a valve chart that identifies the location of each control valve. Coordinate identification of control valve with the Owner. The chart shall include no less than the following: Tag ID No., valve size, service (control valve, main drain, aux. drain, inspections test valve, etc.), and location.

6. Final Document Submittals: Provide as-built drawings, testing and maintenance instructions in accordance with the requirements in Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Submittals shall include, but not be limited to, the following:

   a. One complete set of reproducible as-built drawings showing the installed system with the specific interconnections between the waterflow switch or pressure switch and the fire alarm equipment.

   b. Complete, simple, understandable, step-by-step, testing instructions giving recommended and required testing frequency of all equipment, methods for testing all equipment, and a complete trouble shooting manual. Provide maintenance instructions on replacing any components of the system including internal parts, periodic cleaning and adjustment of the equipment and components with information as to the address and telephone number of both the manufacturer and the local supplier of each item.

   c. Material and Testing Certificate: Upon completion of the sprinkler system installation or any partial section of the system, including testing and flushing, provide a copy of a completed Material and Testing Certificate as indicated in NFPA 13.

   d. Certificates shall document all parts of the installation.

   e. Instruction Manual: Provide one copy of the instruction manual covering the system in a flexible protective cover and mount in an accessible location adjacent to the riser.

D. Design Basis Information: Provide design, materials, equipment, installation, inspection, and testing of the automatic sprinkler system in accordance with the requirements of NFPA 13. Recommendations in appendices shall be treated as requirements.

   1. Perform hydraulic calculations in accordance with NFPA 13 utilizing the Area/Density method. Do not restrict design area reductions permitted for using

quick response sprinklers throughout by the required use of standard response sprinklers in the areas identified in this section.

2. Sprinkler Protection: The hazard classification examples of uses and conditions identified in the Annex. of NFPA 13 shall be mandatory. To determining spacing and sizing, apply the following coverage classifications:

   a. Ordinary Hazard Group 1 Occupancies: Laboratories, Mechanical Equipment Rooms, Transformer Rooms, Electrical Switchgear Rooms, Electric Closets.

   b. Request clarification from the Owner for any hazard classification not identified.

3. Hydraulic Calculations: Calculated demand including hose stream requirements shall fall no less than 10 percent below the available water supply curve.

4. Water Supply: Base water supply on a flow test made by the contractor. Report submitted to the Owner is to include:

   a. Location

   b. Elevation Static Test Gauge: ___ ft.

   c. Elevation Residual Test Gauge: ___ ft.

   d. Static pressure: 85 psi.

   e. Residual pressure: 73 psi.

   f. Flow: 1500 gpm.

   g. Date: ____.

   h. Time: ____.

5. Contractor shall confirm allowable water flow and pressure by performing their own water flow test in the presence of authorities having jurisdiction prior to any design work.

6. Zoning:

   a. For each sprinkler zone provide a control valve, flow switch and a test and drain assembly with pressure gauge.

   b. Provide seismic protection in accordance with NFPA 13 and Section 13 05 41.

1.04 APPLICABLE PUIBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. Codes and Standards: Provide a wet-pipe sprinkler system conforming to latest editions of Codes and Standards.

C. National Fire Protection Association (NFPA), including all amendments and appendices:

13 .....Installation of Sprinkler Systems

101 .....Safety to Life from Fire in Buildings and Structures (Life Safety Code)

101 .....Life Safety Code

170 .....Fire Safety Symbols

D. Underwriters Laboratories, Inc. (UL):

UL-FPED (Fire Protection Equipment Directory)

E. Factory Mutual Engineering Corporation (FM):

Approval Guide

F. California Building Code

G. California Fire Code

PART 2 PRODUCTS

2.01 PIPING & FITTINGS

A. Sprinkler systems in accordance with NFPA 13.

2.02 VALVES

A. Valves in accordance with NFPA 13.

B. Do not use quarter turn ball valves for 50 mm (2 inch) or larger drain valves.

C. The wet system control valve shall be a listed indicating type valve. Control valve shall be UL Listed and FM Approved for fire protection installations. System control valve shall be rated for normal system pressure but in no case less than 175 PSI. (No Substitutions Allowed).

2.03 FIRE DEPARTMENT SIAMESE CONNECTION

A. Use new brass flush wall type, exterior fire department connection with a minimum of two 65 mm (2-1/2 inch) connections threaded to match those on the local fire protection service, with polished brass caps and chains. Provide escutcheon with integral raised letters "Automatic Sprinkler" "Standpipe and Automatic Sprinkler". Install an automatic ball drip between fire department connection and check valve with drain piping routed to the exterior of the building.

2.04 SPRINKLERS

A. All sprinklers shall be FM approved. Provide quick response recessed type fire sprinklers in all areas, except where specifically prohibited by their listing or approval.

1. In generator electrical and telecom rooms: Standard response sprinklers.

2. Provide ‘cages’ to protect sprinkler heads from breakage/damage when the elevation of the head is less than 7 feet 6 inches above finished floor (mechanical rooms, janitor closets, etc).

B. Temperature Ratings: In accordance with NFPA 13:

1. Sprinklers in electrical rooms, telecom rooms, and “doghouses”: High temperature rated.

2.05 SPRINKLER CABINET

A. Provide sprinkler cabinet with the required number of sprinkler heads of all ratings and types installed, and a sprinkler wrench for each system. Locate adjacent to the riser. Sprinkler heads shall be installed in center of tile or center to center.

2.06 FLEXIBLE SPRINKLER HOSE

A. U.L. 2443 and FM 1637 approved type 304 stainless steel, 2’-0” to 6’-0” lengths, 1/2" or 3/4" outlets, 175 psi maximum rated pressure, fully welded non-mechanical fittings, braided, leak tested with minimum 1 inch true bore internal corrugated hose diameter. Provide elbow hose assembly as required.

B. Ceiling. Brackets: Galvanized steel, multi-port style, self-securing integrated snap-on clip ends with tamper resistant screws, and removable hub type with set screw flexible hose attachment.

2.07 IDENTIFICATION SIGNS/HYDRAULIC PLACARDS

A. Plastic, steel or aluminum signs with white lettering on a red background with holes for easy attachment. Enter pertinent data for each system on the hydraulic placard.

2.08 SWITCHES:

A. Contain in a weatherproof die cast/red baked enamel, oil resistant, aluminum housing with tamper resistant screws, 13 mm (1/2 inch) conduit entrance and necessary facilities for attachment to the valves. Provide two SPDT switches rated at 2.5 amps at 24 VDC.

B. Water flow Alarm Switches: Mechanical, non-coded, non-accumulative retard and adjustable from 0 to 60 seconds minimum. Set flow switches at an initial setting between 20 and 30 seconds.

C. Valve Supervisory Switches for Ball and Butterfly Valves: May be integral with the valve.

2.09 ELECTRIC BELL:

A. UL listed and Factory Mutual approved electric alarm bell.

2.10 GAUGES

A. Provide gauges as required by NFPA 13.

2.11 PIPE HANGERS AND SUPPORTS

A. Supports, hangers, etc., of an approved pattern placement to conform to NFPA 13. System piping shall be substantially supported to the building structure. The installation of hangers and supports shall adhere to the requirements set forth in NFPA 13, Standard for Installation of Sprinkler Systems. Materials used in the installation or construction of hangers and supports shall be listed and approved for such application. Hangers or supports not specifically listed for service shall be designed and bear the seal of a professional engineer.

2.12 WALL, FLOOR AND CEILING PLATES

A. Provide chrome plated steel escutcheon plates for exposed piping passing though walls, floors or ceilings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation shall be accomplished by the licensed contractor. Provide a qualified technician, experienced in the installation and operation of the type of system being installed, to supervise the installation and testing of the system.

B. Installation of Piping: Accurately cut pipe to measurements established by the installer and work into place without springing or forcing. In any situation where bending of the pipe is required, use a standard pipe-bending template. Install concealed piping in spaces that have finished ceilings. Where ceiling mounted equipment exists, install sprinklers so as not to obstruct the movement or operation of the equipment. Sidewall heads may need to be utilized. Locate piping in stairways as near to the ceiling as possible to prevent tampering by unauthorized personnel, and to provide a minimum headroom clearance of 2250 mm (seven feet six inches). To prevent an obstruction to egress, provide piping clearances in accordance with NFPA 101.

C. Welding: Conform to the requirements and recommendations of NFPA 13.

D. Drains: Pipe drains to discharge at safe points outside of the building or to sight cones attached to drains of adequate size to readily carry the full flow from each drain under maximum pressure. Do not provide a direct drain connection to sewer system or discharge into sinks. Install drips and drains where necessary and required by NFPA 13.

E. Supervisory Switches: Provide supervisory switches for sprinkler control valves.

F. Waterflow Alarm Switches: Install waterflow switch and adjacent valves in easily accessible locations.

G. Inspector's Test Connection: Install and supply in conformance with NFPA 13, locate in a secured area, and discharge to the exterior of the building.

H. Affix cutout disks, which are created by cutting holes in the walls of pipe for flow switches and non-threaded pipe connections to the respective waterflow switch or pipe connection near to the pipe from where they were cut.

I. Provide pressure gauge at each water flow alarm switch location and at each main drain connection.

J. For each fire department connection, provide the symbolic sign given in NFPA 170 and locate 2400 to 3000 mm (8 to 10 feet) above each connection location. Size the sign to 450 by 450 mm (18 by 18 inches) with the symbol being at least 350 by 350 mm (14 by 14 inches).

K. Securely attach identification signs to control valves, drain valves, and test valves. Locate hydraulic placard information signs at each sectional control valve where there is a zone water flow switch.

L. Repairs: Repair damage to the building or equipment resulting from the installation of the sprinkler system by the installer at no additional expense to the Owner.

3.02 INSPECTION AND TEST

A. Preliminary Testing: Flush newly installed systems prior to performing hydrostatic tests in order to remove any debris which may have been left as well as ensuring piping is unobstructed. Hydrostatically test system, including the fire department connections, as specified in NFPA 13, in the presence of the Owners or his designated representative. Test and flush underground water line prior to performing these hydrostatic tests.

B. Final Inspection and Testing: Subject system to tests in accordance with NFPA 13, and when all necessary corrections have been accomplished, advise Owner to schedule a final inspection and test. Connection to the fire alarm system shall have been in service for at least ten days prior to the final inspection, with adjustments made to prevent false alarms. Furnish all instruments, labor and materials required for the tests and provide the services of the installation foreman or other competent representative of the installer to perform the tests. Correct deficiencies and retest system as necessary, prior to the final acceptance. Include the operation of all features of the systems under normal operations in test.

3.03 INSTRUCTIONS

A. Furnish the services of a competent instructor for not less than two hours for instructing personnel in the operation and maintenance of the system, on the dates requested by the Owner.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:
1. Expansion Fittings and Loops for Piping Systems
2. Alignment Guides and Anchors
3. Dielectric Fittings
4. Pipe Sleeves
5. Sleeve Seals Systems for Piping
6. Silicone Sealant
7. Escutcheons for Piping
8. Floor Plates

1.02 SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC” for Submittal requirements.

1.03 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.04 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

PART 2 PRODUCTS

2.01 EXPANSION FITTINGS AND LOOPS FOR PIPING SYSTEMS

A. Rubber Union Connector Expansion Joints
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Mason Industries, Inc.
   b. MetraFlex.
   c. Twin City Hose.
2. Material: Twin reinforced-rubber spheres with external restraining cables.
3. Minimum Pressure Rating: 150 psig at 170 deg F, unless otherwise indicated.
4. End Connections for NPS 2 and Smaller: Threaded.

B. Flexible-Hose Packless Expansion Joints:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Mason Industries, Inc.
   b. Metraflex Company (The).
   c. Twin City Hose Inc.
2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
4. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.
   a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.
5. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4: Copper-alloy fittings with threaded end connections.
   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.
6. Expansion Joints for Steel Piping NPS 2 and Smaller: Carbon-steel fittings with threaded end connections.
   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F and 325 psig at 600 deg F ratings.
7. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6: Carbon-steel fittings with flanged end connections.
   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F and 145 psig at 600 deg F ratings.

2.02 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides
1. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.

B. Anchor Materials:
1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.
   a. Stud: Threaded, zinc-coated carbon steel.
   b. Expansion Plug: Zinc-coated steel.
   c. Washer and Nut: Zinc-coated steel.
5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
   a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
   b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
   c. Washer and Nut: Zinc-coated steel.
6.

2.03 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. Dielectric Unions are not allowed.

C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
   b. Central Plastics Company.
   c. Matco-Norca.
   d. Watts; a division of Watts Water Technologies, Inc.
   e. Wilkins; a Zurn company.
2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 175 psig.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.
2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. PEX Dielectric Separator:
1. Description: 6” long section of pex piping shall be installed between dis-similar piping materials.
2. Pipe Material: PEX plastic according to ASTM F 876.
3. Oxygen Barrier: O2 permeability <= 0.32 mg/m2/day in accordance with DIN 4726.
4. Fittings: ASTM F 1960, cold expansion fittings and reinforcing rings.
5. Pressure/Temperature Rating: Minimum 100 psig and 180 deg F.

2.04 SLEEVES

A. Galvanized-Steel Sheet Pipe Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.05 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. GPT; an EnPro Industries company.

4. Metraflex Company (The).

B. Description:
1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20-psig.
3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
4. Pressure Plates: Composite plastic.
5. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.06 SILICONE SEALANTS

A. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.

2.07 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.08 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 EXECUTION

3.01 EXPANSION JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install expansion joint per the manufacture’s written instructions.

3.02 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install two guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four (4) pipe diameters from expansion joint.

C. Attach guides to pipe, and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:
1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

3.03 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Install Dielectric fittings per the manufacturers written instructions.

C. Install pipe hangers immediately upsteam and downstream of dielectric fittings.

D. Install isolation valves immediately upsteam and downstream of dielectric fittings.

E. Dielectric Fittings for NPS 2 and Smaller: PEX Dielectric Separator.

F. Dielectric Fittings for NPS 2-1/2 and Larger: Dielectric Flange.

3.04 SLEEVE INTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inchannular clear space between piping and concrete slabs and walls.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
1. Cut sleeves to length for mounting flush with both surfaces.
    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inchesabove finished floor level.
2. Using silicone sealant, seal space outside of sleeves in slabs and walls without sleeve-seal system.

D. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke-Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.05 SLEEVE-SEALS SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls at piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal-system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.06 SLEEVE-SEAL SCHEDULE

A. Use sleeve and sleeve-seals for the following piping-penetration applications:
1. Exterior Concrete Walls Above Grade: Galvanized-Steel Sheet Pipe Sleeves with Sleeve-seal system
2. Exterior Concrete Walls Below Grade: Galvanized-Steel Sheet Pipe Sleeves with Sleeve-seal system
3. Interior or Exterior Concrete Slabs-on-Grade: Sleeve not required.
4. Interior Concrete Slabs Above Grade: Galvanized-Steel Sheet Pipe Sleeves with Silicone Sealant or Fire calk
5. Interior Partitions: Sleeve not require – fire calk penetrations of rated assemblies.

3.07 ESCUTCHEON INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

3.08 FLOOR PLATE INSTALLATION

A. Install floor plates for piping penetrations of equipment-room floors.

B. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

END OF SECTION 220500

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ashcroft Inc.
2. Miljoco Corporation.
3. Tel-Tru Manufacturing Company.
4. Trerice, H. O. Co.
5. Prior Approved Equal

B. Standard: ASME B40.200.

C. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES or CSA.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

A. Direct-Mounted and Remote, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ashcroft Inc.
   b. Miljoco Corporation.
   c. Tel-Tru Manufacturing Company.
   d. Trerice, H. O. Co.
   e. Prior Approved Equal

2. Standard: ASME B40.100.

3. Case: Liquid-filled, Sealed type(s); 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.

5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Metal.
11. Accuracy: Grade B, plus or minus 2 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston or porous-metal-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending a minimum of 2 inches into fluid and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install thermometers in the following locations:

1. Inlet and outlet of each domestic water heater.
2. Inlet and outlet of each domestic hot-water storage tank.
3. Two inlets and two outlets of each heat pump.
4. Inlet and outlet of each hydronic coil in air-handling units.
5. Inlet and outlet of each thermal-storage tank.
6. Inlet and outlet of each refrigeration condenser.

K. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each pump.

L. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

M. Adjust faces of meters and gages to proper angle for best visibility.

3.2 THERMOMETER SCALE-RANGE SCHEDULE

A. Domestic Cold-Water Piping: 0 to 150 deg F.

B. Domestic Hot-Water Piping: 50 to 200 deg F.

C. Heating Water Piping: 50 to 200 deg F.

3.3 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Water Service Piping: 0 to 150 psi.

B. Domestic Water Piping: 0 to 100 psi.

C. Heating Water Piping: 0 to 150 psi

END OF SECTION 220519

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Ball Valves
2. Butterfly Valves
3. Bronze Gate Valves
4. Iron Gate Valve
5. Bronze Check Valves
6. Iron Swing Check Valves
7. Iron Silent Check Valves

1.2 SUBMITTALS

A. See Section 220000 “General Requirements for Pluming and HVAC” for submittal requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder-joint connections.
5. ASME B31.1 for power piping valves.
6. ASME B31.9 for building services piping valves.

C. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

D. Refer to valve schedule articles for applications of valves.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valves in Insulated Piping:

1. Include 2-inch (50-mm) stem extensions.
2. Extended operating handle of nonthermal-conductive material, and protective sleeves that allow operation of valves without breaking the vapor seals or disturbing insulation.

3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE BALL VALVES, TWO-PIECE WITH FULL PORT AND STAINLESS-STEEL TRIM:

A. Manufacturers: Provide products from one of the following:
1. Apollo
2. Nibco
3. Milwaukee
4. Watts

B. Description:
1. Standard: MSS SP-110.
2. SWP Rating: 150 psig.
3. CWP Rating: 600 psig.
4. Body Design: Two piece.
5. Body Material: Bronze.
6. Ends: Solder or Threaded.
7. Seats: PTFE.
8. Stem: Stainless steel.
9. Ball: Stainless steel, vented.
10. Port: Full.

2.3 BRONZE GATE VALVES, NRS, CLASS 150:

A. Manufacturers: Provide products from one of the following:
1. Apollo
2. Nibco
3. Crane
4. Milwaukee

B. Description:
1. Standard: MSS SP-80, Type 1.
2. CWP Rating: 300 psig.
3. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
4. Ends: Threaded.
5. Stem: Bronze.
6. Disc: Solid wedge; bronze.
7. Packing: Asbestos free.
8. Handwheel: Malleable iron, bronze, or aluminum.

2.4 BRONZE SWING CHECK VALVES WITH BRONZE DISC, CLASS 125:

A. Manufacturer: Provide products from one of the following:
1. Apollo
2. Crane
3. Nibco
4. Watts

B. Description:
1. Standard: MSS SP-80, Type 3.
2. CWP Rating: 200 psig (1380 kPa).
3. Body Design: Horizontal flow.

4. Body Material: ASTM B 62, bronze.
5. Ends: Threaded or soldered. See valve schedule articles.
6. Disc: Bronze.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS ½" – 2" and Smaller: solder ends.
2. For Steel Piping, NPS 2" and Smaller: Threaded ends.
3. For Steel Piping NPS 2-1/2" and larger: Flanged or Grooved ends.

3.3 VALVE SCHEDULE

A. Domestic Water ½" – 2" NPS: Ball Valve, Solder or Threaded Ends

B. Domestic Water 2-1/2" NPS and Larger: Butterfly Valve, Lug Type

3.4 CHECK VALVE SCHEDULE

A. Pump Discharge ½" – 2" NPS: Bronze Swing Check, Threaded or Solder Ends

B. Pump Discharge 2-1/2" NPS and Larger: Iron Body Globe Style Silent Check, Flanged Ends

END OF SECTION 220523

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

1.3 SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use

operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting.", Section 099123 "Interior Painting.", Section 099600 "High-Performance Coatings."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.

3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING AND HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient supports.
9. Resilient pipe guides.
10. Elastomeric hangers.
11. Spring hangers.
12. Snubbers.
13. Restraint channel bracings.
14. Restraint cables.
15. Seismic-restraint accessories.
16. Mechanical anchor bolts.

1.2 ACTION SUBMITTALS

A. See Section 220000 “General Requirements for Plumbing and HVAC” for submittal requirements.

B. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.

1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum

seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Design seismic restraints for components for seismic design forces defined in Chapter 13 of ASCE 7-10.
   a. Design Spectral Response Acceleration at Short Periods, S_{DS} = 42.70%g
   b. Component Importance Factor, I_P = 1.0; except for components conveying, supporting, or otherwise containing natural gas or other flammable and/or explosive contents, I_P = 1.5.
   c. Component Response Modification Factor, R_P: See Table 13.6-1 of ASCE 7-10
   d. Component Amplification Factor, a_P: See Table 13.6-1 of ASCE 7-10

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:
1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
2. Size: Factory or field cut to match requirements of supported equipment.
3. Pad Material: Oil and water resistant with elastomeric properties.
4. Surface Pattern: Smooth, Ribbed or Waffle pattern.
5. Infused nonwoven cotton or synthetic fibers.
6. Load-bearing metal plates adhered to pads.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:
1. Mounting Plates:

   a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
   b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:
1. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

a. Housing: Cast-ductile iron or welded steel.
b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators:
1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig (3447 kPa).
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.6 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:
1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Top housing with attachment and leveling bolt.

2.7 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:
1. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Top plate with threaded mounting holes.
c. Internal leveling bolt that acts as blocking during installation.

2. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:
   1. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.
      a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
      b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.
   2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.9 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch- thick neoprene.
   1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
   2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.10 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch- thick neoprene.
   1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.11 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:
   1. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
   2. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.12 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:
   1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
   2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
   7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
   8. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.13 SNUBBERS

A. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

   1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
   2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
   3. Maximum 1/4-inch air gap, and minimum 1/4-inch- thick resilient cushion.

2.14 RESTRAINT CHANNEL BRACINGS

A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.15 RESTRAINT CABLES

A. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.16 SEISMIC-RESTRAINT ACCESSORIES

A. Hanger-Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

B. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

C. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

D. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete." or Section 033053 "Miscellaneous Cast-in-Place Concrete."

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

C. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

D. Equipment Restraints:

1. Install seismic snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES that provides required submittals for component.

E. Piping Restraints:

1. Comply with requirements in MSS SP-127.

2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

F. Install cables so they do not bend across edges of adjacent equipment or building structure.

G. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES that provides required submittals for component.

H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

K. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 221116 "Domestic Water Piping" for piping flexible connections.

3.4 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION 220548

SECTION 220553 - IDENTIFICATION FOR PLUMBING AND HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White
3. Background Color: Black
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch For name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White

C. Background Color: Red

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

PART 3 - EXECUTION

3.1 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.2 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Compressed Air Piping:
   a. Background: Blue
   b. Letter Colors: White

2. Natural Gas Piping:
   a. Background: Yellow
   b. Letters: Black:

3. Domestic Water Piping:
   a. Background: Green
   b. Letter Colors: White

4. Sanitary Waste and Storm Drainage Piping:
   a. Background Color: Black
   b. Letter Color: White

5. Heating Water Piping:
   a. Background Color: Green
   b. Letter Color: White

6. Heat Pump Water Piping:
   a. Background Color: Green
   b. Letter Color: White

7. Condenser Water Piping
   a. Background Color: Green
   b. Letter Color: White

END OF SECTION 220553

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Temperature-actuated, water mixing valves.
5. Bronze, Calibrated-Orifice, Balancing Valves
6. Strainers.
7. Drain valves.
8. Water-hammer arresters.
9. Trap-seal primer valves.

B. Related Requirements:

1. Section 220500 “General Provisions of Plumbing and HVAC” for Expansion Loops, Alignment Guides, Dielectric Fittings, Sleeves and Sleeve Seals, Sealants, Escutcheons and floor plates.
2. Section 220519 "Meters and Gages for Plumbing and HVAC Piping" for thermometers, pressure gages.
3. Section 221116 "Domestic Water Piping" for piping and fittings.
4. Section 224500 "Emergency Plumbing Fixtures" for water tempering equipment.
5. Section 224713 "Drinking Fountains" for water filters for water coolers.
6. Section 224716 "Pressure Water Coolers" for water filters for water coolers.
7. Section 224723 "Remote Water Coolers" for water filters for water coolers.

1.2 ACTION SUBMITTALS

A. See Section 220000 “General Requirement of Plumbing and HVAC” for submittal requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14. Mark "NSF-pw" on plastic piping components.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Standard: ASSE 1011.
2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Chrome or nickel plated.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers:
   a. Watts
   b. Zurn Wilkins
   c. Prior approved Equal
2. Description:
   a. Standard: ASSE 1013.
   b. Operation: Continuous-pressure applications.
   c. Pressure Loss: 12 psig maximum, through middle third of flow range.
   d. Size: See Drawings – Line size of size not specifically listed.
   e. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
   f. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
   g. Accessories:
      1) Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
      2) Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
      3) Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double-Check, Backflow-Prevention Assemblies:

1. Manufacturers:
   a. Watts
   b. Zurn Wilkins
   c. Prior approved Equal

2. Description:
   a. Standard: ASSE 1015.
   b. Operation: Continuous-pressure applications unless otherwise indicated.
   c. Pressure Loss: 5 psig maximum, through middle third of flow range.
   d. Size: See Drawings – Line size of size not specifically listed.
   e. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
   f. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

g. Accessories:
   1) Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
   2) Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Apollo Valves; Conbraco Industries, Inc.
   b. Watts; a Watts Water Technologies company.
   c. Zurn Industries, LLC.

2. Standard: ASSE 1003.

3. Pressure Rating: Initial working pressure of 150 psig.
4. Size: See Drawings – Line size of size not specifically listed.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
6. Valves for Booster Heater Water Supply: Include integral bypass.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Leonard Valve Company.
   b. Symmons Industries, Inc.
   c. Watts; a Watts Water Technologies company.
   d. Zurn Industries, LLC.

2. Standard: ASSE 1017.

3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Finish: Chrome plated.

B. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Armstrong International, Inc.
b. Leonard Valve Company.
c. Symmons Industries, Inc.
d. Zurn Industries, LLC.

2. Standard: ASSE 1017.

3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: Cabinet-type, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Finish: Chrome plated.
9. Piping Finish: Chrome plated.
10. Cabinet: Factory fabricated, stainless steel, for surface mounting and with hinged, stainless-steel door.

2.7 BRONZE, CALIBRATED-ORIFICE, BALANCING VALVES

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bell & Gossett; a Xylem brand.
   b. Flow Design, Inc.
   c. Nexus Valve, Inc.
   d. TACO Comfort Solutions, Inc.
2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
   a. Strainers NPS 2 and Smaller: 0.020 inch.
   b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
6. Drain: Factory-installed, hose-end drain valve with cap.

2.9 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.10 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg. Co.
    b. Sioux Chief Manufacturing Company, Inc.
    c. Watts; a Watts Water Technologies company.
    d. Zurn Industries, LLC.

2. Standard: ASSE 1010 or PDI-WH 201.

3. Type: Metal bellows or Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.11 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg. Co.
    b. Sioux Chief Manufacturing Company, Inc.
    c. Watts; a Watts Water Technologies company.
    d. Zurn Industries, LLC.

2. Standard: ASSE 1018.

3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install double check backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

C. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

D. Install balancing valves at each hot water recirculation branch connection to the return main.

E. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve, solenoid valve and pump.

F. Install water-hammer arresters in water piping according to PDI-WH 201.

G. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each reduced-pressure-principle backflow preventer and double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves. Verify pressure set points with Engineer prior to setting

B. Set field-adjustable flow set points of balancing valves. Verify flow rates with Engineer prior to setting.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves. Verify temperature setting with engineer prior to setting.

END OF SECTION 221119

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes water meters, water meter registers and accessors.

1.2 SUBMITTALS

A. See Section 220000 “General Requirement of Plumbing and HVAC” for submittal requirements.

1.3 QUALITY ASSURANCE

A. All meters furnished shall be manufactured by a registered ISO 9001 quality standard facility. Acceptable meters shall have a minimum of fifteen (15) years of successful field use. All specifications meet or exceed the latest revision of AWWA C702.

B. All meter and components must comply with the Safe Drinking Water Act (SDWA) per NSF 372 and be compliant with NSF/ANSI 61, Annex G and Annex F. Specifically:

1. Meters shall be made of “lead free” alloy as defined by NSF/ANSI 61, Annex G and Annex F.
2. Meters shall comply with NSF/ANSI 61, Annex G which allows a maximum weighted average lead content level of 0.25% of the wetted surface area.
3. Meters shall comply with NSF/ANSI 61, Annex F which requires leaching of less than 5 µg/L in tests performed per the NSF/ANSI 61 test methodology for water with pH of 5 and pH of 10.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide Neptune TRU/FLO Compound meter or prior approved equal.

2.2 DESCRIPTION

A. Compound meters shall consist of a combination of an AWWA Class II turbine meter for measuring high rates of flow and a nutating disc type positive displacement meter for measuring low rates of flow enclosed in a single maincase. An automatic valve shall direct flows through the disc meter at low flow rates and through the turbine meter at high flow rates. At high flow rates, the automatic valve shall also serve to restrict the flow through the disc meter to minimize wear.

2.3 CAPACITY AND OPERATING CHARACTERISTICS

A. See drawings for size.

2.4 CONSTRUCTION

A. The maincase and cover shall be cast from an NSF/ANSI 61, Annex G and Annex F certified lead free high copper alloy containing a minimum of 85% copper. The size, model, NSF certification and arrows indicating direction of flow shall be cast in raised characters on the maincase or cover. The covers all contain a stainless steel calibration vane for the purpose of calibrating the turbine measuring element while the meter is inline and under pressure. A test plug shall be located in the maincase or the cover for the purpose of field testing of the meter.

B. Casing bolts shall be made of AISI Type 316 stainless steel.

C. Maincases shall be flanged. The 2” meters shall be oval flanged and 3” through 6” sizes shall be round flanged per Table 4, AWWA C702.

D. The meter serial number shall be imprinted on the meter flange or cover as well as the register box covers.

E. The turbine measuring chamber shall be a self-contained unit, attached to the cover for easy removal. The turbine shaft shall be tungsten carbide with tungsten carbide inserts and shall rotate in removable graphite bushings. Thrust bearings shall be tungsten carbide.

F. The nutating disc chamber shall be a self-contained unit mounted on the cover and easily removable from the cover. It shall conform to AWWA Standard C700 for the following sizes: 2” and 3”- 5/8” disc; 4”- 3/4” disc; 6”- 1” disc. The inlet to the disc chamber shall be a “single” opening of adequate size not to be susceptible to plugging and water restriction by water-borne debris.

G. The intermediate gear train shall be directly coupled from the turbine rotor and magnetically coupled to the register through the meter cover. The gear train shall be housed in the turbine measuring chamber. All moving parts of the gear train shall be made of a self-lubricating polymer or stainless steel for operation in water. Only the cover must be removed to gain access to the valve for inspection or service. The disc meter shall include a self-actuated valve that directs flow through the disc meter at low flow rates and through the turbine meter at high flow rates. At high flow rates, the self-actuated throttle valve shall restrict the flow through the disc meter to minimize wear.

H. A strainer shall be provided for the disc meter. It shall be easily removable and have an effective straining area of double the disc meter inlet.

2.5 REGISTER

A. Provide the meter with Neptune TRICON/S Register. The register shall output a switch closure that is proportional to the flow rate. Coordinate the switch configuration (gallons, cubic feet, etc…) with the Owner and electrical contractor prior to ordering.

B. Provide separate registers for the disc and turbine portions of the meter if required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Follow manufacturer's recommendation for installation. Installation will conform to the guidelines provided by the Installation & Operation Manual.

B. Provide manufacturers straight pipe requirements on the inlet (upstream) side, and on the outlet (downstream) side. Provide Neptune Strainer on inlet of meter.

3.2 RESPONSIBILITY

A. The Mechanical Contractor shall furnish and install in the flow meter in the location shown on the plans.

B. The electrical contractor shall provide all wiring (line and low voltage) between the flow meter and smart meter (see electrical drawings for location).

END OF SECTION 221120

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Cleanouts.
2. Miscellaneous sanitary drainage piping specialties.

B. Related Requirements:

1. Section 221316 “Sanitary Waste and Vent Piping”

1.2 SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 CLEANOUTS

A. Above Grade Wall Cleanout
1. Provide JR Smith 4422 or approved equal
2. Description: Cast iron caulked spigot ferrule with cast bronze taper thread plug and stainless steel round cover and screw.

B. Finished Floor Cleanout
1. Provide JR Smith 4100 or approved equal
2. Description: Cast iron cleanout with extra heavy duty round, adjustable, scoriated, secured nickel bronze top, and no-hub outlet, gasket seal bronze plug and flashing clamp for.

C. Outdoor Cleanout
1. Provide JR Smith 4241S or approved equal
2. Description: Cast iron floor level cleanout assembly with heavy duty, round, adjustable, scoriated cast iron top, non-tilt tractor cover, gasket seal bronze plug.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains or Hub Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-less, cast-iron soil-pipe fittings. Include P-trap, riser section; and where required, increaser fitting joined with ASTM C 564 rubber gaskets.
2. Size: See drawings. If not shown drain shall 2" minim or one size larger than piping discharging to the drain.

B. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

C. Floor-Drain, Trap Seal:
1. Barrier type floor drain or sink trap seal device.
2. IAPMO 7479 and ASSE std. 1072 listed.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Expansion Joints:

1. Standard: ASME A112.6.4.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout with top flush with finished floor. It shall be the responsibility of the plumbing contractor to coordinate the installation of cleanouts with the general contractor and floor contractor to ensure that floor cleanouts are properly adjusted so that the top is flush and level with finished flooring material. Cleanout covers that are not flush and level with the finished floor will be rejected and the plumbing contractor will be

required to sawcut or core drill the floor, provide and install and new cleanout, coordination installation of new concrete and new finished flooring material.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Coordinate installation of roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof with the general contractor or construction manager.

E. Assemble open drain fittings and install with top of hub 2 inches above floor.

F. Install deep-seal traps on floor drains and other waste outlets, if indicated.

G. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

H. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

I. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

J. Install wood-blocking reinforcement for wall-mounting-type specialties.

K. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial, gas-fired, storage, domestic-water heaters.
2. Commercial, gas fired, tankless, domestic-water heaters.
3. Domestic-water heater accessories.

1.2 SUBMITTALS

A. See Section 220000 “General Requirements of Mechanical and Plumbing” for submittal requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

C. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Warranty Periods: From date of Substantial Completion.

a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:

1) Storage Tank: Three years.
2) Controls and Other Components: One year(s).

b. Commercial, Gas-Fired, Tankless, Domestic-Water Heaters:
   1) Heat Exchanger: Six (6) years
   2) All other components: 5 years

c. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

A. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Bradford White Corporation.
   b. Lochinvar, LLC.
   c. Rheem Manufacturing Company.
   d. Smith, A. O. Corporation.

2. Standard: ANSI Z21.10.3/CSA 4.3.

3. Description: High efficiency gas fired, storage tank type water heater and shall bear the ASME "HLW" stamp and shall be National Board listed.

4. Glass lined steel storage tank.

5. Sealed combustion, modulating gas burner with 95% thermal efficiency.

6. 150 psi working pressure.

7. The storage tanks shall be insulated in accordance with ASHRAE 90.1 and shall have a painted heavy gauge steel jacket.

8. ASME rated temperature and pressure relief valve.

9. Combustion air ducting shall be PVC.

10. Flue venting shall be PVC, CPVC, polypropylene or stainless steel.

11. Combustion air and venting shall terminate vertical though roof or horizontal through a sidewall.

12. Unit shall include integrated solid-state temperature and ignition control device with integral diagnostics, graphic user interface, fault history display, and shall have digital temperature readout.

13. Capacity and Characteristics:
    a. See Drawings.

2.2 COMMERCIAL, GAS-FIRED, TANKLESS, DOMESTIC-WATER HEATERS

A. Commercial, Gas-Fired, Tankless, Domestic-Water Heaters
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Rinnai
      b. Bosch
      c. Prior approved equal
   2. Description: Commercial, condensing tankless water heater with recirculation capability and certified for commercial use.
   3. Direct electronic ignition
   4. Minimum Flow Rate: 0.26 GPM
   5. Minimum Activation Flow Rate: 0.4 GPM
   6. Maximum Flor Rate: 9.8 GPM
   7. Discharge Temperature Rage: 98F-120F
   8. All vales shall be NSF/ANSI 61 approved for potable use.
   9. Min/Max Water Supply Pressure: 20-150 psi
   10. Min/Max Natural Gas Supply Pressure: 4 – 10.5” W.C.
   11. Venting and Combustion Air: Ubbink Polypropylene Concentric Vent.
   12. Capacities and Characteristics: See drawings

2.3 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Expansion Tanks:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. AMTROL, Inc.
      b. Taco
      c. Armstrong
      d. John Wood

   2. Description: AMSE rated, steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

   3. Construction:

      a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
      b. Interior Finish: Comply with NSF 61 Annex barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
      c. Air-Charging Valve: Factory installed.

   4. Capacity and Characteristics:
      a. See Drawings.

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.

D. Heat-Trap Fittings: ASHRAE 90.2.

E. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig-maximum outlet pressure unless otherwise indicated.

F. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

G. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.

H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

I. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.

J. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of 18 inches above the floor.

K. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

L. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

M. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include pressure rating as required to match gas supply.

N. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect assembled domestic-water heaters and storage tanks specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial domestic-water heaters and storage tanks to minimum of one and one-half times pressure rating before shipment.

C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523 “General Duty Valves for Plumbing and HVAC.”

C. Install gas-fired, domestic-water heaters according to NFPA 54.

1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 231123 "Facility Natural-Gas Piping."

D. Install commercial domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

E. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install combination temperature-and-pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

G. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

H. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

I. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

J. Fill domestic-water heaters with water.

K. Charge domestic-water compression tanks with air.

L. Install combustion air and vent piping per manufacturer’s instructions.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."

B. Comply with requirements for fuel-oil piping specified in Section 231113 "Facility Fuel-Oil Piping."

C. Comply with requirements for gas piping specified in Section 231123 "Facility Natural-Gas Piping."

D. Drawings indicate general arrangement of piping, fittings, and specialties.

E. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and respecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

END OF SECTION 223400

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Plumbing fixtures shown and scheduled on the drawings.

1.2 SUBMITTALS

A. See section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURE MANUFACTURERS – The following manufacturers are approved. Fixtures and equipment other than those listed in the plumbing fixture schedule must be submitted for approval prior to bidding. Only products from the manufacturers listed below will be considered. Request for prior approval from manufacturers not listed below will not be considered.

A. DRINKING FOUNTAINS & WATER COOLERS
1. FIXTURES
a. HAWS
b. ELKAY
c. ACORN
d. HALSEY TAYLOR

B. FLOOR DRAINS & SINKS
1. FIXTURES
a. JR SMITH
b. ZURN
c. JOSAM

2. TRAP SEAL
a. TRAP GUARD
b. JR SMITH

3. TRAP PRIMERS
a. JR SMITH
b. WATTS
c. ZURN

C. HOSE BIBBS / WALL HYDRANTS
1. WOODFORD
2. WATTS
3. ZURN

D. LAVATORIES
1. FIXTURES
a. KOHLER

b. AMERICAN STANDARD
c. TOTO

2. CARRIERS AND SUPPORTS
   a. JR SMITH
   b. ZURN
   c. JOSAM

3. FAUCETS
   a. MOEN COMMERCIAL
   b. SLOAN
   c. CHICAGO FACUET

4. PIPING COVERS
   a. TRUBRO
   b. PLUMMEREX

E. STAINLESS STEEL SINKS
1. FIXTURES
   a. ELKAY
   b. JUST
   c. KOHLER

2. FAUCETS
   a. MOEN COMMERCIAL
   b. T&S BRASS
   c. CHICAGO FAUCET

F. STOP VALVES

1. BRASSCRAFT

2. WATTS

3. KINGSTON BRASS

G. UTILITY SINKS & MOP SINKS
1. FIXTURES
   a. FIAT
   b. MUSTEE
   c. KOHLER

2. FAUCETS
   a. MOEN COMMERCIAL
   b. T&S BRASS
   c. CHICAGO FAUCET
3. ACCESSORIES
   a. FIAT
   b. MUSTEE

H. URINALS
1. FIXTURES
   a. KOHLER
   b. AMERICAN STANDARD
   c. TOTO
   d. SLOAN

2. FLUSH VALVES
   a. MOEN
   b. ZURN
   c. SLOAN

3. CARRIERS AND SUPPORTS
   a. JR SMITH
   b. ZURN
   c. JOSAM

I. WATER CLOSETS
1. FIXTURES
   a. KOHLER
   b. AMERICAN STANDARD
   c. TOTO
   d. SLOAN

2. FLUSH VALVES
   a. MOEN
   b. ZURN
   c. SLOAN

3. SEATS
   a. KOHLER
   b. CHURCH
   c. OLSONITE

4. CARRIERS AND SUPPORTS
   a. JR SMITH
   b. ZURN
   c. JOSAM

2.2 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install plumbing fixtures level and plumb according to roughing-in drawings.

B. Install floor-mounted water closets on closet flange attachments to drainage piping.

C. Install counter-mounting fixtures in and attached to casework.

D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.

E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."

F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

G. Install toilet seats on water closets.

H. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

I. Install shower flow-control fittings with specified maximum flow rates in shower arms.

J. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes unless otherwise indicated.

K. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

L. Install dishwasher air-gap fitting at each sink indicated to have air-gap fitting. Install in sink deck. Connect inlet hose to dishwasher and outlet hose to disposer.

M. Set bathtubs and shower receptors in leveling bed of cement grout.

N. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks.

O. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

P. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

Q. The Plumbing contractor shall furnish a 24V control transformer to all hard wired optical/handsfree fixtures. The Plumbing contractor shall coordinate with the electrical contractor to install all line and low voltage wiring in compliance with section 260519 “Low-voltage Electrical Power Conductors and Cables”, and section 260523 “Control-Voltage Electrical Power Cables”.

3.2 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks.

E. All electrical connections shall be coordinated by the plumbing contractor with the electrical contractor.

3.3 ADJUSTING

A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.4 CLEANING AND PROTECTION

A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.

B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed plumbing fixtures and fittings.

D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

F. TDH: Total dynamic head.

1.3 ACTION SUBMITTALS

A. See Section 220000 “General Requirement of Plumbing and HVAC” for submittal requirements

1.4 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC, NEBB, TABB, or as approved by the Engineer prior to bidding.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

E. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

E. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

F. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

G. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

H. Examine system pumps to ensure absence of entrained air in the suction piping.

I. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

2.2 PREPARATION

A. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Duct systems are complete with terminals installed.
b. Volume, smoke, and fire dampers are open and functional.
c. Clean filters are installed.
d. Fans are operating, free of vibration, and rotating in correct direction.
e. Variable-frequency controllers' startup is complete and safeties are verified.
f. Automatic temperature-control systems are operational.
g. Ceilings are installed.
h. Windows and doors are installed.
i. Suitable access to balancing devices and equipment is provided.

2.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", NEBB's "Procedural

Standards for Testing, Adjusting, and Balancing of Environmental Systems" or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with plastic plugs.
2. Coordinate with the mechanical insulation contractor to Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

2.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

2.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.

b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:

a. Measure static pressure directly at the fan outlet or through the flexible connection.
b. Measure static pressure directly at the fan inlet or through the flexible connection.
c. Measure static pressure across each component that makes up the air-handling system.
d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

2.6 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

2.7 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:
1. Manufacturers' test data.
2. Field test reports prepared by system and equipment installers.
3. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Face and bypass damper settings at coils.
    d. Settings for supply-air, static-pressure controller.
    e. Other system operating conditions that affect performance.

D. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.

e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.

E. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.

2. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

F. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Air velocity in fpm.
c. Preliminary airflow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.

2.8 DUCT TESTING

A. Duct Testing is required for supply, return or exhaust ductwork that will operate at 3 inWC static pressure or greater.

B. Leakage test procedures shall follow the outlines and classifications in the SMANCA HVAC Air Duct Leakage Test Manual.

C. The Owner and mechanical engineer shall select sections of ductwork from each air handling system for duct leakage testing. The sample shall include at least five transverse joints, typical seams, and access door connections. The sample will include all medium pressure supply ductwork between the air handling unit to within 2’ of the connection to variable air volume terminal units.

D. The Air handling systems shall be tested at 3 inches w.g. and shall meet leakage Class 3.

E. If a section fails to meet allotted leakage level, the contractor shall modify the ductwork to bring it into compliance and shall retest the section until acceptable leakage is demonstrated. One retest shall will be provided by the TAB contractor. The mechanical contractor shall pay the TAB contractor for any additional retesting required.

F. All testing and necessary repairs shall be completed prior to concealment of the ductwork.

END OF SECTION 230593

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, Duct Insulation.

B. Related Sections:

1. Section 220716 "Plumbing and HVAC Equipment and Piping Insulation."
2. Section 233113 "Metal Ducts" for duct liners.

1.2 ACTION SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.

G. Jacketed Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: 60 percent by volume and 66 percent by weight.
4. Color: White.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 FIELD-APPLIED JACKETS

A. Self-Adhesive Outdoor Jacket: 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting a rubberized bitumen compound; heat applied to a multi-ply embossed UV-resistant aluminum foil/polymer laminate, and polyester/foil multiple layer laminate with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Polyguard Products, Inc.
   b. Prior Approved Equal

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Width: 3 inches.
   2. Thickness: 11.5 mils.
   3. Adhesion: 90 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch in width.
   6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
   1. Width: 3 inches.
   2. Thickness: 6.5 mils.
   3. Adhesion: 90 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch in width.
   6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
   1. Width: 2 inches.
   2. Thickness: 3.7 mils.
   3. Adhesion: 100 ounces force/inch in width.
   4. Elongation: 5 percent.
   5. Tensile Strength: 34 lbf/inch in width.

2.8 SECUREMENTS

A. Cupped Head Weld Pins:
   1. Material: Low carbon steel.
   2. Finish: Copper coated pins with galvanized washer
   3. Pin gauge: 12 Ga.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 FINISHES

A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint outdoor ductwork.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.7 DUCT INSULATION SCHEDULE, GENERAL

A. Duct insulation shall not be installed on any indoor, supply or return ductwork that is exposed to view unless otherwise indicated on the drawings.

B. Insulation materials and thicknesses for ductwork are identified in the table below. If more than one material is listed for an application, selection from materials listed is at the Contractor's option. Ductwork that is not listed below or is exposed to view shall not be insulated.

Application	Insulation Type	Installed R-Value	Vapor Barrier	Factory Installed Jacket Type
Indoor Supply	Mineral-Fiber Blanket	6	YES	FSK
Indoor Exhaust *	Mineral-Fiber Blanket	8	YES	FSK
Indoor Fresh Air	Mineral-Fiber Board	8	YES	FSK

*Indoor Exhaust Ductwork shall be insulated from the penetration of the building envelope to 10ft upstream of a backdraft of shutoff damper.

3.8 FIELD APPLIED JACKETING SCHEDULE

A. Field applied jackets for Plumbing and HVAC piping are identified in the table below. If more than one material is listed for an application, selection from materials listed is at the Contractor's option.

END OF SECTION 230713

PART 1 - GENERAL

1.1 DESCRIPTION

A. The requirements of this Section apply to all sections of Division 23.

B. This project will have selected building systems commissioned.

1.2 RELATED WORK

A. All sections listed in the Table of Contents shall be a Condition of this Section.

1.3 COMMISSIONED SYSTEMS

A. Commissioning of a system or systems specified in Division 23 is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's Operation and Maintenance personnel in accordance with the requirements of Division 23.

1.4 SUBMITTALS

A. The commissioning process requires review of selected Submittals that pertain to the systems to be commissioned. The Commissioning Agent will provide a list of submittals that will be reviewed by the Commissioning Agent. This list will be reviewed and approved by the Owner prior to forwarding to the Contractor. Refer to Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, and SAMPLES for further details.

B. The commissioning process requires Submittal review simultaneously with engineering review.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 Construction inspections

A. Commissioning of HVAC systems will require inspection of individual elements of the HVAC systems construction throughout the construction period.

3.2 PRE-FUNCTIONAL CHECKLISTS

A. The Contractor shall complete Pre-Functional Checklists to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing. The Commissioning Agent will prepare Pre-Functional Checklists to be used to document equipment installation. The Contractor shall complete the checklists. Completed checklists shall be submitted to the Owner and to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all the

checklists for the type of equipment will be returned to the Contractor for correction and resubmission.

3.3 CONTRACTORS TESTS

A. Contractor tests as required by other sections of Division 23 shall be scheduled and documented in accordance with Section 01 00 00 GENERAL REQUIREMENTS. All testing shall be incorporated into the project schedule. Contractor shall provide no less than 7 calendar days' notice of testing. The Commissioning Agent will witness selected Contractor tests at the sole discretion of the Commissioning Agent. Contractor tests shall be completed prior to scheduling Systems Functional Performance Testing.

3.4 SYSTEMS FUNCTIONAL PERFORMANCE TESTING:

A. The Commissioning Process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions. The Commissioning Agent will prepare detailed Systems Functional Performance Test procedures for review and approval by the Architect. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials, and test equipment identified in the test procedure to perform the tests. The Commissioning Agent will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed.

3.5 TRAINING OF OWNER PERSONNEL

A. Training of the Owner operation and maintenance personnel is required in cooperation with the Architect and Commissioning Agent. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. Contractor shall submit training agendas and trainer resumes. The instruction shall be scheduled in coordination with the Owner and Architect after submission and approval of formal training plans.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.
3. Refrigerants.

1.2 SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC”

B. Shop Drawings:

1. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
2. Show interface and spatial relationships between piping and equipment.
3. Shop Drawing Scale: 1/4 inch equals 1 foot or 1/8 in equal 1 foot.

1.3 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Working Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:
1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:
1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).
   1. Body and Bonnet: Plated steel.
   2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
   3. Seat: Polytetrafluoroethylene.
   4. End Connections: Threaded.
   5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24, 115, or 208-V ac coil as required by the installation.
   6. Working Pressure Rating: 400 psig.
   7. Maximum Operating Temperature: 240 deg F.

F. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
   1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
   2. Piston, Closing Spring, and Seat Insert: Stainless steel.
   3. Seat: Polytetrafluoroethylene.
   4. End Connections: Threaded.
   5. Working Pressure Rating: 400 psig.
   6. Maximum Operating Temperature: 240 deg F.

G. Thermostatic Expansion Valves: Comply with AHRI 750.
   1. Body, Bonnet, and Seal Cap: Forged brass or steel.
   2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
   3. Packing and Gaskets: Non-asbestos.
   4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
   5. Suction Temperature: 40 deg F.
   6. Superheat: Adjustable.
   7. Reverse-flow option (for heat-pump applications).
   8. End Connections: Socket, flare, or threaded union.
   9. Working Pressure Rating: 700 psig.

H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
   1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
   2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
   3. Packing and Gaskets: Non-asbestos.
   4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
   5. Seat: Polytetrafluoroethylene.
   6. Equalizer: Internal or External.
   7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter and 24, 115, or 208-V ac coil as required for the application.
   8. End Connections: Socket.
   9. Set Pressure: Field Verify.
   10. Throttling Range: Maximum 5 psig.
   11. Working Pressure Rating: 500 psig.
   12. Maximum Operating Temperature: 240 deg F.

I. Straight-Type Strainers:
   1. Body: Welded steel with corrosion-resistant coating.
   2. Screen: 100-mesh stainless steel.
   3. End Connections: Socket or flare.
   4. Working Pressure Rating: 500 psig.
   5. Maximum Operating Temperature: 275 deg F.

J. Angle-Type Strainers:
   1. Body: Forged brass or cast bronze.

2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

K. Moisture/Liquid Indicators:
1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in parts per million (ppm).
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

L. Replaceable-Core Filter Dryers: Comply with AHRI 730.
1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: High moisture capacity.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

M. Permanent Filter Dryers: Comply with AHRI 730.
1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: High Moisture capacity.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

2.4 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

D. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

E. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

F. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

G. Safety-Relief-Valve Discharge Piping: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

H. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

I. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-size, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves according to Section 220553 "Identification for Plumbing and HVAC Piping and Equipment."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220500 "General Provisions of Plumbing and HVAC."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220500 "General Provisions of Plumbing and HVAC."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "General Provisions of Plumbing and HVAC."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:

1. NPS 1/2: Maximum span, 60 inches; minimum rod, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod, 1/2 inch.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.
6. Seismic-restraint devices.

B. Related Sections:
1. Section 220529 “Hangars and Supports for Plumbing and HVAC Piping and Equipment.”
2. Section 220548 “Vibration and Seismic Controls for Plumbing and HVAC Piping and Equipment”
3. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
4. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ANSI/ASHRAE 62.1.

1.2 SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

1.3 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

B. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints,"

for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 24 in Diameter: Flanged.

C. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.

2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches from bottom of duct.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts at a minimum to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

C. Leakage Tests: (Engineer shall include or remove as required)

1. Test 100 percent of installed ductwork for leakage in accordance with "System Pressure Testing for Leaks," published by United Sheet Metal Division of United McGill Corporation. Use prescribed test kit containing test blower, two U-tube manometers and calibrated curve attached to the orifice tube assembly.
2. Pressurize installed duct system in 2 inch water gauge over design operating pressure. Total allowable leakage shall not exceed one percent of air handling capacity of system. If system is tested in sections, add leakage rates for individual sections to determine leakage for the whole system.
3. Correct leaks found in excess of allowable limits. Retest.
4. Have test results available for review on a progressive and final basis. Include test results in project closing file.
5. For Bidding purposes, assume all leakage tests will be witnessed by Engineer. Notify Engineer of testing schedule a minimum of (7) days in advance.
6. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
7. Test for leaks before applying external insulation.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.

2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems." And ASCE/SEI 7.

3.7 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.8 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: C.

c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round and Flat Oval: 8.

2. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round and Flat Oval: 8.

3. Ducts Connected to Variable-Air-Volume Air-Handling Units:

a. Pressure Class: Positive 3-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 8.
d. SMACNA Leakage Class for Round and Flat Oval: 4.

4. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round and Flat Oval: 8.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round and Flat Oval: 8.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round and Flat Oval: 8.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round and Flat Oval: [**3**] [**6**] [**12**] <**Insert value**>.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.
b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round and Flat Oval: 8.

2. Ducts Connected to Air-Handling Units:

    a. Pressure Class: Positive or negative 3-inch wg.
    b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
    c. SMACNA Leakage Class for Rectangular: 8.
    d. SMACNA Leakage Class for Round and Flat Oval: 4.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

    a. Pressure Class: Positive or negative 2-inch wg.
    b. Minimum SMACNA Seal Class: C.
    c. SMACNA Leakage Class for Rectangular: 16.
    d. SMACNA Leakage Class for Round and Flat Oval: 8.

2. Ducts Connected to Air-Handling Units:

    a. Pressure Class: Positive or negative 3-inch wg.
    b. Minimum SMACNA Seal Class: B.
    c. SMACNA Leakage Class for Rectangular: 8.
    d. SMACNA Leakage Class for Round and Flat Oval: 4.

3. Ducts Connected to Equipment Not Listed Above:

    a. Pressure Class: Positive or negative 3-inch wg.
    b. Minimum SMACNA Seal Class: B.
    c. SMACNA Leakage Class for Rectangular: 8.
    d. SMACNA Leakage Class for Round and Flat Oval: 4.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. PVC-Coated Ducts:

    a. Exposed to Airstream: Match duct material.
    b. Not Exposed to Airstream: Galvanized.

3. Stainless-Steel Ducts:

    a. Exposed to Airstream: Match duct material.
    b. Not Exposed to Airstream: Match duct material.

4. Aluminum Ducts: Aluminum.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    a. Velocity 1000 fpm or Lower:

        1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
        2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Flange connectors.
5. Turning vanes.
6. Duct-mounted access doors.
7. Flexible connectors.
8. Duct accessory hardware.

1.2 SUBMITTALS

A. See section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a 2D finish for concealed ducts and 2BA finish for exposed ducts.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cesco Products; a divsion of MESTEK, Inc.
2. Nailor Industries Inc.
3. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 1000 fpm.

D. Maximum System Pressure: 4.5 inch wg.

E. Frame: Hat-shaped, 0.063-inch-thick extruded aluminum, with welded corners or mechanically attached and mounting flange.

F. Blades: Multiple single-piece blades, end pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Extruded vinyl, mechanically locked.

I. Blade Axles:

1. Material: Nonmetallic.
2. Diameter: 0.20 inch.

J. Bearings: synthetic pivot bushings.

K. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.
    a. Sleeve Thickness: 20 gage minimum.
    b. Sleeve Length: 6 inches minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Aluminum.
8. Screen Type: Bird.
9. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cesco Products; a divsion of MESTEK, Inc.
   b. Nailor Industries Inc.
   c. Ruskin Company.

2. Standard leakage rating.

3. Suitable for horizontal or vertical applications.
4. Frames:

   a. Frame: 16 Gauge galvanized steel, 5 in deep
   b. Mitered and welded corners.
   c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. 16 gauge galvanized steel with V groove for stiffness.

6. Blade Axles: Galvanized steel.
7. Bearings:

   a. Molded synthetic.
   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.5 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cesco Products; a divsion of MESTEK, Inc.
2. Nailor Industries Inc.
3. Ruskin Company.

B. Frames:

1. U shaped.
2. 16 gage galvanized steel.
3. Interlocking, gusseted corners.

C. Blades:

1. Multiple blade with maximum blade width of 6 inches.
2. Parallel- and opposed-blade design.

3. 14 gage Galvanized-steel.
4. Blade Edging: Closed-cell neoprene.
5. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

D. Blade Axles: 1/2-inch-diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

E. Bearings:

1. Oil-impregnated stainless-steel sleeve.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.6 FLANGE CONNECTORS

A. Description: Roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

B. Material: Galvanized steel.

C. Gage and Shape: Match connecting ductwork.

2.7 TURNING VANES

A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

B. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Double wall.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cesco Products; a divsion of MESTEK, Inc.
2. Ductmate Industries, Inc.
3. Flexmaster U.S.A., Inc.
4. Nailor Industries Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. Vision panel.
   d. Hinges and Latches: 1-by-1-inchbutt or piano hinge and cam latches.
   e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

   a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
   c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.
   d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 3.0- to 8.0-inch wg.
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch-thick, fibrous-glass or polystyrene-foam board.

2.9 FLEXIBLE CONNECTORS

A. Materials: Flame-retardant or noncombustible fabrics.

B. Coatings and Adhesives: Comply with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd..
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.10 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream and downstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure

relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot spacing.
8. Control devices requiring inspection.
9. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

K. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

N. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

O. Connect flexible ducts to metal ducts with draw bands.

P. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes intake and exhaust louvers shown on the mechanical drawings.

B. Related Requirements:

1. Section 233113 “Metal Ducts”
2. Section 233300 “Air Duct Accessories”

1.2 SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

1.3 QUALITY ASSURANCE

A. Louvers licensed to bear AMCA Certified Ratings Seal. AMCA Certified Ratings Seal applies to air performance and water penetration ratings.

B. Louvers shall be factory engineered to withstand the specified seismic loads.

C. Minimum design loads shall be calculated to comply with ASCE – 7.

1.4 DELIVERY STORAGE AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store materials in a dry area indoors, protected from damage and in accordance with manufacturer's instructions.

C. Protect materials and finishes during handling and installation to prevent damage.

1.5 WARRANTY

A. Manufacturer shall provide warranty for louver systems for a period of one year from date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ruskin

2. Cesco
3. Nailor

2.2 DESCRIPTION

A. Louver shall be the type and size listed on the drawings.

B. Louvers shall have stationary, drainable louver type with drain gutters in each blade and head with downspouts in jambs and mullions with all welded construction.

2.3 PERFORMANCE

A. See Drawings.

B. Louver performance shall be tested in accordance with AMCA 500 or AMCA 500-L.

C. Louvers shall be factory engineered to withstand the specified seismic loads. Minimum design loads shall be calculated to comply with ASCE – 7.

2.4 MATERIALS

A. Frame and Blades: Extruded Aluminum, Alloy 6063-T6.

2.5 FINISHES

A. Finish: 70 percent PVDF: Finish shall be applied at 1.2 mil total dry film thickness.
1. Coating shall conform to AAMA 2605. Apply coating following cleaning and pretreatment. Cleaning: AA-C12C42R1X.
2. Standard 2-coat.
3. Pearledize 70 (2-coat mica).
4. 3-coat metallic.
5. 3-coat exotic.
6. 20-year finish warranty.

B. Color: Submit color chart to architect for selection.

2.6 ACCESSORIES

A. Provide the following accessories when called out on the drawings:
1. Aluminum Blank-Off Panels: 0.040 aluminum sheet, factory installed with removable fasteners and neoprene gaskets.
2. Insulated Aluminum Blank-Off Panels: 0.040 aluminum sheet, 2 inch aluminum skin insulated core, factory installed with removable fasteners and neoprene gaskets.
3. Hinged Frame: Continuous piano hinge attached to angle or channel subframe.
4. Filter Racks: Formed channel racks to accept standard 1 inch or 2 inch thick filters. Unused bottom portion blanked off with 0.040 inch aluminum sheet.
5. Security Bars: Aluminum, 3/4 inch x 1/2 inch, welded to louver.
6. Bird Screen: Aluminum, 1/2 inch by 0.063 inch, expanded and flattened. Frame: Removable.

7. Extended Sills: Extruded aluminum, Alloy 6063-T6. Minimum nominal thickness 0.081 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect areas to receive louvers. Notify the Architect of conditions that would adversely affect the installation or subsequent utilization of the louvers. Do not proceed with installation until unsatisfactory conditions are corrected.

B. If opening preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean opening 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.

3.3 INSTALLATION

A. Install louvers at locations indicated on the drawings and in accordance with manufacturer's instructions.

B. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.

C. Install joint sealants as specified in Section 07 92 00.

3.4 CLEANING

A. Clean louver surfaces in accordance with manufacturer's instructions.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 233330

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Insulated flexible ducts.

1.2 SUBMITTALS

A. See section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."

D. Comply with ASTM E 96/E 96M, "Test Methods for Water Vapor Transmission of Materials."

2.2 INSULATED FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Thermaflex; a Flex-Tek Group company.

B. Insulated, Flexible Duct: UL 181, Class 1, two-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.
4. Insulation R-Value: R6.

2.3 FLEXIBLE DUCT CONNECTORS

A. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.

C. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

D. Connect diffusers or light troffer boots to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

E. Install duct test holes where required for testing and balancing purposes.

F. Installation:

1. Install ducts fully extended.
2. Do not bend ducts across sharp corners.
3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
5. Install flexible ducts in a direct line, without sags, twists, or turns.

G. Supporting Flexible Ducts:

1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.
4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION 233346

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ceiling-mounted ventilators.
   2. In-line centrifugal fans.

1.2 SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Acme Engineering & Manufacturing Corp.
   2. Loren Cook Company.
   3. Panasonic.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Plastic, louvered grille with spring clip or flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

   1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
   2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.

3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
4. Motion Sensor: Motion detector with adjustable shutoff timer.
5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
6. Isolation: Rubber-in-shear vibration isolators.
7. Manufacturer's standard roof jack or wall cap, and transition fittings.

G. Capacities and Characteristics: See Drawings

2.2 IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Manufacturing Corp.
2. Aerovent
3. Greenheck Fan Corporation.
4. Loren Cook Company.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
3. Companion Flanges: For inlet and outlet duct connections.
4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

G. Capacities and Characteristics: See Drawings

1. Vibration Isolators:

a. Type: Elastomeric hangers.
b. Static Deflection: 1 inch.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.4 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

B. Support suspended units from structure using threaded steel rods and elastomeric hangers or spring hangers having a static deflection of 1 inch. Vibration-control devices are specified in Section 220548 "Vibration and Seismic Controls for Plumbing and HVAC Piping and Equipment."

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 233423

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grilles, Registers and Diffusers.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.

1.2 SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS AND DIFFUSERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Krueger.
2. Nailor Industries Inc.
3. Price

B. See the “Grilles Registers and Diffusers Schedule” on the drawings for grille, register or diffuser type, mounting, capacities, characteristics, finish, etc.

C. Coordinate the color and finish of all grilles registers and diffusers with the architect if not specifically listed in the “Grilles Registers and Diffusers Schedule”.

D. Substituted grilles, registers and diffusers must meet or exceed the performance of the schedules diffuser.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install grilles, registers and diffusers level and plumb.

B. Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel.

Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install grilles, registers and diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

D. Provide all duct transitions and duct fittings required for a complete installation.

3.2 ADJUSTING

A. After installation, adjust grilles, registers and diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
- A. Daikin AC
- B. LG

2.2 INDOOR UNITS
- A. General:
  1. The indoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.
- B. Unit Cabinet:
  1. The indoor unit shall have a white, “flat screen” finish.
  2. The drain and refrigerant piping shall be concealed from view and enter the unit through the back panel.
  3. The cabinet shall be supplied with a mounting plate to be installed onto a wall for securely mounting the cabinet.
- C. Fan:
  1. The evaporator fan shall be an assembly consisting of a direct-driven fan by a single motor.
  2. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
  3. An auto-swing louver for adjustable air flow (both vertically and horizontally).
  4. The indoor fan shall offer a choice of five speeds, plus quiet and auto settings.
- D. Filter:
  1. The return air filter provided will be a mildew proof, removable and washable filter.
- E. Coil:
  1. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
  2. All tube joints shall be brazed with silver alloy or phoscopper.
  3. All coils will be factory pressure tested.
  4. A condensate pan shall be provided under the coil with a drain connection.
  5. Provide condensate pump where required and coordinate with electrical contractor for power requirements.
- F. Electrical
  1. Electrical connections shall be made. See drawings for voltage, phase requirements.
- G. Control:
  1. The unit shall have a wall mounted, wired controller. The controller shall have the following capabilities:
     a. System On/Off
     b. Fan: On/Auto
     c. Mode: Cool/Dry/Heat/Auto
     d. Schedule: 7 day programmable
     e. Temperature adjustment
     f. Auxiliary contacts to turn on/off supplemental heating equipment if applicable.

2.3 OUTDOOR UNITS
- A. General:
  1. The outdoor unit shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls. The system shall have all provisions required to allow cooling operation to 5 outside air temperature.
- B. Unit Cabinet:
  1. The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
- C. Condenser Fan:
  1. The fan shall be a direct drive, propeller type fan.
  2. The motor shall be inverter driven, permanently lubricated type bearings, inherent.

3. A fan guard is provided on the outdoor unit to prevent contact with fan operation.
4. Airflow shall be horizontal discharge.

D. Condenser Coil:
1. The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

E. Compressor:
1. The compressor shall be a inverter driven compressor.
2. The outdoor unit shall have an accumulator and four-way reversing valve.
3. The compressor shall have an internal thermal overload.
4. The outdoor unit can operate with a maximum vertical height difference of 66 feet and overall maximum length of 100 feet without any oil traps or additional components.

F. Electrical
1. The electrical power requirement is 208-230 volt, 1-phase, and 60 Hz power.
2. The outdoor shall be controlled by a microprocessor located in the outdoor and indoor units via commands from the wired controller.
3. Dedicated EEV’s shall be provided for capacity control during part load of the indoor unit.

G. Sound:
1. The outdoor unit shall have a sound level of 54 dB(A) when in maximum cooling operation and measured 3ft from the outdoor unit.

2.4 ACCESSORIES

A. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
B. Drain Hose: For condensate.
C. Additional Monitoring:
1. Monitor constant and variable motor loads.
2. Monitor variable-frequency-drive operation.
3. Monitor economizer cycle.
4. Monitor cooling load.
5. Monitor air distribution static pressure and ventilation air volumes.

2.5 CAPACITIES AND CHARACTERISTICS

A. See Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.
B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 07 72 00 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.
D. Equipment Mounting:
1. Comply with requirements for vibration isolation and seismic control devices specified in Section 23 05 48 "Vibration and Seismic Controls for HVAC."
2. Comply with requirements for vibration isolation devices specified in Section 23 05 48.13 "Vibration Controls for HVAC."
E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes air source VRF outdoor units, indoor units (fancoils), refrigerant piping and controls.

1.2 SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

B. Shop Drawings:
1. Factory approved shop drawings that detail the routing of all refrigeration piping, refrigerant pipe sizes, refrigerant pipe lengths, and location of y-braches, refrigerant charge weights and all other required accessories.
2. Factory approved wiring diagrams for components and controls.

1.3 INFORMATIONAL SUBMITTALS

1.4 QUALITY ASSURANCE

A. If requested all bidders must submit references for three (3) successfully completed VRF system installations of similar size and complexity.

B. All components of the VRF system shall be installed by staff who have completed the VRF system manufacturer’s installation and commissioning training. Submit certificates of training completion to the owner and engineer for review and approval prior to starting work. Any VRF system installation work completed by personal that have not completed factory installation and commissioning training will be considered non-conforming and will be rejected.

C. Engage a factory authorized representative to inspect the VRF system refrigeration system installation and submit a written report to the owner and engineer approving the installation prior to concealing any portion of the VRF refrigerant piping system within walls, above ceiling or in attics.

D. Engage a factory authorized representative to perform the initial VRF system start-up and written start-up report to the owner and engineer that approves the installation indicates that the system meets the manufacturer’s installation and commissioning requirements.

1.5 WARRANTY

A. The Part(s) are warranted for a period of two (2) years beginning on the date of original installation by the end use purchaser or eighteen (18) months from the date of manufacture shown on the System nameplate label, whichever occurs first.

B. The Compressor part is warranted for seven (7) years beginning on the date of original installation by the end use purchaser or thirty (30) months from the date of manufacture shown on the System nameplate label, whichever occurs first.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the following:
1. LG
2. Daikin

B. General
1. The VRF system shall consist of a single frame outdoor unit, interconnecting piping, multiple indoor units (ducted, non-ducted or mixed combinations), onboard, self-contained, stand-alone communication and controls.
2. Heat pump systems shall require two pipes, simultaneous heating and cooling shall not be supported. One pipe shall support bidirectional flow single state liquid refrigerant. The other pipe shall support bidirectional flow of single state refrigerant gas. In heating mode the gas shall be super heated high pressure. In cooling mode the gas shall be low pressure, low temperature.
3. Heat pump outdoor units shall be designed to communicate directly with all VRF indoor units manufactured by the same supplier over a field supplied stranded, twisted and shielded pair wire.
4. Indoor unit connectivity: The system shall be designed to accept connection up to 12 indoor units of various configurations and capacity. Number of indoor units allowed:
   a. 2 ton HP 4 IDUs
   b. 3 ton HP 6 IDUs
   c. 4 ton HP 8 IDUs
   d. 4.4 ton HP 9 IDUs

C. Outdoor Unit
1. General: The unit shall be shipped from the factory fully assembled including internal refrigerant piping, inverter driven compressor, controls, contacts, relay(s), fan(s), power and communication wiring.
2. Operating Range: The VRF systems shall be capable of providing continuous compressor operation over the required ambient operating range. The required ambient operating range is defined as follows:
   a. Cooling: -9.9°F DB to 122°F DB
   b. Heating: - 4°F WB to 61°F WB
3. Cabinet:
   a. Outdoor unit cabinet shall be made of 22 gauge galvanized steel with a weather and corrosion resistant enamel finish. Outdoor unit cabinet finish shall be tested in accordance with ASTM B-117 salt spray surface scratch test (SST) procedure for a minimum of 1000 hours.
   b. The cabinet shall have piping knockouts to allow refrigerant piping to be connected at the front, right side, or through the bottom of the unit.
   c. A removable service panel, shall be provided to access the following internal components:
      1) Service tool connection
      2) DIP switches
      3) Main microprocessor
      4) Inverter PCB
4. Compressor:

a. The compressor shall be a high efficiency high-side shell rotary hermetic design. Bearing shall be manufactured using high lubricity material. Compressor shall be factory charged with Polyvinyl Ether (PVE) oil. Single or dual speed compressors charged with Polyolester oil (POE) shall not be acceptable. Compressor inverter drive shall allow modulation from 20Hz to 90Hz with control in 1.0 Hz increments depending on the nominal capacity.

5. Coil:
   a. Outdoor unit coil shall be comprised of aluminum fins mechanically bonded to copper tubing with inner surfaces having a riffling treatment to expand the total surface of the tube interior
   b. The aluminum fin heat transfer surfaces shall have factory applied corrosion resistant coating. The coils coating shall be tested per ASTM B-117 standard. The test shall be performed for a minimum of 1000 hours.
   c. The outdoor unit coil shall be protected with a heavy gauge steel wire guard.
   d. The coil guard shall have a baked enamel finish.
   e. The outdoor unit coil shall be field tested to a minimum pressure of 550 psig.
   f. The cabinet shall have a factory installed coil guard.
6. Fan:
   a. All units shall be equipped with direct drive variable speed axial flow fan(s) with Brushless Digitally Controlled (BLDC) motor(s) with a horizontal air discharge.
   b. The fan(s) blades shall be made of Acrylonitrile Butadiene Styrene (ABS) material.
   c. The fan motor(s) shall be equipped with permanently lubricated bearings.
   d. The fan motor(s) shall be variable speed with an operating speed range of 0 to 850 RPM in cooling mode and heating mode. The fan(s) shall have a guard(s) to help prevent contact with moving parts.
   e. The fan control shall have a function setting to remove excess snow.
7. Refrigerant Circuit:
   a. The outdoor unit refrigeration circuit at a minimum shall include the following components:
      1) Refrigerant strainer(s)
      2) Check valve(s)
      3) Inverter driven, high pressure shell compressor
      4) Oil separator
      5) Accumulator/receiver
      6) 4-way reversing valve
      7) Electronic expansion valve(s)
      8) Double spiral tube sub-cooler and EEV
      9) High/low Schrader valve service ports with caps
      10) High/low service valves
      11) Threaded fusible plug
      12) High pressure switch
8. Controls:
   a. Factory installed microprocessor control in the outdoor unit, and indoor unit(s) shall communicate using the same protocol. Translators of any kind are not allowed. Communication between VRF system components shall be via field supplied stranded, shielded and twisted wire pair in a RS 485 network configuration. Integrated control system shall perform functions to optimize the operation of the VRF system.
   b. Main processor shall provide the commissioning agent the ability to customize the VRF systems operation based on the environment in which it is installed. Customization function to include defrost operation, modifying target superheat, sub-cooling, low pressure and high pressure values , and invoke other algorithms such as smart load control to optimize system operating efficiency. The main processor board shall include the following features:
      1) Service tool connection
      2) DIP switches

3) Auto addressing
4) Error codes
5) Main microprocessor
6) Inverter PCB

c. Outdoor unit microprocessor shall have the capability of reporting malfunction and diagnostic codes to remote control devices such as the VRF manufacturer's central controller, Zone controllers, and Building Management System (BMS).

d. Sensors
1) Each outdoor unit module shall have
2) Suction temperature sensor
3) Discharge temperature sensor
4) High Pressure sensor
5) Low Pressure sensor
6) Outdoor temperature sensor
7) Outdoor unit heat exchanger temperature sensors
8)

9. Capacities and Characteristics: See Drawings

D. Indoor Units
1. Description:
a. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an adjustable external static pressure switch.
2. General:
a. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
b. Provide fancoil units of the type and style listed in VRF Fancoil Schedule.
c. Ductless ceiling cassette type units shall have a 26"x26" maximum face plate to coordinate with lay-in ceiling.
d. Wall mounted unit shall be furnished with a wall mounting plate/bracket.
3. Fan:
a. The fan type will vary with the style of unit.
b. The fan impeller shall be statically and dynamically balanced.
c. The fan motor is Brushless Digitally commutated (BLDC) with permanently lubricated and sealed ball bearings.
d. The fan motor shall include thermal, overcurrent and low RPM protection.
e. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.
f. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm that provides a minimum of four pre-programed fan speeds in the heating mode and fan only mode and five speeds in the cooling mode. The fan speed algorithm provides a field selectable fixed speed.
g. In cooling mode, the indoor fan shall have the following settings: Low, Med, High, Super high, Power Cool, and Auto.
h. In heating mode, the indoor fan shall have the following settings: Low, Med, High, Super high and Auto.
4. Filter
a. Exposed ductless units shall have a factory supplied, removable, washable long-life filter.
b. Concealed and ducted units shall have a field fabricated filter rack on the return air inlet to house a 2" pleated MERV-8 filter. The filter rack and filter shall be sized for a max filter velocity of 400 fpm. At the contractors option return grilles with filter frames may be substituted for the filter rack at the unit. The number and size of

filter grilles shall ensure that the filter velocity is maintained below 500 ft/min and the pressure drop does not adversely affect the unit operation.

5. Coil:
   a. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
   b. The copper tubing shall have inner grooves to expand the refrigerant contact surface for high efficiency heat exchanger operation.
   c. Unit shall have a one, two to three row coil, 18-21 fins per inch.
   d. Unit shall have a factory supplied condensate drain pan below the coil constructed of polystyrene resin.
   e. Unit shall include an installed and wired condensate drain lift pump capable of providing minimum 27.5 inch lift from bottom surface of the unit. The unit drain pan is supplied with a secondary drain port/plug allowing the pan to be gravity drained and serviced.
   f. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan, model dependent.
   g. Unit shall have provision of 45° flare refrigerant pipe connections.
   h. The coil shall be factory pressure tested at a minimum of 550 psig.
   i. All refrigerant piping from outdoor unit to indoor unit shall be field insulated. Each pipe should be insulated separately.
   j.
6. Control:
   a. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system with or without the use of a wall mounted controller.
   b. The unit shall have a factory mounted return air thermistor for use as a space temperature control device. Where required a wall mounted thermistor shall be furnished and installed to ensure adequate temperature control.
   c. All operating parameters except scheduling shall be stored in non-volatile memory resident on the microprocessor. The microprocessor shall provide the following functions, self-diagnostics, auto re-start after a power failure and a test run mode.
   d. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, two core, stranded, twisted and shielded communication cable (RS-485).
   e. The unit controls shall operate the indoor unit using one of the five operating modes:
      1) Heating
      2) Cooling
      3) Dry
      4) Fan only
   f. Unit shall have a field settable method to choose auto fan speed change operation based on mode of operation, on/off fan operation based on mode of operation, or continuous minimum set fan speed operation.
   g. Unit shall have the ability to control a single stage of auxiliary heat when the fancoil unit cannot maintain the room temperature setpoint.
7. Capacities and Characteristics: See Drawings

E. VRF Controls:
1. General: The system shall be furnished with a remote controller for each fancoil unit. The remote controller shall be wall mounted and shall control On/Off, Mode of Operation, Airflow direction, Fan Speed, space temperature, and space temperature Set Point. The remote controller shall be capable of providing 7 day programmable scheduling of Occupied/Unoccupied settings, On/Off, Mode of operation, Set Point and Fan Speed.
2. Remote Controllers shall communicate to the VRF indoor unit via the indoor unit remote controller communication bus.

3. Remote Controller shall support the ability to display or hide user accessible functions from the home screen.
4. Remote Controller shall have an internal time clock and calendar to allow programming of occupied and unoccupied periods.
5. Remote Controller shall be able to enable or dis-able Auxiliary Heat.

F. Refrigerant Piping
1. The refrigerant circuit shall be constructed using field provided ACR copper, de-hydrated, refrigerant rated copper pipe, piped together with manufacturer supplied Y- branches, as may be required, connected to multiple (ducted, non-ducted or mixed combination) indoor units to effectively and efficiently control the heat pump operations of the VRF system.
2. All refrigerant pipe, y-branches, elbows and valves shall be individually insulated with no air gaps. Insulation R-value shall not be less than 0.19 btu/hr*ft^2*F (3/4” closed cell elastomeric). In no case shall the insulation be allowed to be compressed at any point in the system. All joints shall be glued and sealed per insulation manufactures instructions to make an air tight assembly.
3. The outdoor unit shall be capable of operating at an elevation difference of up to of 164 feet above or 131 feet below the lowest or highest indoor unit respectively without the requirement of field installed sub cooler or other forms of performance enhancing booster devices.
4. The outdoor unit shall be capable of operating with up to 984 equivalent length feet of interconnecting liquid line refrigerant pipe in the network.
5. The outdoor unit shall be capable of operating with up to 492 actual feet or 574 equivalent length feet of liquid line refrigerant pipe spanning between outdoor unit and farthest indoor unit.
6. The elevation difference between the highest and lowest indoor units shall not exceed 49 feet.
7. The piping system shall be designed with pipe expansion and contraction possibilities in mind. Required expansion devices shall be field designed, supplied and installed based on proper evaluation of the proposed piping design. In addition to these requirements, the piping system installation must conform to the VRF equipment manufacturer’s published guidelines.
8. The installation of pipe hangers, supports, insulation, and in general the methods chosen to attach the pipe system to the structure must allow for expansion and contraction of the piping system and shall not interfere with that movement.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All VRF system components shall be furnished installed by the mechanical contractor. Install all VRF system components per the manufacturer’s instructions and requirements.
1. Install all units level and plumb.
2. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
3. Install seismic restraints.
4. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. See Section 23 0548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

B. Duct Connections: Duct installation requirements are specified in Section 23 3113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 23 3300 "Air Duct Accessories.

C. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

D. Pipe condensate drain or outlet of condensate pump to an approved discharge location. Coordinate all discharge locations with the engineer prior to installing drain piping.

3.3 REFRIGERATION PIPING

A. Suction Lines for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR and wrought-copper fittings with brazed joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR and wrought-copper fittings with soldered joints.

D. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

E. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

F. Install Flexible connectors at compressors and connection to condensing units.

G. Install isolation valves with charging ports in piping connection to all branch selector boxes.

H. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

I. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

K. Install piping adjacent to machines to allow service and maintenance.

L. Install piping adjacent to machines to allow service and maintenance.

M. Select system components with pressure rating equal to or greater than system operating pressure.

N. Slope refrigerant piping as follows:
   1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
   2. Install horizontal suction lines with a uniform slope downward to compressor.

O. Install traps and double risers to entrain oil in vertical runs.

P. Liquid lines may be installed level.

Q. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Identify refrigerant piping and valves according to Section "Identification for HVAC Piping and Equipment."

T. Install sleeves for piping penetrations of walls, ceilings, and floors.

U. Install sleeve seals for piping penetrations of concrete walls and slabs.

V. Install escutcheons for piping penetrations of walls, ceilings, and floors.

W. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes.
1. NPS 1/4: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
4. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
5. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
8. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
9. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
10. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

X. Refrigerant pipe hangers shall consist of Cooper B-line “Snap ‘N Shield” supports mounted on a trapeze made from threaded rod and framing channel. Other hanger systems must be approved prior to installation. **Non approved hangar system will be rejected**.

Y. Charge system using the following procedures:
1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.4 REFRIGERANT LEAK DETECTION

A. Where required by the International Mechanical Code or ASHRAE Standard 15, install a refrigerant leak detection system and appropriate exhaust fans and make-up air provisions. Coordinate location of all system components with the architect and engineer prior to installation.

3.5 IDENTIFICATION

A. Provide and install equipment and piping identification in accordance with section 220553 “Identification for Plumbing and HVAC Piping and Equipment”.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Remove and replace malfunctioning units and retest as specified above. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Initial start-up of VRF system equipment shall be conducted with the assistance of a factory trained representative for the VRF system manufacturer.

B. Submit a start-up report to the architect and engineer at the completion of start-up. The report shall document any deficiencies or problems encountered and how they were addressed/resolved.

3.8 Controls:

A. Each Remote Controller shall be programmed by the contractor at the time of substantial completion. The contractor shall assist the owner in modifying the programming of any or all zones as requested prior to final completion:
1. Occupied Mode:
    a. Monday through Friday
    b. 7:30 am till 5:30 pm
    c. Heat/Cool Mode: Auto
    d. Fan: Auto
    e. Heating Setpoint: 68F
    f. Cooling Setpoint: 74F
2. Unoccupied Mode:
    a. Monday through Friday
    b. 5:31 pm through 5:29 am
    c. Heat/Cool Mode: Auto
    d. Fan: Auto
    e. Heating Setpoint: 60F
    f. Cooling Setpoint: 80F
3. Weekend/Holliday Mode:
    a. Saturday & Sunday
    b. All Day
    c. Heat/Cool Mode: Auto
    d. Fan: Auto
    e. Heating Setpoint: 60F
    f. Cooling Setpoint: 80F
4. Deadband: +/- 4F

3.9 CONTROL WIRE, CABLE AND RACEWAYS INSTALLATION

A. Comply with NECA 1.

B. Wire and Cable Installation:
1. Comply with installation requirements in Section 260523 "Control-Voltage Electrical Power Cables."
2. Comply with installation requirements in Section 271313 "Communications Copper Backbone Cabling."
3. Comply with installation requirements in Section 271513 "Communications Copper Horizontal Cabling."
4. Install cables with protective sheathing that is waterproof and capable of withstanding continuous temperatures of 90 deg C with no measurable effect on physical and electrical properties of cable.
    a. Provide shielding to prevent interference and distortion from adjacent cables and equipment.
5. Provide strain relief.
6. Terminate wiring in a junction box.
    a. Clamp cable over jacket in junction box.
    b. Individual conductors in the stripped section of the cable shall be slack between the clamping point and terminal block.
7. Terminate field wiring and cable not directly connected to instruments and control devices having integral wiring terminals using terminal blocks.
8. Install signal transmission components according to IEEE C2, REA Form 511a, NFPA 70, and as indicated.
9. Use shielded cable to transmitters.
10. Use shielded cable to temperature sensors.
11. Perform continuity and meager testing on wire and cable after installation.

C. Conduit Installation:
1. Comply with Section "260533 "Raceways and Boxes for Electrical Systems" for control-voltage conductors.
2. Comply with Section 270528 "Pathways for Communications Systems" for balanced twisted pair cabling and optical fiber installation.
3. All low and line voltage cabling shall be installed in conduit. Minimum trade size shall be ½".

3.10 DEMONSTRATION

A. Engage a factory authorized representative to train the owner and owner's personnel to operate the system, controls and perform basic maintenance.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes ductless fan coil units and accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For ventilation equipment, indicating compliance with ASHRAE 62.1, Section 5 - "Systems and Equipment."

C. Shop Drawings:

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.

D. Samples: For units with factory-applied color finishes.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale and coordinated with each other based on input from installers of the items involved:

B. Seismic Qualification Certificates: For fan coil units, accessories, and components, from manufacturer.

C. Field quality-control reports.

D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-packaged and -tested units rated according to AHRI 440, ASHRAE 33, and UL 1995.

2.2 DUCTLESS FAN COIL UNITS

A. Coil Section Insulation: Insulate coil section according to Section 230616 "HVAC Equipment Insulation."

1. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84 by a qualified testing agency.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

B. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

C. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Wiring Termination: Connect motor to chassis wiring with plug connection.

D. Electrical Connection: Factory wire motors and controls for a single electrical connection.

E. Capacities and Characteristics:
   a. See drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fan coil units level and plumb.

B. Install fan coil units to comply with NFPA 90A.

C. Suspend fan coil units from structure with elastomeric hangers. Vibration isolators are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

D. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches (1220 mm) above finished floor.

E. Install new filters in each fan coil unit within two weeks after Substantial Completion.

F. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping adjacent to machine to allow service and maintenance.
2. Connect piping to fan coil unit factory hydronic piping package. Install piping package if shipped loose.
3. Connect condensate drain to indirect waste.

    a. Install condensate trap of adequate depth to seal against fan pressure. Install cleanouts in piping at changes of direction.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

3.3 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions.

END OF SECTION 238219

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceways and cables.
2. Sleeve seals.
3. Grout.
4. Common electrical installation requirements.

1.2 SUBMITTALS

A. Product Data: For sleeve seals.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.

c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

3. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
4. Pressure Plates: Stainless steel. Include two for each sealing element.
5. Connecting Bolts and Nuts: Stainless steel]of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260500

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. **Copper** Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types **THW** and **THHN-THWN**.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide **the product indicated on Drawings** or a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: **EPDM** or **NBR** interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: **Stainless steel**. Include two for each sealing element.
3. Connecting Bolts and Nuts: S**tainless steel** of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: **Copper** Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway, OR Romex product NEC compliant for application and approved by AHJ. Contractor shall verify NEC and AHJ compliance prior to any rough-in.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. Class 1 Control Circuits: Type THHN-THWN, in raceway.

J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both wall surfaces.

E. Extend sleeves installed in floors 2 inches above finished floor level.

F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."

I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."

J. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

K. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.5 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and service for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad, 3/4 inch by10 feet in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No.8 AWG and smaller, and stranded conductors for No.6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
10. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

E. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.

a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
b. Perform tests by fall-of-potential method according to IEEE 81.

B. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

E. Comply with all Seismic Requirements.

1.3 SUBMITTALS

A. Product Data: For steel slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

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 following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.; a division of Cooper Industries.
    c. ERICO International Corporation.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut; Tyco International, Ltd.
    g. Wesanco, Inc.

3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
6. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted [or other]support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi , 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section Miscellaneous Cast-in-Place Concrete.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. See Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks and manholes, and underground handholes, boxes, and utility construction.

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. IMC: ANSI C80.6.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel or die-cast, compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

A. ENT: NEMA TC 13.

B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

C. LFNC: UL 1660.

D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: UL 514B.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.

C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

D. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.

E. Nonmetallic Floor Boxes: Nonadjustable, round.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.

I. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit or IMC.
2. Concealed Conduit, Aboveground: rigid steel conduit, IMC or EMT.

3. Underground Conduit: RNC, Type EPC-40PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit or IMC. Includes raceways in the following locations:

   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit or IMC.
7. Raceways for Optical Fiber or Communications Cable: EMT.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems." Comply with all Seismic requirements.

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.

I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

K. Raceways for Communications Cable: Install as follows:

1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

M. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
   d. Attics: 135 deg F temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

N. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

O. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

P. Set metal floor boxes level and flush with finished floor surface.

Q. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits, placing them 24 inches o.c. Align planks along the width and along the centerline of conduit.

3.4 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260533

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.2 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

D. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.5 FLOOR MARKING TAPE

A. 2-inch wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.7 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES.

2.8 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after completing finish work.

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120v to ground: Install labels at 30-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

E. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning sign.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

    1. Labeling Instructions:

        a. Indoor Equipment: Adhesive film label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
        b. Outdoor Equipment: Engraved, laminated acrylic or melamine label Stenciled legend 4 inches high.
        c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
        d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 260553

PART 1 - GENERAL

1.1 DESCRIPTION

A. The requirements of this Section apply to all sections of Division 26.

B. This project will have selected building systems commissioned.

1.2 RELATED WORK

A. All sections listed in the Table of Contents shall be a Condition of this Section.

1.3 COMMISSIONED SYSTEMS

A. Commissioning of a system or systems specified in Division 26 is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's Operation and Maintenance personnel.

1.4 SUBMITTALS

A. The commissioning process requires review of selected Submittals that pertain to the systems to be commissioned. The Commissioning Agent will provide a list of submittals that will be reviewed by the Commissioning Agent. This list will be reviewed and approved by the Owner prior to forwarding to the Contractor. Refer to Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, and SAMPLES for further details.

B. The commissioning process requires Submittal review simultaneously with engineering review.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.1 Construction inspections

A. Commissioning of Electrical systems will require inspection of individual elements of the electrical systems construction throughout the construction period.

3.2 PRE-FUNCTIONAL CHECKLISTS

A. The Contractor shall complete Pre-Functional Checklists to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing. The Commissioning Agent will prepare Pre-Functional Checklists to be used to document equipment installation. The Contractor shall complete the checklists. Completed checklists shall be submitted to the Owner and to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a

significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all the checklists for the type of equipment will be returned to the Contractor for correction and resubmission.

3.3 CONTRACTORS TESTS

A. Contractor tests as required by other sections of Division 26 shall be scheduled and documented in accordance with Section 01 00 00 GENERAL REQUIREMENTS. All testing shall be incorporated into the project schedule. Contractor shall provide no less than 7 calendar days' notice of testing. The Commissioning Agent will witness selected Contractor tests at the sole discretion of the Commissioning Agent. Contractor tests shall be completed prior to scheduling Systems Functional Performance Testing.

3.4 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

A. The Commissioning Process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions. The Commissioning Agent will prepare detailed Systems Functional Performance Test procedures for review and approval by the Architect. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials, and test equipment identified in the test procedure to perform the tests. The Commissioning Agent will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed.

3.5 TRAINING OF OWNER PERSONNEL

A. Training of the Owner operation and maintenance personnel is required in cooperation with the architect and Commissioning Agent. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. Contractor shall submit training agendas and trainer resumes. The instruction shall be scheduled in coordination with the Owner after submission and approval of formal training plans.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following lighting control devices:
   1. Indoor occupancy sensors.
   2. Daylight sensors
   3. Lighting control systems and components

B. See drawing details and notes for "Network Lighting Controls" for low-voltage, manual and programmable lighting control systems.

C. See Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

D. All systems, controls, devices, components etc. shall meet California Title 24 requirements.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 LIGHTING CONTROL SYSTEMS AND COMPONENTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product deemed equivalent by engineer::

2.2 INDOOR OCCUPANCY SENSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product deemed equivalent by engineer:
   1. Lithonia Lighting; Acuity Lighting Group, Inc.
   2. Sensor Switch, Inc.
   3. Watt Stopper (The).

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: As indicated on drawings and notes
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; Provide 0-10vdc dimming control with adjustable daylighting discount factor.

C. PIR/SOUND Dual detection Type: Ceiling mounting; detect occupancy by sensing a combination of heat, movement and sound in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft when mounted on a 96-inch high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot high ceiling.

2.3 OUTDOOR PHOTOELECTRIC SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
1. Intermatic, Inc.
2. Lithonia Lighting; Acuity Lighting Group, Inc.
3. Paragon Electric Co.; Invensys Climate Controls.
4. Square D; Schneider Electric.
5. TORK.
6. Watt Stopper (The).

B. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.

4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

C. Description: Solid state, with SPST dry contacts rated for 1800 VA to operate connected load, relay, or contactor coils; complying with UL 773.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
2. Time Delay: 30-second minimum, to prevent false operation.
3. Lightning Arrester: Air-gap type.
4. Mounting: Twist lock complying with IEEE C136.10, with base.

D. Description: Electrically operated and electrically held, combination type with fusible switch, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings matching the NEMA type specified for the enclosure.

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No.14AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

B. When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label components with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

C. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Field quality-control reports.

E. Panelboard schedules for installation in panelboards.

F. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush- and surface mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Directory Card: Inside panelboard door, mounted in transparent card holder.

C. Incoming Mains Location: Top and bottom.

D. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Compression type.
3. Ground Lugs and Bus Configured Terminators: Compression type.
4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, and listed and labeled for series-connected short-circuit rating by an NRTL.

I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

D. Mains: Circuit breaker.

E. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

G. Branch Overcurrent Protective Devices: Fused switches.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Eaton Electrical Inc.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D;

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lug.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

F. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

C. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Division 26 Section "Electrical Power Monitoring and Control."

f. Shunt Trip: 120V trip coil energized from separate circuit, set to trip at [55] [75] percent of rated voltage.
g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

D. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Division 26 Section "Fuses."

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, store and install panelboards and accessories according to NECA 407.

B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Mount top of trim 90 inches above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

I. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Wall-box motion sensors.
3. Snap switches and wall-box dimmers.
4. Solid-state fan speed controls.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets.

B. See Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 5351 (single), 5352 (duplex).
    b. Hubbell; HBL5351 (single), CR5352 (duplex).
    c. Leviton; 5891 (single), 5352 (duplex).
    d. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, feed through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; GF20.
    b. Pass & Seymour; 2084.

2.4 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide switches as indicated on drawings and applicaton.

2.5 WALL-BOX DIMMERS

A. Switches as indicated on drawings.

2.6 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic 0.035-inch.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.

4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant thermoplastic with lockable cover.

2.7 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.

2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.

2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

END OF SECTION 262726

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, switchboards and motor-control centers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA FU 1 for cartridge fuses.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

A. Motor Branch Circuits: Class RK1, time delay.

B. Other Branch Circuits: Class RK1, time delay.

C. Control Circuits: Class CC, fast acting.

3.2 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.3 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

END OF SECTION 262813

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Receptacle switches.
4. Shunt trip switches.
5. Molded-case circuit breakers (MCCBs).
6. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7**.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

D. Field quality-control reports.

E. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings** or comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate **indicated** fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.2 MOLDED-CASE CIRCUIT BREAKERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings** or comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

E. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

F. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; **integrally mounted, self-powered** type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Auxiliary Contacts: **One SPDT switch** with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
7. Alarm Switch: One **NO** contact that operates only when circuit breaker has tripped.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, **Type 1**.
2. Outdoor Locations: NEMA 250, **Type 3R**.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.2 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections:

1. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.2 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

C. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings. Substitutions shall be submitted to Engineer minimum (10) days prior to bid date for evaluation.

2.2 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture. Comply with all Seismic requirements.

B. Comply with NFPA 70 for minimum fixture supports.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Adjust aimable lighting fixtures to provide required light intensities.

E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior luminaires with lamps.

1.2 SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.

B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with IEEE C2, "National Electrical Safety Code."

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings. Substitutions shall be submitted to Engineer minimum (10) days prior to bid date for evaluation.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports. Comply with all Seismic Requirements.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming.

3.2 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Division 26 Section "Raceway and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.3 GROUNDING

A. Ground metal poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundations.

END OF SECTION 265600

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

1. Provide all supervision, engineering, design, labor and materials necessary to install a complete fire detection and alarm system.

1.02 REQUIREMENTS

1. Compliance: The entire fire detection and alarm system shall be designed in accordance with this specification.

   A. All material and equipment used shall be listed or approved by UL, FM or another nationally recognized testing agency, and approved by the Owner, for their intended use and service.

   B. Approved Shop Drawings: Installation of the fire detection and alarm system shall not be started until complete shop drawings and calculations have been approved in accordance with this specification, and General Requirements 01 33 00 - Submittals.

2. Contractor shall coordinate the project schedule with the Owner all design drawings, specifications, and products covered under this section shall be submitted within two weeks of Notice to Proceed, and shall be submitted to the Owner within 3 weeks of NTP in accordance with Division 1. Refer to local and state guidelines for additional submittal procedure requirements.

3. Contractor Requirements:

   A. Design shall be performed and certified/stamped by either a NICET Level III or IV Fire Alarm Technician or a California Registered Professional Fire Protection Engineer who is employed by a factory authorized distributor.

   B. Installation shall be performed by State of California Certified Fire Alarm Installers with a NICET Level II or higher certification. The services of a NICET Level II or higher Fire Alarm Technician provided by the control equipment manufacturer or factory authorized distributor shall be provided to supervise installation, adjustments, and conduct all tests of the system.

   C. Installation shall be performed by a California C-10 licensed electrical contractor experienced in the design and installation of fire detection and alarm systems, minimum 5 years. Installer shall have an office, which has been in existence for at least 3 years, within a 150 mile radius of the jobsite. The Owner may reject any proposed installer who cannot show evidence of such qualifications.

4. Service Organization: The Contractor shall furnish, to the Owner, evidence that there is an experienced and effective service organization which carries a stock of repair parts for the system in order to readily affect repairs throughout the warranty period. Should the Contractor fail to comply with the service requirements of this section, the Owner will then have the option to make the necessary repairs and back charge the Contractor without any loss of warranty or guarantee as provided by the contract documents.

   A. The Contractor shall furnish service and maintenance of the new fire alarm system for a period of one-year from the Date of Notice of Completion.

5. Project Superintendent: The Contractor shall provide one full-time, on-site staff member

designated as the "Project Superintendent". The duties of the Project Superintendent are to supervise execution of all aspects of this specification and per Division 01 including safety on the job site. That clause incorporates into the contract, by reference, the Secretary of Labor's OSHA Standards (29 CFR Part 1926). The Project Superintendent shall be thoroughly familiar with all contract obligations and shall be capable of making all contractual decisions with regards to their project scope of work on behalf of the Contractor. The Project Superintendent shall be responsible for making sure that quality control review has been performed on all submittals prior to the submission to the Owner. The fire alarm contractor shall also be responsible for ensuring that all submittals are accurate and fully coordinated. The fire alarm installer shall have a cell phone and be accessible to the Owner during business hours.

6. Guarantee: The Contractor shall guarantee labor, materials, and equipment provided under this contract against defects for a period of one year after the date of final acceptance of this work by the Owner. Final Acceptance includes, but is not limited to, the receipt of as-built record drawings and operation and maintenance manuals in accordance with Division 01.

7. Codes and Standards: Provide a fire detection and alarm system conforming to the latest adopted editions of codes and standards of the following organizations:

   A. International Code Conference (ICC): Title 24, Part 2:

      a. California Building Code Title 24, Part 3

      b. California Electrical Code Title 24, Part 4

      c. California Mechanical Code Title 24, Part 9

      d. California Fire Code

   B. National Fire Protection Association (NFPA), including all amendments and appendices: Standard No. 72 National Fire Alarm Code

   C. Underwriters Laboratories Inc. (UL)

      UL-FPED (Fire Protection Equipment Directory)

1.03 FIRE DETECTION SYSTEM DESCRIPTION

1. Supervised non-coded 24 VDC (limited energy) system.

2. Provide devices as per the Drawings and Specifications and fire codes.

3. The fire detection and control system shall include:

   A. New Potter IPA-4000 fire alarm control panel with modules and connections to the new fire alarm system devices.

   B. New auxiliary power supply panel(s), as required.

   C. New addressable relay modules and interface relays, as required, for air–handling systems shutdown.

   D. New smoke detectors, duct smoke detectors, and heat detectors.

   E. New manual pull stations.

F. New audible and visual alarm notification appliances.

G. Warning signs and device labels.

H. Provide AC power surge suppression on Potter IPA-4000 and auxiliary power supply panel(s).

I. Provide surge suppression on all loops in Potter IPA-4000 panel.

J. Provide surge suppression on all exterior initiating device circuits.

K. A laminated 11" x 17" fire alarm device floor plan prepared using AutoCAD, showing all devices and addresses, installed adjacent to the fire alarm control panel and the remote annunciator panel. Submit plan to the Architect for approval.

4. Each detector, manual station or other initiating device shall be supervised as an individual point or as indicated on the drawings. The FACP shall provide sensor sensitivity testing reports that meet NFPA 72 calibrated test method requirements. The repots shall be available for display or for printing for annual recording and logging of the calibration maintenance schedule.

5. Duct smoke detectors shall interrupt control power to the AHU system fans and shut down all air handler systems serving a common area.

6. The Potter IPA-4000 FACP shall transmit signals via the existing DACT to the existing monitoring service.

7. Sound an audible alarm to indicate alarm or trouble.

8. Initiating device circuits (IDC) shall be of Style B - Class B operation.

9. Signaling line circuits (SLC) shall be of Style 4 - Class B operation.

10. Notification appliance circuits (NAC) shall be of Style Y - Class B operation.

11. No notification appliance circuit shall be initially loaded in excess of 75% of its rated ampere capacity.

12. Power supply for Potter IPA-4000 panels and all auxiliary power supply panels shall be 120 volts, 60 Hz from an emergency branch circuit.

A. The 24 volts, DC power for all system supervisory and control functions shall be provided by the Fire Alarm Control Panel power supply.

B. Notification appliance circuits shall be powered from either Potter IPA-4000 panel or an auxiliary power supply panel.

13. Upon loss of normal building power the entire system shall operate on battery power for 24 hours and then be capable of operation in alarm mode for 30 minutes.

14. Conduit Routing: All new conduits to be run concealed in walls, under floors or above ceilings in all finished areas. No exposed conduit shall be permitted in finished spaces.

1.04 QUALITY ASSURANCE

1. All equipment supplied shall be listed by a nationally recognized fire equipment test laboratory (UL and/or FM) and if required, listed by the jurisdiction having authority.

2. The Contractor shall have experience in installing three addressable systems in the last three years and shall submit with the bid the following for verification of qualifications: Prior to installation, submit documentation, to the Owner, showing that the Contractor has successfully installed automatic fire alarm systems of comparable size, type and design as specified herein. The data shall include the names and locations of the installations where the Contractor installed such systems, the contact person familiar with work and telephone numbers. The Contractor shall certify that each system has performed satisfactorily for a period of not less than one year.

3. The system software shall be supplied by a manufacture district office and programmed by a factory trained technician.

1.05 SUBMITTALS

1. General: Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples. Submit six (6) complete sets of submittals (drawings and calculations) for approval prior to start of installation. Partial submittals will not be acceptable and will be returned without review. Before any work is commenced, the submittal must be approved by the Owner and the Authority Having Jurisdiction (AHJ).

   A. Plans shall be clearly drafted and shall not be photocopies of bid set plans.

   B. The signature and seal of a registered Professional Fire Protection Engineer, a registered Professional Engineer with a minimum of two years fire protection design experience, or the signature of a NICET Level III or IV Fire Alarm Technician shall be affixed to all drawings and calculations.

2. Shop Drawings: Submit detailed shop drawings, in accordance with NFPA 72, and the California Fire Code Section 907.1.1, on uniform size sheets no smaller than 24 inches by 30 inches, to the Owner for review and approval. Shop drawings shall be prepared using the latest AutoCAD software. Survey the existing field conditions to coordinate all new conduit and materials with existing conditions prior to the start of design. Coordinate location of new piping and materials with those installed by other trades. The following information is required for approval:

   A. Complete equipment arrangement, device addresses and conduit routing on building floor plans, point-to-point panel and device wiring diagrams, voltage drop calculations for notification appliance circuits, panel battery back-up calculations, sequence of operation I/O matrix, location of existing smoke/fire barriers on plans, schedule for all cabling, and a list of the English language zone descriptions to be programmed.

   B. Indicate all system components, quantities, size of components, location, addresses, and provide full schematic of wiring system showing building and operation details.

   C. Provide complete system wiring diagrams for components connected to the system and interfaces to equipment supplied by others. Indicate all points of interface with other systems, including but not limited to the building fire alarm panel, fire/smoke dampers and the HVAC control system.

   D. Provide riser diagram with device addresses.

3. Technical Information: Submit manufacturer's descriptive literature identifying

components, including UL and CSFM listing for all system components, installation instructions (including outlet box or black box requirements for each piece of equipment), operating instructions, and maintenance and repair data. Manufacturer's data shall be annotated to show the specific model, type and size of each item to be furnished.

4. Submit a system programming printout for approval prior to loading the program in the FACP for testing.

5. As-Built Record Drawings: Prepare and submit to the Owner detailed "As-Built Record Drawings" within two weeks after the final acceptance test of the system in accordance with Division 1:

   A. The as-built drawings shall show the system as installed, including all deviations from both the contract drawings and the approved shop drawings.

   B. The as-built drawings shall also include all information as required by NFPA 72.

   C. Submit 3 sets of full-size copies of the as-built record drawings on bond paper.

   D. Submit a copy of the AutoCAD DWG files on a CD-ROM with all references, special fonts, shapes, plot styles, etc. for use in printing an exact copy of the paper as-built record drawings.

6. Operation and Maintenance (O&M) Manuals in accordance with Division 1:

   A. Each manual shall include an index, copies of all approved shop drawings and submittal materials (updated to as-built), calculations, a complete parts list of all components, and the necessary information for ordering replacement parts.

   B. The parts list shall include, for each item furnished:

      i. Manufacturer's name

      ii. Serial number

      iii. Model or part number

      iv. A catalog cut sheet, diagram, drawing or other descriptive data providing a physical description of the part

      v. Complete instructions, covering the proper testing, operation, and maintenance

   C. The Contractor shall provide a copy of the O&M Manuals, with as-built record drawings and calculations in a locked wall mounted cabinet at the FACP. The cabinet keys shall be furnished to the Owner.

1.06 COORDINATION

A. The Contractor shall coordinate location of water flow and tamper switches with existing fire sprinkler system.

B. The Contractor shall coordinate the installation of the new fire alarm system with the existing fire alarm system wiring and field devices.

   1. New system wiring may be installed in existing conduits, subject to

authorization from the Owner and compliance with the referenced codes and standards.

PART 2 PRODUCTS

2.01 FIRE ALARM SYSTEM

A. The control panel will supervise, receive alarm, supervisory and trouble signals from the detectors, manual stations and interface devices listed below. The control panel shall be capable of reading and displaying the sensitivity of remote addressable photoelectric sensors, at the control panel. The control panel shall be Potter IPA-4000 with current software revision.

1. The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. System shall be capable of storing dual configuration programs with one active and one in reserve. Panel shall be capable of full system operation during a new configuration download.

2. Dynamic supervision of system electronics, wiring, detection devices, and software shall be provided by the control panel. Failure of the system hardware of wiring shall be indicated by type and location on the alphanumeric annunciator and the printer Software and process operation shall be monitored by an independent hardware watch-dog circuit, which will indicate their failure.

3. Any quantity of addressable devices shall be in alarm at any time up to the total number connected to the system.

4. Addressable dual-chamber photoelectric sensors' sensitivity shall be reported to the control panel when requested. It shall be possible to change the sensor sensitivity from the control panel within maximum and minimum values as defined by the UL listings of the sensors.

5. The panel annunciator shall be a 80-character alphanumeric display, which shall provide optional user definable messages associated with each detection device or zone. It shall be possible to display up to (127) alarms and up to (127) trouble indications, one at a time, on the digital annunciator and as a list on the printer.

6. The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. Separate logs for alarm and trouble conditions shall be provided, in order to prevent the alarm history from being overwritten by trouble conditions.

7. The system shall have the capacity of eight programmable one-person test groups, such that only a portion of the system need be disabled during testing. Groups of devices shall be selectable in software and shall not be hardware dependent in order to accommodate the building layout. The actuation of the “enable one-person test” program at the control unit shall activate the “One-Person Testing” mode of the system as follows

   a. Control relay functions associated with one of the eight testing groups shall be bypassed.

b. The control unit shall indicate a trouble condition.

c. The alarm activation of any initiating device in the testing group shall cause the audible notification appliances assigned only to that group to sound a code to identify the device or zone.

d. Any opening of any initiating device or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.

e. The unit shall automatically reset itself after signaling is complete.

8. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a “wrong device”, the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a “wrong device” trouble condition.

9. Addressable/programmable initiating circuits shall be provided in the quantity as indicated on the Drawings. The signaling line circuit shall allow multiple T-taps and not require any end-of-line devices. Each initiating circuit shall accommodate up to 250 addressable devices without any restriction on the types of devices that each circuit can support. Each circuit shall be capable of Class "A" or Class "B" wiring. The module shall be Potter PAD 100-LED.

10. An output circuit for operation of DC audible devices shall be provided in the quantity as indicated on the Drawings. Circuits shall be Class B or A (Style Y/Z) Notification Appliance Circuits (NAC) rated 3A @ 24VDC. Each circuit shall be programmed to operate as the system requires. The module shall be Potter System Power Supplies or Expansion Power Supplies.

11. Programmable relay modules shall be provided to perform functions as indicated in Specifications and Drawings. The Module shall be Potter RLY-5.

12. The power supply/battery charger shall provide power to operate the system as specified and be capable of keeping the back-up batteries at their full potential. The battery charger shall be a microprocessor controlled variable rate device. The power supply/battery charger shall be Potter System Power Supplies or Expansion Power Supplies.

13. Software shall be provided by the Contractor so that a functional and operational system results that meets the requirements of the Owner. Based on direction by SJSU, the following minimum information shall be entered into the system: Descriptors, setpoints, sequence of operation, etc.

a. Descriptors shall be created in the following format:

Building asset number if panel serves more than one building
General Location on the floor (e.g. NE)

Floor or room #'s if applicable

Further location information if room # not provided

Device type abbreviation

The abbreviation O/S (outside) and a room number are often used for a hall location. (Floor # not needed if room # is provided.)

Device type abbreviations:

HD	Heat detector
WF	Water flow
MS	Manual station
TS	Tamper
SD	Smoke detector
DD	Duct smoke detector

Examples:

145	4FL	W HALL	SD
227	3FL	S STAIRS	MS
136		RM 205	SD

b. Separate audible, stair door release, smoke damper and air handler shutdown override keyed switches shall be installed at the Potter IPA-4000 panel per Owner requirements to allow these functions to be bypassed during testing. Alternatively, one of the panel function keys shall be configured to disable horn and siren operation when testing.

c. Contractor shall submit programming worksheets for review by Owner before creating the program and shall submit the program for review before loading into FACP.

d. Sequence of operation - In general, all notification appliances will be activated by an alarm in that building only. Fire/smoke dampers shall be closed when smoke is detected by the associated duct detector by hallway smoke detectors. For non-fume hood equipped buildings, fans will be shut down when smoke is detected by any smoke detector in the building.

14. The system shall be capable of being programmed in the field via a laptop computer. All programmed information shall be stored in non-volatile memory. System programming shall be password protected and shall include full upload and download capability.

B. The system shall be capable of providing a hard copy written record consisting of: all alarms, troubles, system activity and to print detection device designations, as well as, location messages by means of a full carriage width printer capable of a single line of up to (128) characters, wherein (40) are reserved for device or zone custom identification.

C. The addressable photoelectric smoke sensor shall be UL listed. The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations. The FACP shall

automatically indicate when an individual sensor needs cleaning. A “DIRTY SENSOR” trouble condition shall be indicated at the FACP and the sensor base LED shall glow steady giving a visible indication at the sensor location. The “DIRTY SENSOR” condition shall not affect the sensitivity level required to alarm the sensor. If a “DIRTY SENSOR” is left unattended, and its average value increases to a second predetermined value, an “EXCESSIVELY DIRTY SENSOR” trouble condition shall be indicated at the control unit.

1. Photoelectric smoke sensors shall have seven selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP. It is possible to adjust and/or electronically measure the sensitivity of the addressable sensors from the control panel.

2. It shall be possible to identify a sensor that is close to a trouble reporting condition (“ALMOST DIRTY”). This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system.

3. The sensor address shall be located in the base in order to eliminate addressing errors when replacing sensors.

4. No special tools or programming devices shall be required to set a device address.

5. The optional detector relay shall be capable of operating from the detector or from the control panel.

6. The detector shall be Potter 100-PD with base model PAD 100-6B/4B or relay base model PAD 100-RB.

D. The addressable photoelectric duct smoke sensor shall be UL listed. It is possible to adjust and/or electronically measure the sensitivity of the addressable sensors from the control panel. The duct smoke sensor relay shall be capable of operating from the sensor or from the control panel. The sensor shall be Potter 100-DUCTR.

E. The addressable thermal fire sensor shall be a combination fixed-temperature and rate-of-rise unit. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute. The sensor shall plug into a standard base and have a lamp to indicate alarm initiating. This sensor shall be capable of being mixed on the same circuit as addressable photoelectric sensors, addressable manual stations and addressable interface modules.

1. The heat sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32 degrees F to 155 degrees F.

2. The sensor address shall be located in the base in order to eliminate addressing errors when replacing sensors.

3. No special tools or programming devices shall be required to set a device address.

4. The optional detector relay shall be capable of operating from the detector or from the control panel.

5. The sensor shall be Potter PAD 100-HD with base model PAD 100-SB or relay base model PAD 100-RB.

F. The remote zone addressable module shall be UL listed. This unit is designed to provide interface for direct shorting contact devices to the system. This unit is used for water flow

switches; OS&Y tamper switches, low profile heat detectors, manual stations, kitchen hood, and duct systems. No special tools or programming devices shall be required to set a device address. The interface module shall be Potter 100-RM.

G. The air duct sensor shall be UL listed. The air duct sensor shall operate on a cross-sectional air sampling principle to overcome stratification and the "skin effect." The air duct sensor shall consist of a standard addressable sensor mounted in an air duct sampling assembly and sampling tube that protrudes across the duct of the ventilating system. The air duct sensor features of the addressable photoelectric sensor and shall be installed in the ducts as indicated by the manufacturer's instructions. The duct sensor shall be Potter PAD 100-DUCTR and sampling tubes, sized to fit duct. The sensor shall be interlocked with the associated fan starter so that it shuts down when smoke is detected. For exterior locations use weatherproof housing. No special tools or programming devices shall be required to set a device address.

H. Non-addressable heat detectors shall be rate of rise, low profile, 135 degrees, Potter THERMOFLEX CR Series. Mechanical rooms shall utilize fixed temperature 200-degree type. They shall be connected to an IAM or ZAM.

I. An IAM or ZAM shall be used to indicate flow alarm and tamper switches. No special tools or programming devices shall be required to set a device address.

J. Notification Appliances

1. The audio/visual notification appliance shall provide an indication of a fire condition.

2. The horn shall be an electronic type. Audible devices shall provide temporal coded output as required by NFPA 72. Audible signals shall be synchronized within a building. The highest sound level shall produce 95 dB UL Sound Pressure Level (SPL) at 10'. Audible devices shall have a field selectable SPL.

3. The strobe shall produce light intensity to meet ADA requirements. The strobe shall provide polar distribution complying with UL 1971 of at least 15 candela. Visual notification devices shall be synchronized when two or more can be seen from a single location. Multiple candela field selectable strobes shall be used.

4. The notification appliances shall be Potter SH-120.

5. Notification appliances located outdoors shall be UL listed as weatherproof.

K. Addressable manual fire station shall be U.L listed, non-coded, and shall operate on any addressable detection circuit. The addressable manual station shall be individually annunciated at the panel. It shall be Potter Pull Station Series. Addressable manual stations exposed to rain shall be protected by a weatherproof cover such as Safety Technology International, Inc. Weatherstopper II or equal.

L. Power Supply - Provide 10 amp power supply and batteries to provide power to the standalone smoke detectors in "alarm" condition. Power supply to be 24 VDC output, with less than 2 volts ripple. La Marche (no known equal).

2.02 REMOTE ANNUNCIATOR

A. The Potter RA-6500 may be used for remote annunciation of the new fire alarm control panel signals.

1. Potter RA-6500 software and components shall be fully supervised and be both

UL and OSFM listed.

B. A UL-listed supervised LED annunciator with typed device type labels may also be used.

2.03 SURGE SUPPRESSION

A. All 120 VAC power circuits to new fire alarm control panels and auxiliary power supplies shall be protected with UL listed surge suppressors.

B. All SLC network circuits that travel between or outside of buildings shall be protected with manufacturer approved, UL and CSFM listed, fire alarm addressable circuit surge suppressors.

2.04 MULTI-CONDUCTOR CABLE

A. Underground cables shall be UL listed solid copper conductors with a polyethylene jacket. Cables shall have an overall copper tape shield with twisted pair conductors - IMSA spec. No. 20- 2-1984. Other cables shall be IMSA spec. No. 20-1-1984. Alternately type TC cables may be used.

B. Above ground cables shall be UL listed Power Limited Fire Protection Signaling cable in accordance with NEC Article 760. IDNet cables shall be shielded and twisted. Cables shall consist of 2 or more conductors in an overall red jacket.

PART 3 EXECUTION

3.01 INSTALLATION

A. Examination: Coordinate location of fire alarm devices with Owner prior to rough-in. Device locations on floor plans have been designed to meet strobe and sound coverage.

Deviations from locations in floor plans must be approved prior to installation. Contractor shall be responsible for providing additional devices if strobe and sound coverage requirements are not met due to changes in device locations.

B. All equipment, terminals, sensors, etc. shall be located and installed to be readily accessible for operation and maintenance. Manufacturer's instructions shall be followed in all cases.

C. Connection to the power source shall be made via separate locked fused safety disconnect switch with a "Fire Alarm" nameplate on the cover. The power disconnect switch shall be painted red. AC power wiring and installation shall confirm to the appropriate portions of Division 26 of this specification.

D. Insulated bushings shall be installed on all conduits entering panels, control cabinets, terminal cabinets, outlet and junction boxes. Bushings shall be O.Z. Type B for rigid conduit, or Type A for EMT; T & B; or equal.

E. Installation shall be accomplished in a professional manner by qualified personnel regularly engaged in and experienced in this type of work. Installation, workmanship, fabrication, assembly, erection, inspection and testing shall be in accordance with NFPA 70 and NFPA 72, except as modified herein.

F. Audible/Visible Device Installation:

1. Audible/Visible devices shall be installed at eighty inches (80") minimum above the floor, or six inches (6") below the ceiling, whichever is lower, in accordance with ADA guidelines.

2. Audible devices shall be installed at ninety inches (90") minimum above the floor, or six inches (6") below the ceiling, whichever is lower, in accordance with ADA guidelines.

3. All audible devices intended for operation in public spaces shall have a sound level of not less than seventy-five (75) dBA at ten feet (10'), no more than 120 dBA at the minimum hearing distance from the device.

4. Audible devices intended for operation in private spaces shall have a sound level of not less than forty-five (45) dBA at ten feet (10'), nor more than 120 dBA at the minimum hearing distance from the device.

5. All audible emergency alarm signals shall be at least 15 dBA over the existing sound level within a space or shall exceed the maximum sound level by 5 dBA for at least 60 seconds, whichever is louder. Within areas occupied by persons with hearing impairments, audible emergency alarms must have the intensity and frequency to provide notification of an alarm condition.

G. Manual pull stations are to be mounted with the operable portion at 48 inches above finished floor level.

H. There shall be no T-Taps.

I. Provide all addressable control relays, EMT conduit and wiring from each air handling unit to fire alarm control panel for control of HVAC shutdowns. Provide all addressable control relays, EMT conduit and wiring at each fire/smoke damper for shutdown. The University will make all final connections to existing hardware for HVAC and fire/smoke damper shutdown.

J. Impairments: Work involving connections to existing systems shall be scheduled a minimum of 72 hrs. in advance in writing to the Owner. The Contractor shall not shut-off any sprinkler system control valves at any time or disconnect any existing fire alarm devices. System impairments shall be limited to a maximum duration of one 8 hr. shift at a time. All overtime costs required to oversee and restore the impaired systems for longer than one 8-hour shift will be back charged to the Contractor.

1. Field Changes: The Contractor shall not make field changes in device layout or wire and conduit sizes from that shown on the approved shop drawings without the prior written approval of the Owner.

3.02 WIRING

A. When required, wiring between Potter IPA-4000 and transponder shall be a #18 twisted shielded pair. Wiring between addressable devices and Potter IPA-4000 or panel (circuit) shall be #18 twisted or twisted shielded pair. Circuit wiring shall be a Class B supervisory system. Notification appliance circuit (NAC) wiring shall be #12 AWG solid, minimum. NAC circuit wiring shall be a Class B supervisory system. Wiring between contact closure devices and IAM's or ZAM's shall be #14 AWG.

B. Multi-conductor cable shall be installed in 3/4" minimum EMT conduit and shall be installed concealed in walls and above ceilings. Underground wiring shall be installed in PVC conduit as specified in the appropriate portions of Division 26 of this specification. The minimum size of underground conduit shall be 4". All other alarm system wiring

shall be installed in minimum 3/4" EMT conduit raceways. Conduits shall be sized to provide 25% room for future cables (beyond 40% NEC maximum fill). All wiring not terminating in a control panel shall be routed via wiring gutters, junction boxes and/or conduit as appropriate.

C. Wiring shall be continuous from device to device; splicing shall be accomplished by use of terminal blocks, or, in non-terminal locations with permission of the Owner, shall be soldered splices with wire nuts in locked cabinets or junction boxes (keyed Corbin Cat. 60). Provide separate terminal strips for notification and activation wiring. No splices in the underground system. If the voltage loss at the last device on a loop exceeds 2.4V DC, a larger size wire will be required.

1. No t-tapping is permitted on any circuits.

2. Route wiring continuous between devices without splices.

D. All conduits containing fire alarm wiring shall be dedicated fire alarm conduits and shall not contain wiring for any other purpose.

E. All conductors shall be color coded. Color coding shall be by wire insulation, not taping or banding. The numbering and color coding shall be continuous for each circuit wire. Color coding shall be as follows (polarity shown in alarm condition):

1. CIRCUIT: Signaling Line Circuits; COLOR CODE: Red & Black unshielded twisted pairs

2. CIRCUIT: Horns, 24VDC; COLOR CODE: Yellow (+) and Black

3. CIRCUIT: Strobes, 24VDC; COLOR CODE: White (+) and Purple

4. CIRCUIT: Horn/strobes; 24VDC; COLOR CODE: Orange (+) and Black

5. CIRCUIT: Initiating Device Circuits; COLOR CODE: Blue and Brown

6. CIRCUIT: Valve Supervision; COLOR CODE: Orange and Yellow

7. CIRCUIT: DC Power; COLOR CODE: Red (+) and Black

8. CIRCUIT: System AC Power; COLOR CODE: Black and White

F. General: Firestop all holes for piping, or other penetrations which pass through floor slabs, fire- rated walls, partitions with fire-rated doors, vertical service shafts, or any fire-rated assemblies with a listed fire stopping system equal to the existing fire assembly rating and as approved by the Owner. Submit manufacturer's data in accordance with Division 1 Section 01 30 00 - Submittals.

3.03 LABELING

A. Cable labeling shall be Potter IPA-4000 number or device description. The numbering and color coding shall be continuous for each circuit wire. Individual conductors shall be numbered at each connection, termination, and junction point.

B. Each group of cables or conductors shall be tagged with its destination at each panel, terminal box, or junction box using an engraved plastic tag. Attach the tag to each group of wires where they enter and leave the panel, terminal box, junction box or other enclosure.

C. All conduits entering and leaving terminal cabinets and junction boxes shall be numbered in a logical and consecutive manner. Upon completion, a riser diagram shall be supplied by the Contractor showing all conduits, junction boxes, terminal cabinets, and devices, with all conduit numbers indicated.

D. Print the address on the back of all devices with a felt marking pen.

E. For IAM's or ZAM's, install an engraved red nameplate with the loop and address number.

F. For devices installed above a suspended ceiling, install an engraved red nameplate with the loop and address number. Attach to t-bar with double-sided tape.

3.04 SUPERVISION AND TESTING

A. After "rough-in" is completed and prior to connection of equipment, the manufacturer's representative shall meet with the Contractor to review the installation and connection requirements. Upon completion of the installation, the Contractor shall have the manufacturer's engineer assist the Contractor on final testing and inspection and shall certify that the entire installation was tested and performed satisfactorily.

1. Contractor shall provide a printer to Potter IPA-4000 panel that is capable of printing alarm / trouble information on-site during check-out.

2. Contractor shall provide his own personal computer to initially enter the program into the panel.

B. Prior to connecting and testing, the Contractor shall perform a clearance test of all systems to insure that the systems are clear of opens, grounds, and defects.

C. Prior to scheduling testing, Contractor shall supply a completed matrix form to the Owner. This matrix will list all devices and provide a check-off box for contractor to indicate successful pre-testing of the device including confirmation of correct descriptor wording. Contractor shall schedule operations with adequate time to accommodate the availability of the Owner to witness the acceptance test. A 48 hours minimum notice after receipt of pre-test documentation is required.

D. Contractor shall provide sound meter, chemical smoke, ladder, extensions devices, printer, CSGM listing and the services of at least two technicians for the final acceptance test.

3.05 TESTS AND REPORTS

A. Contractor shall have system tests performed only by an individual who has attended a manufacturer's seminar for testing the systems as specified above. Testing of the system shall be performed with the test instruments as required by the manufacturer. Testing by means other than the manufacturer's procedures will not be acceptable unless agreed to by the Owner.

B. Test reports shall include, but not be limited to:

1. A complete list of equipment installed.

2. Indication that all equipment is properly installed and functions and conforms to these specifications.

3. Test of individual zones as applicable.

4. List serial numbers, locations by zone and device number, and model number for each sensor installed.

5. A hard copy printout of the sensitivity settings for each photoelectric sensor, measured in place with the HVAC system operating.

6. List method of testing thermal and flame detectors, as well as manual stations.

7. Technician's name, company represented, and date.

C. Final acceptance will require the Contractor to deliver three copies of the following in a manual type binder:

1. Operating and maintenance manuals.

2. A statement of guarantee including date of termination and the name and phone number of the person to be called in the event of an equipment failure.

3. Complete record drawings of wiring and conduits.

4. Detailed catalog data on all installed system components.

5. Copy of the test reports described in paragraph 3.06B.

6. A current hard copy and electronic file on disk of the installed C.S.G.M. program. The electronic version of the program, sufficient for the University to change sequences of operation if desired, shall be provided.

7. A completed NFPA 72 Record of Completion.

D. One hundred percent (100%) of the new devices and functions shall be field tested. Testing from the system keyboard is not acceptable.

3.06 SPECIAL TRAINING AND MATERIALS

A. Contractor shall arrange a special training (minimum of 4 hours) conducted to familiarize campus maintenance personnel with the new fire alarm system. Training shall at a minimum cover the following

1. Familiarization with the new fire alarm system, devices, identifying zones, coverage, and routing.

2. Provide general guidelines on the proper maintenance and operation of the fire alarm system (i.e. battery, voltage check, alarm, and trouble mode, etc.)

3. Provide instructions on how to operate fire alarm for fire drill purposes.

B. Fire Alarm Installer shall provide Owner with 8.5" x 11" sheets of floor plans showing all the fire alarm equipment and devices. Device addresses shall be reflected in these floor plans. Device addresses shall correspond with preprogrammed addresses in the fire alarm control panel.

END SECTION 28 31 00

PART 1 GENERAL

1.01 SUMMARY

A. Excavating for footings, slabs-on-grade, trenches, curbs, and paving; backfill and compaction of sub-grade, base and trenches.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to this Section.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Submit list and source of materials to be used in the Work.

1.04 QUALITY ASSURANCE

A. Verify that survey benchmark and intended elevations for the Work are as indicated.

B. Comply with State of California Construction Safety Orders (CAL/OSHA)

1.05 UTILITY DISCONNECTS

A. Coordinate directly with San Mateo County for any utility disconnects.

B. Notify Owner 72 hours prior to any excavation.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Fill material will be subject to approval of the Geotechnical Engineer.

B. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, vegetation, and other unsuitable materials. Local and import fill should have less than 15% fines and a plasticity index (PI) of less than 20.

C. Aggregate Base: Class 2 conforming to Caltrans Specification Section 26, maximum size 3/4 inches; compact to minimum of 95 percent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain from damage.

C. Notify utility company to remove and relocate utilities if required.

D. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.02 EXCAVATION AND COMPACTING

A. Saw cut all cuts into asphalt and/or concrete surfaces.

B. Excavate subsoil to accommodate building foundations, paving and site structures, construction operations, and as indicated on Drawings and in attached Project Geotechnical Report.

C. Compact disturbed load-bearing soil in direct contact with foundations to original bearing capacity; perform compaction as directed by Geotechnical Engineer.

D. Support trench excavations in compliance with local codes and safety regulations.

E. Sheet Pile or shore all excavations as required.

F. Do not interfere with 45 degree bearing splay under foundations except at pile foundations or where shoring is designed to resist earth and foundation pressures without permitting any settlements of foundations, slabs, or similar structures.

G. Grade top perimeter of excavation to prevent surface water from draining into excavation.

H. Hand trim excavation. Remove loose matter.

I. Remove lumped subsoil, boulders, and rock larger than 2 inches in diameter.

J. Correct areas over-excavated as directed by Geotechnical Engineer.

K. Do not backfill trenches until tests and inspections have been made.

L. Compact to minimum of 95 percent dry density (ASTM 1557) in planted areas and a minimum of 95 percent dry density (ASTM 1557) in paved areas.

M. Footing bottoms should be free of loose debris and should be firm and unyielding as approved by the project Geotechnical Engineer prior to placement of steel and concrete.

END OF SECTION

PART 1 GENERAL

1. 01 DESCRIPTION:

A. Work includes all labor, materials and equipment for infiltration trench and bioretention.

B. Work includes pretreatment areas and trench outfall.

1.02 RELATED WORK:

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE:

A. Installer shall have minimum 3-year experience or installing of similar pretreatment and infiltration trench work.

B. Conduct preinstallation meeting with architect, geotechnical engineer and Owner prior to start of fill.

1.04 SUBMITTALS:

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Furnish Manufacture's Certifications and Data certificates that the materials conform to the requirements specified.

C. Soil hydraulic group.

D. Test reports.

E. Material and data sheets for products and materials including but not limited to, perforated pipe, infiltration media, fill, hydraulic storage area and supporting calculations.

1.05 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society for Testing and Materials (ASTM):

ASTM D3385.....Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer

D2467-15 .....Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

D1785-15e1 .....Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

ASTM A929.....Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe

ASTM A798.....Standard Practice for Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications

ASTM A998.....Standard Practice for Structural Design of Reinforcements for fittings in Factory-Made Corrugated Steel Pipe for Sewers and Other Applications

C. America Association of State Highway and Transportation Official (AASHTO)

AASTHO Design Section 12 – Soil-Corrugated Metal Structure Interaction Systems

AASHTO Construction Section 26 – Metal Culverts

AASHTO M274 – Standard Specification for Steel Sheet, Aluminum-Coated (Type 2), for Corrugated Steel Pipe

1.06 DELIVERY

A. Deliver products in manufactures packaging.

B. Before installation, return or dispose of products that are distorted, damaged or in open packaging.

1.06 STORAGE AND PROTECTION

A. Protect products from damage during handling and construction operations.

PART 2 PRODUCTS

2.01 INFILTRATION AND BIORETENTION TRENCH MATERIALS:

A. Infiltration trench: Excavate and fill erosion control fabric.

1. Infiltration media.

2. Fill, section 33 23 00 Excavate Backfills and Compaction and drawing details. Clean aggregate with a maximum diameter of 3 inch and minimum of 1 ½ inch. Void space 30% to 40%.

3. Inspection well, schedule 80 PVC pipe.

4. Underdrains: PVC is storm water specifications.

PART 3 EXECUTION

3.01 INSPECTION:

A. Inspect site conditions for access and any work that may interfere with trench installation.

B. Verify seasonal water table is not within 3 feet of trench excavation.

3.02 PREPARATION AND INSTALLATION:

A. No sediment deposits from ongoing construction actively, perimeter controls functional fore bay is trapping soils/oil grease.

B. Excavate trench. Grade bottom of trench to provide position drainage towards outflow.

C. Decompact subsoil with backhoe ripper to a depth with of 20 inches.

D. Install perforated pipe with positive drainage stopper, wrap pipe with geotexitile filter fabric. Backfill material shall be placed in 12 inch loose lifts.

E. Install irrigation filter media and fill. Install 6 inch washed stone mix in bottom of trench. Wrap stones on bottom sides and top, less the top 6 inches of stone.

F. Install PVC inspection well. Install PVC inspection well. Install steel base for support of pipe. Top screw off id with “observation well” label,

G. Building downspouts shall extend to top of infiltration trench.

H. Coordinate trench pretreatment zone with planting specifications and drawings.

I. Remove loose soils and rocks.

3.03 TESTING:

A. Test drainage of subsoil per ASTM D3385 Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer. Thoroughly wet soil prior to testing. Fill rough basin with water prior to filter fabric and fill installation. Measure infiltration rate, water in 48 hours.

B. Remove sediments into bottom of basin after test and prior to installation of materials.

3.04 ADJUSTMENT AND CLEAN:

A. Remove accumulated sediments.

B. Repair damage.

C. Clean leaves, debris and after fill within from top 6” of trench.

D. Arrange top layer of stones for neat, tight performance and appearance.

E. Remove all debris, rubbish and excess material from the site.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the requirements for providing and installing temporary erosion control structures as specified.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE

A. Reference Standards

1. California Stormwater Quality Association (CASQA) “Stormwater Best Management Practice Handbook for Construction”.

2. State Water Resources Control Board (SWRCB) standards

3. California Stormwater Quality Association “Stormwater Best Management Practice Handbook” for Construction and Industrial and Commercial Development, latest edition.

PART 2 PRODUCTS

2.01 MATERIALS

A. Furnish and install the following as specified herein and required to eliminate potential erosion and sedimentation during construction works.

1. Outlet structure, basins, ditches

2. Filter fabric, and/or mesh

3. Concrete washout

4. Fiber rolls

5. Inlet protection

6. Stabilized construction entrance

7. Straw waddles

PART 3 EXECUTION

3.01 PROCEDURES

A. Contractor shall prepare and submit for approval a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the SWRCB application and requirements for Owner review and approval prior to submitting to the SWRCB.

B. Erosion and sedimentation control measures are to be installed in areas as indicated or as directed by governing regulations.

C. Contractor shall provide inspection and repair of established SWPPP applications and prepare maintenance reports of erosion control measures in accordance with approved SWPPP.

D. Erosion and sedimentation control measures shall be adjusted, relocated or new controls established for each phase of construction and for specific construction activities that may disturb soils and contribute to erosion.

E. The County has provided specific guidance and intent to provide and maintain erosion and sedimentation control as attached below.

F. The County has standard details for erosion and sedimentation control and can be found: https://planning.smcgov.org/erosion-and-sediment-control-plan-requirements

END OF SECTION

County of San Mateo
Planning and Building Department

General Erosion and Sediment Control Plan Guidelines

(Best Management Practices to be used during Site Preparation and Construction)

A complete Erosion and Sediment Control Plan (EC Plan) should include the following (as applicable to the site and project):

1.	**Delineation of Area of Work**
a.	For projects, including those requiring a Grading Permit, separate erosion and sediment control plan sheets are required to show the measures to be implemented at the grading stage (e.g., grading, foundation/retaining walls) and at the construction stage. For difficult projects only, additional plan sheets are required for each of the following phases: Grading and retaining wall phase, foundation and construction phase.
b.	Show all areas of construction, including but not limited to: areas to be graded as shown on a grading plan, areas to be cleared, as well as structures, retaining walls, roads, drives, utilities, trenches, scaffolds, catch basins, etc. These areas should be consolidated and located outside steep or sensitive areas.
c.	Protect surface water locations, providing primary control measures (e.g., silt fence along outer buffer zone of creek; do not disturb riparian areas) and secondary control measures (e.g., fiber rolls) in disturbed areas sloping toward the creek/ocean.
d.	Protect storm drain inlets using fiber rolls, permeable rock sacks, or other measures that keep sediment from entering the drain. Show inlet locations and protection measure details on the EC Plan. Include on the EC Plan that filter fabric or filter baskets shall be installed in the drains and cleaned out after each rain event, or as needed to function property. Do not use sand bags as these tear and can result in sand entering the storm drains.
e.	Maximize and protect areas to be undisturbed (including sensitive areas and buffer zones), using a vegetative buffer strip or 6 ft. fence/barrier. Show the "limits of work" on the EC Plan and barriers along the "limit". Forbid work, storage, earth moving, vegetation clearing, and other disturbances outside of the "limit". Do not use hay bales as these can easily fall apart.
f.	Provide a separate Tree Protection Plan to identify and protect trees, using fencing placed along driplines. An arborist report is required for those trees where work will encroach into the dripline. See separate Tree Protection Plan Guidelines.
g.	Prevent runoff to off-site areas using perimeter controls (diversion berms, silt fencing, and/or fiber rolls). Silt fencing is preferred, but fiber rolls may work in some instances. Where the site is flat or the slope is gentle, installing these measures on the property line should be adequate. On slopes greater than 3:1, the measures must be installed along contour lines.
2.	**Prevent Erosion of Unstable or Denuded Areas**
a.	Show all proposed retaining walls in the EC Plan, including areas that will be used for stockpiling earth and storing construction materials
b.	Indicate the location and method for stabilizing disturbed bare earth areas. Use seeding and/or mulching and the following, as necessary: i) For slopes less than 3:1, provide silt fencing or fiber rolls along contour lines. ii) For slopes greater than 3:1, anchored erosion blankets (rice, straw, or coconut) and fiber rolls or silt fencing at the crest are required. Jute netting is preferred when used with seeding.
c.	Use diversion berms to divert water from unstable or denuded areas (e.g., top and base of a disturbed slope, grade breaks where slopes transition to a steeper slope).
d.	Direct water from construction areas to designated temporary filtration/detention areas. Show any temporary detention areas for stormwater and stabilization of those areas.
3.	**Show Locations of Logistics Areas**
a.	Show location of office trailer(s), storage sheds, temporary power pole, scaffold footprint, and other temporary installations on the EC Plan. Show how they will be accessed and show protection of the access routes.
b.	Show location of utility trenches, indicate utility types, and identify timing of installation.

4.	**Construction Access Routes**
a.	Use stabilized designated access points for entrance onto the property using 3"- 6" fractured aggregate over geo-textile fabric over the first 20 feet of the property. If using an existing paved driveway, identify on EC Plan. Where vehicles or equipment will travel from an existing paved driveway to unpaved areas within the property, a stabilized transition point is required that meets the above standards.
b.	Provide designated area(s) for parking of construction vehicles, using aggregate over geo-textile fabric.
c.	Show all access roads/ramps and access points used by excavation equipment, trucks, or fork lifts/crane access (second floor construction). For unpaved routes, use ridges running diagonally across the road that run to a stabilized outlet. The type of materials used for stabilization and their locations shall be indicated on the EC Plan. Materials for this purpose are required to be stored on-site.
5.	**Containment of Construction Materials and Waste**
a.	Show location, installation and maintenance of a concrete/stucco mixer, washout, and pits. No concrete, mortar, or stucco washout is allowed to be placed directly on the soil/ground. Specify the method used to contain the washout.
b.	Show location of portable toilets away from surface water locations and storm drain inlets.
c.	Show storage location and containment of construction materials during work, as well as afterhours/weekends. Show the location of lumber, gravel, and materials storage areas on the EC Plan. Show how they will be accessed and show protection of the access routes.
d.	Show areas and proposed protection of temporary stockpiles using anchored-down plastic sheeting in dry weather. The use of plastic sheeting during the wet season, Oct 1 through April 30, is not allowed, unless the stockpile is also protected with fiber rolls containing the base of the stockpile. Alternatively, in wet weather, or for longer storage, use seeding and mulching, soil blankets or mats.
e.	Indicate the location of refuse piles and debris box locations on the EC Plan. Show how they will be accessed and show protection of the access routes.
6.	**Construction Schedule**
a.	Provide an anticipated construction schedule and/or construction duration (in weeks or months).
7.	**Other Required Permits/Inspections**
a.	Does the project require a County Grading Permit? Check with Planning staff to verify. For County Grading Permits (only): Grading associated with a County Grading Permit is prohibited during the Winter Grading Moratorium (Oct. 1 through April 30).
b.	Does the project disturb 1 acre (43,560 sq. ft.) of area or more? If Yes: ☐ Applicant shall file Notice Of Intent (NOI) with State Water Resources Control Board for State General Construction Activity NPDES Permit. (Prior to issuance of the building permit, applicant must submit WDID Number to Planning).
c.	A Pre-Site EC and/or Tree Protection Inspection may be required prior to the issuance of a building, grading, or demolition permit.
8.	**Add the Following Standard Comments on the EC Plan:**
Erosion Control Point of Contact. (Please provide an Erosion Control Point of Contact including name, title/qualification, email, and phone number. The EC Point of Contact will be the County's main point of contact if Erosion Control or Tree Protection corrections are required).	
Perform clearing and earth-moving activities only during dry weather. Measures to ensure adequate erosion and sediment control shall be installed prior to earth-moving activities and construction.	
Measures to ensure adequate erosion and sediment control are required year-round. Stabilize all denuded areas and maintain erosion control measures continuously between October 1 and April 30.	
Store, handle, and dispose of construction materials and wastes properly, so as to prevent their contact with stormwater.	
Control and prevent the discharge of all potential pollutants, including pavement cutting wastes, paints, concrete, petroleum products, chemicals, wash water or sediments, and non-stormwater discharges to storm drains and watercourses.	
Use sediment controls or filtration to remove sediment when dewatering site and obtain Regional Water Quality Control Board (RWQCB) permit(s) as necessary.	
Avoid cleaning, fueling, or maintaining vehicles on-site, except in a designated area where wash water is contained and treated.	
Limit and time applications of pesticides and fertilizers to prevent polluted runoff.	

Limit construction access routes to stabilized, designated access points.
Avoid tracking dirt or other materials off-site; clean off-site paved areas and sidewalks using dry sweeping methods.
Train and provide instruction to all employees and subcontractors regarding the Watershed Protection Maintenance Standards and Construction Best Management Practices.
Placement of erosion materials at these locations are required on weekends and during rain events: (List locations)
The areas delineated on the plans for parking, grubbing, storage, etc., shall not be enlarged or "run over."
Construction sites are required to have erosion control materials on-site during the "off-season."
Dust control is required year-round.
Erosion control materials shall be stored on-site.
Use of plastic sheeting between October 1 and April 30 is not acceptable, unless for use on stockpiles where the stockpile is also protected with fiber rolls containing the base of the stockpile.
Tree protection shall be in place before any demolition, grading, excavating or grubbing is started.

Sources: Watershed Protection Maintenance Standards (County of San Mateo Department of Public Works, Watershed Protection website); SMCWPP's Erosion and Sediment Control Field Manual (Planning Counter)

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PART 1 GENERAL

1.01 SUMMARY

A. This specification shall govern the process known as Cement Stabilized Soil (CSS). CSS consists of mixing the existing base, subbase and subgrade materials and uniformly mixing with Portland cement and water. Mixture shall then be compacted, finished, and cured in such a manner that the CSS mixture forms a dense, uniform mass conforming to the lines, grades, and cross sections shown on the Plans.

1.02 RELATED SECTIONS

A. All Sections listed in the Table of Contents are a Condition of this Section.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials:

1. Materials to be stabilized with Portland cement shall consist of existing aggregate base, subbase and underlying native subgrade soils incorporated into the mix design.

2. Existing materials shall be pulverized so that 100 percent will pass a 2-inch (50-mm) sieve and a minimum of 85 percent will pass a 1-inch (25-mm) sieve.

B. Portland cement:

1. All cement to be used or furnished shall conform to ASTM C150. The cement shall be protected from moisture until used and be sufficiently dry to flow freely when handled. Cement shall be furnished in bulk and not exposed until applied to prepared grade.

C. Water:

1. Water shall be free from oils, acids, organic matter or other substances deleterious to the cement treatment of materials. The water shall not contain more than 1000 parts per million of chlorides nor more than 1000 parts per million of sulfates as SO_4. Water shall be clean and potable and shall be added as needed during mixing, compacting, and finishing operations and during the curing period, as required.

2.02 CEMENT APPLICATION RATE

A. The cement application rate is based on the laboratory mix design. The percentage of cement is determined according to the maximum dry weight of the untreated material determined in the laboratory by ASTM D1557.

B. For bidding purposes, the Contractor shall use a cement application rate of four percent (4%), assuming a dry unit soil density of 120 pounds per cubic foot (pcf). The application rate will be expressed in lbs. per sq. ft. of cement. The final application rate shall be determined by a mix design confirmation performed by the Contractor.

2.03 CONTRACTORS QUALIFICATION

A. The contractor performing the CSS cement stabilization shall document a minimum of five years' experience performing similar stabilization work. The contractor shall submit a list of equipment to be utilized in performance of the stabilization process. The contractor shall submit a detailed description of work procedures for approval by the Engineer prior to beginning CSS cement stabilization.

B. The contractor performing CSS cement stabilization shall have a representative on site with a minimum of 5 years' experience in cement stabilization. Their function should include coordinating with other contractors and site representatives. All personnel should be properly trained in the CSS treatment process, including quality control and safety procedures.

2.04 PROTECTION OF EXISTING UTILITIES

A. Where existing underground utilities or utility services lie within the CSS section, the contractor shall verify, by potholing or other means acceptable to and approved by the Engineer, that there is sufficient cover over the utilities to provide clearance for the CSS mixing process without damage to the existing utility facilities. This verification shall be carried out where each utility crosses the boundary of the CSS section, and at a minimum of one location in between. This paragraph shall not relieve the Contractor of conforming to all utility protection requirements contained elsewhere in these special provisions.

B. The Contractor shall be responsible for the protection of existing pipelines, manholes, catch basins, valve boxes and other utility structures that are to remain within the CSS work area. Any such utility facilities that are damaged from roadway excavation work performed by the Contractor shall be either repaired or replaced to the satisfaction of the Engineer at no cost to the Owner, in accordance with Section 15-1.02, "Preservation of Property." of the State Standard Specifications.

2.05 EQUIPMENT

A. CSS section shall be constructed utilizing a combination of equipment that will produce results that meet all the requirements herein. The Engineer prior to use shall approve such machines.

1. Cement Spreader: The cement spreader shall be equipped with such instrumentation and equipment to control spread rates over variable travel speeds. The operator shall demonstrate that the instrumentation and equipment is calibrated and capable of controlling the spread rates within specifications.

2. Mixer: The mixing equipment shall be capable of mixing the full-specified depth of cement treatment, leaving a relatively smooth plane at the bottom of the CSS section. Mixing equipment shall be equipped with a visible depth indicator showing the mixing depth, and odometer or foot-meter to indicate travel speed, and a controllable water additive system for regulating water added to the mixture.

3. Compactors: When compacting cement-treated sections greater than eight (8) inches, a sheepsfoot-type compactor capable of compacting the entire section to the project specification shall be used. The final grade shall be rolled with a smooth-drum roller to provide a firm, level surface.

PART 3 EXECUTION

3.01 PREPARATION

A. The Contractor shall use the cement type determined by the Engineer and set forth in the plans and specifications.

B. The soil materials shall be graded to conform to the lines and grade shown on the Plans prior to application of the cement. Grading operations will require some movement of material along the grade and/or off-hauled to conform to the lines and elevations shown on the Plans and to allow for the subsequent construction activities to proceed.

3.02 PORTLAND CEMENT APPLICATION

A. The Portland cement shall be applied in one operation to the required width, grade and cross section. Cement shall be evenly spread at the designated rate and shall not vary more than 10 percent on any area. Only a calibrated spreader able to provide a uniform distribution of the cement throughout the treatment area shall spread cement. The cement shall be added in a dry state and every precaution shall be taken to prevent fugitive dust outside the work zone.

B. The spreader truck shall demonstrate the ability to maintain a consistent spread rate over variable travel speeds. The contractor will demonstrate the consistency of the spread rate by conducting multiple pan tests. The pan test consists of placing a 3-foot-square pan on the grade in front of the spreader truck. After the cement spreader truck has passed over the pan, the cement captured in the pan is weighed to determine the rate of spread in pounds per square foot. Truck tags will be used to verify amount of cement delivered to project. No traffic other than the mixing equipment or other related construction equipment would be allowed to pass over the exposed cement until after completion of mixing.

C. Cement shall not be spread or mixed/hydrated while the atmospheric temperature is below 35° F. At the Engineers discretion, processing will be allowed if temperature is rising.

3.03 MIXING AND HYDRATING

A. The thickness of the CSS treatment shall be designated on the Plans or as determined by the Engineer. In areas where mixing equipment cannot access, such as around manholes or curbs, the Contractor can process the mixture, within allowable time constraints, by pulling the recycled material and applied cement away from obstacles and transported to an area accessible to mixing equipment.

B. Cement treatment can be conducted in one lift provided the contractor can demonstrate that the spread rate, particle size, and compaction can be achieved. The mixer shall be capable of automatically adjusting itself to maintain a constant depth. On the initial mix, the water truck must have a solid connection to the mixer. The water shall be injected directly into the mixing chamber and shall produce a homogenous blend free from streaks or pockets of dry cement. Leakage of water from equipment will not be permitted. Care shall be exercised to avoid the addition of any excessive water into the mixture.

C. When mixed material, exclusive of one inch or larger clods, is sprayed with phenolphthalein alcohol indicator solution, areas showing no color reaction will be considered evidence of inadequate mixing.

D. Contractor is required to complete mixing and initial compaction of the CSS-cement section within 2 hours of initial hydration of cement.

3.04 CONSTRUCTION JOINTS

A. When horizontally joining two treated sections, contractor shall overlap the new treated section with previously treated section by 12-inches. When joining two treated sections on same day, care shall be taken to adjust water content along overlapping zone.

3.05 COMPACTION

A. Maintain moisture above the optimum moisture content, but within allowable moisture range as determined by the moisture/density relationship of the compaction curve. The CSS-cement section shall be compacted to 95 percent of the maximum dry density as determined by ASTM 1557.

B. The maximum compacted thickness of a single layer may be any thickness the contractor can demonstrate to the Engineer that his equipment and method of operation will provide the required compacted density throughout the treated layer.

C. Initial Compaction:

1. Contractor shall achieve the projects minimum compaction requirement during initial compaction operation. Lift thickness of 8 to 12 inches shall be compacted by means of a sheepsfoot compactor. Lift thickness greater than 12 inches shall be compacted by a sheepsfoot compactor with an open ring design to prevent bridging of the lower half of the CSS section. Areas inaccessible to rollers shall be compacted to the required compaction by other means satisfactory to the Engineer.

D. Surface Compaction:

1. Surface compaction is defined as the upper 3 inches of the CSS section. Surface compaction shall be by means of steel-tired or pneumatic-tired smooth-drum roller.

3.06 FINAL GRADING

A. Surface compaction and finish grading shall proceed in such a manner as to produce, in not more than 2 hours from initial compaction, a smooth, closely knit surface conforming to the crown, grade and line indicated and will be free of cracks, ridges or loose material.

B. Maintain moisture content on surface within allowable moisture range during all grading procedures.

C. All excess material above the grade tolerance specified by the plans should be removed from the grade prior to final surface compaction of the CSS section. This excess material can be used in areas inaccessible to treatment equipment, provided the CSS mixture is used within the allotted time constraints.

D. Minor indentations may remain in the surface of the finished material if no loose material remains in the indentations.

3.07 TRAFFIC LOADING

A. Once the CSS section is finished, contractor may be allowed to place subsequent structural layers over the CSS section provided that the following criteria are met:

1. The CSS section is stable and non-yielding under a minimum 10-ton proofroll.

2. The CSS section has no evidence of cracking.

3. The CSS section criteria's have been met, including CSS thickness, percentage of cement applied, compaction, and square footage of the treated area confirmed.

3.08 CURING

A. After CSS section is completed, it shall be protected against drying and traffic for 3 days. The Engineer may reduce the 3-day cure period, based on factors such as degree of traffic, temperature, and stability.

B. Curing shall be moist (water fogging) or other method approved by the Engineer. If moist curing is used, exposed surfaces of the CSS section shall be kept continuously moist with a fog spray for 3 days.

3.09 REPAIR

A. If the CSS-cement section is damaged, removing and replacing the entire depth of affected layers in the damaged area shall repair it. Feathering will not be permitted for repair of low areas.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This section shall cover site work concrete constructed upon the prepared subgrade and in conformance with the lines, grades, thickness, and cross sections shown. Construction shall include the following:

1. Curb, gutter, and combination curb and gutter.

2. Pedestrian Pavement: Walks.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 DESIGN REQUIREMENTS

A. Design all elements with the latest published version of applicable codes.

1.04 WEATHER LIMITATIONS

A. Placement of concrete shall be in conformance with ACI as specified under Section 03 30 00, CAST-IN-PLACE CONCRETE.

1.05 SELECT SUBBASE MATERIAL JOB-MIX

A. The Contractor shall retain and reimburse a testing laboratory to design a select subbase material mixture and submit a job-mix formula to the Owner’s Representative, in writing, for approval. The formula shall include the source of materials, gradation, plasticity index, liquid limit, and laboratory compaction curves indicating maximum density at optimum moisture.

1.06 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Manufacturers' Certificates and Data certifying that the following materials conform to the requirements specified.

1. Expansion joint filler

2. Hot poured sealing compound

3. Reinforcement

4. Curing materials

C. Data and Test Reports: Select subbase material.

1. Job-mix formula.

2. Source, gradation, liquid limit, plasticity index, percentage of wear, and other tests as specified and in referenced publications.

1.07 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Refer to the latest edition of all referenced Standards and codes.

B. American Association of State Highway and Transportation Officials (AASHTO):

M031MM031-07-UL ..... Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement (ASTM A615/A615M-09)

M055MM055-09-UL ..... Steel Welded Wire Reinforcement, Plain, for Concrete (ASTM A185)

M147-65-UL ..... Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses (R 2004)

M148-05-UL ..... Liquid Membrane-Forming Compounds for Curing Concrete (ASTM C309)

M171-05-UL ..... Sheet Materials for Curing Concrete (ASTM C171)

M182-05-UL ..... Burlap Cloth Made from Jute or Kenaf and Cotton Mats

M213-01-UL ..... Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Type) (ASTM D1751)

M233-86-UL ..... Boiled Linseed Oil Mixer for Treatment of Portland Cement Concrete

T099-09-UL ..... Moisture-Density Relations of Soils Using a 2.5 kg. (5.5 lb) Rammer and a 305 mm (12 in.) Drop

T180-09-UL ..... Moisture-Density Relations of Soils Using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop

C. American Society for Testing and Materials (ASTM):

C94/C94M-09..... Ready-Mixed Concrete

C143/C143M-09..... Slump of Hydraulic Cement Concrete

PART 2 PRODUCTS

2.01 GENERAL

A. Concrete shall be Type C, air-entrained as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE, with the following exceptions:

TYPE	MAXIMUM SLUMP*
Curb & Gutter	75 mm (3")
Pedestrian Pavement	75 mm (3")
* For concrete to be vibrated: Slump as determined by ASTM C143. Tolerances as established by ASTM C94.	

2.02 REINFORCEMENT

A. The type, amount, and locations of steel reinforcement shall be as shown on the drawings and in the specifications.

B. Welded wire-fabric shall conform to AASHTO M55.

C. Dowels shall be plain steel bars conforming to AASHTO M31. Tie bars shall be deformed steel bars conforming to AASHTO M31.

2.03 SELECT SUBBASE (WHERE REQUIRED)

A. Subbase material shall conform to Section 31 23 00 “Excavating Backfilling and Compacting” and as shown on the Drawings.

B. Subbase material shall produce a compacted, dense-graded course, meeting the density requirement specified in these specifications and drawings.

2.04 FORMS

A. Use metal or wood forms that are straight and suitable in cross-section, depth, and strength to resist springing during depositing and consolidating the concrete, for the work involved.

B. Do not use forms if they vary from a straight line more than 3 mm (1/8 inch) in any 3000 mm (ten foot) long section, in either a horizontal or vertical direction.

C. Wood forms should be at least 50 mm (2 inches) thick (nominal). Wood forms shall also be free from warp, twist, loose knots, splits, or other defects. Use approved flexible or curved forms for forming radii.

2.05 CONCRETE CURING MATERIALS

A. Concrete curing materials shall conform to one of the following:

1. Burlap conforming to AASHTO M182 having a weight of 233 grams (seven ounces) or more per square meter (yard) when dry.

2. Impervious Sheeting conforming to AASHTO M171.

3. Liquid Membrane Curing Compound conforming to AASHTO M148 (ASTM C309), and shall be free of paraffin or petroleum.

2.06 EXPANSION JOINT FILLERS

A. Material shall conform to AASHTO M213.

PART 3 EXECUTION

3.01 SUBGRADE PENETRATION

A. Prepare, construct, and finish the subgrade as specified in Section 31 23 00, Excavating Backfilling and Compacting.

B. Maintain the subgrade in a smooth, compacted condition, in conformance with the required section and established grade until the succeeding operation has been accomplished.

3.02 SELECT SUBBASE (WHERE REQUIRED)

A. Mixing: Proportion the select subbase by weight or by volume in quantities so that the final approved job-mixed formula gradation, liquid limit, and plasticity index requirements will be met after subbase course has been placed and compacted. Add water in approved quantities, measured by weight or volume, in such a manner to produce a uniform blend.

B. Placing:

1. Place the mixed material on the prepared subgrade in a uniform layer to the required contour and grades, and to a loose depth not to exceed 200 mm (8 inches), and that when compacted, will produce a layer of the designated thickness.

2. When the designated compacted thickness exceeds 150 mm (6 inches), place the material in layers of equal thickness. Remove unsatisfactory areas and replace with satisfactory mixture, or mix the material in the area.

3. In no case will the addition of thin layers of material be added to the top layer in order to meet grade.

4. If the elevation of the top layer is 13 mm (1/2 inch) or more below the grade, excavate the top layer and replace with new material to a depth of at least 75 mm (3 inches) in compacted thickness.

C. Compaction:

1. Perform compaction with approved equipment (hand or mechanical) well suited to the material being compacted.

2. Moisten or aerate the material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.

3. Compact each layer to at least 95 percent or 100 percent of maximum density as determined by AASHTO T180 or AASHTO T99 respectively.

D. Smoothness Test and Thickness Control:

Test the completed subbase for grade and cross section with a straight edge.

1. The surface of each layer shall not show any deviations in excess of 10 mm (3/8 inch).

2. The completed thickness shall be within 13 mm (1/2 inch) of the thickness as shown.

E. Protection:

1. Maintain the finished subbase in a smooth and compacted condition until the concrete has been placed.

2. When Contractor's subsequent operations or adverse weather disturbs the approved compacted subbase, excavate, and reconstruct it with new material meeting the requirements herein specified, at no additional cost to the Owner.

3.03 SETTING FORMS

A. Base Support:

1. Compact the base material under the forms true to grade so that, when set, they will be uniformly supported for their entire length at the grade as shown.

2. Correct imperfections or variations in the base material grade by cutting or filling and compacting.

B. Form Setting:

1. Set forms sufficiently in advance of the placing of the concrete to permit the performance and approval of all operations required with and adjacent to the form lines.

2. Set forms to true line and grade and use stakes, clamps, spreaders, and braces to hold them rigidly in place so that the forms and joints are free from play or movement in any direction.

3. Forms shall conform to line and grade with an allowable tolerance of 3 mm (1/8 inch) when checked with a straightedge and shall not deviate from true line by more than 6 mm (1/4 inch) at any point.

4. Do not remove forms until removal will not result in damaged concrete or at such time to facilitate finishing.

5. Clean and oil forms each time they are used.

C. The Contractor’s Registered Professional Land Surveyor shall establish and control the alignment and the grade elevations of the forms or concrete slipforming machine operations.

1. Make necessary corrections to forms immediately before placing concrete.

2. When any form has been disturbed or any subgrade or subbase has become unstable, reset and recheck the form before placing concrete.

3.04 EQUIPMENT

A. The Owner's Representative shall approve equipment and tools necessary for handling materials and performing all parts of the work prior to commencement of work.

B. Maintain equipment and tools in satisfactory working condition at all times.

3.05 PLACING REINFORCEMENT

A. Reinforcement shall be free from dirt, oil, rust, scale or other substances that prevent the bonding of the concrete to the reinforcement.

B. Before the concrete is placed, the Owner's Representative shall approve the reinforcement, which shall be accurately and securely fastened in place with suitable supports and ties. The type, amount, and position of the reinforcement shall be as shown.

3.06 PLACING CONCRETE - GENERAL

A. Obtain approval of the Owner's Representative before placing concrete.

B. Remove debris and other foreign material from between the forms before placing concrete. Obtain approval of the Owner's Representative before placing concrete.

C. Before the concrete is placed, uniformly moisten the subgrade, base, or subbase appropriately, avoiding puddles of water.

D. Convey concrete from mixer to final place of deposit by a method which will prevent segregation or loss of ingredients. Deposit concrete so that it requires as little handling as possible.

E. While being placed, spade or vibrate and compact the concrete with suitable tools to prevent the formation of voids or honeycomb pockets. Vibrate concrete well against forms and along joints. Over-vibration or manipulation causing segregation will not be permitted. Place concrete continuously between joints without bulkheads.

F. Install a construction joint whenever the placing of concrete is suspended for more than 30 minutes and at the end of each day's work.

G. Workmen or construction equipment coated with foreign material shall not be permitted to walk or operate in the concrete during placement and finishing operations.

3.07 PLACING CONCRETE FOR CURB AND GUTTER, PEDESTRIAN PAVEMENT, AND EQUIPMENT PADS

A. Place concrete in the forms in one layer of such thickness that, when compacted and finished, it will conform to the cross section as shown.

B. Deposit concrete as near to joints as possible without disturbing them but do not dump onto a joint assembly.

C. After the concrete has been placed in the forms, use a strike-off guided by the side forms to bring the surface to the proper section to be compacted.

D. Consolidate the concrete thoroughly by tamping and spading, or with approved mechanical finishing equipment.

E. Finish the surface to grade with a wood or metal float.

F. All Concrete pads and pavements shall be constructed with sufficient slope to drain properly.

3.08 PLACING CONCRETE FOR VEHICULAR PAVEMENT

A. Deposit concrete into the forms as close as possible to its final position.

B. Place concrete rapidly and continuously between construction joints.

C. Strike off concrete and thoroughly consolidate by a finishing machine, vibrating screed, or by hand-finishing.

D. Finish the surface to the elevation and crown as shown.

E. Deposit concrete as near the joints as possible without disturbing them but do not dump onto a joint assembly. Do not place adjacent lanes without approval by the Owner's Representative.

3.09 CONCRETE FINISHING - GENERAL

A. The sequence of operations, unless otherwise indicated, shall be as follows:

1. Consolidating, floating, straight-edging, troweling, texturing, and edging of joints.

2. Maintain finishing equipment and tools in a clean and approved condition.

3.10 CONCRETE FINISHING CURB AND GUTTER

A. Round the edges of the gutter and top of the curb with an edging tool to a radius of 1/4 inch or as otherwise detailed.

B. Float the surfaces and finish with a smooth wood or metal float until true to grade and section and uniform in textures.

C. Finish the surfaces, while still wet, with a bristle type brush with longitudinal strokes.

D. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the surface, while still wet, in the same manner as the gutter and curb top.

E. Except at grade changes or curves, finished surfaces shall not vary more than 1/8 inch for gutter and 1/4 inch for top and face of curb, when tested with a 10 foot straightedge.

F. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.

G. Correct any depressions which will not drain.

H. Visible surfaces and edges of finished curb, gutter, and combination curb and gutter shall be free of blemishes, form marks, and tool marks, and shall be uniform in color, shape, and appearance.

3.11 CONCRETE FINISHING PEDESTRIAN PAVEMENT

A. Walks, Wheelchair Curb Ramps:

1. Finish the surfaces to grade and cross section with a metal float, trowled smooth and finished with a broom moistened with clear water.

2. Medium brooming shall be transverse to the line of traffic.

3. Finish all slab edges, including those at formed joints, carefully with an edger having a radius as shown on the Drawings.

4. Unless otherwise indicated, edge the transverse joints before brooming. The brooming shall eliminate the flat surface left by the surface face of the edger. Execute the brooming so that the corrugation, thus produced, will be uniform in appearance and not more than 1/16 inch in depth.

5. The completed surface shall be uniform in color and free of surface blemishes, form marks, and tool marks. The finished surface of the pavement shall not vary more than 3/16 inch when tested with a 10 foot straightedge.

6. The thickness of the pavement shall not vary more than 1/4 inch.

7. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.

3.12 JOINTS - GENERAL

A. Place joints, where shown, conforming to the details as shown, and perpendicular to the finished grade of the concrete surface.

B. Joints shall be straight and continuous from edge to edge of the pavement.

3.13 EXPANSION JOINTS

A. Use a preformed expansion joint filler material of the thickness as shown to form expansion joints.

B. Material shall extend the full depth of concrete, cut and shaped to the cross section as shown, except that top edges of joint filler shall be below the finished concrete surface where shown to allow for sealing.

C. Anchor with approved devices to prevent displacing during placing and finishing operations.

D. Round the edges of joints with an edging tool.

E. Form expansion joints as follows:

1. Without dowels, about structures and features that project through, into, or against any site work concrete construction.

2. Using joint filler of the type, thickness, and width as shown.

3. Installed in such a manner as to form a complete, uniform separation between the structure and the site work concrete item.

3.14 CONSTRUCTION JOINTS

A. Locate longitudinal and transverse construction joints between slabs as shown.

B. Place transverse construction joints of the type shown, where indicated and whenever the placing of concrete is suspended for more than 30 minutes.

C. Use a butt-type joint with dowels in curb and gutter if the joint occurs at the location of a planned joint.

D. Use keyed joints with tiebars if the joint occurs in the middle third of the normal curb and gutter joint interval.

3.15 FORM REMOVAL

A. Forms shall remain in place at least 12 hours after the concrete has been placed. Remove forms without injuring the concrete.

B. Do not use bars or heavy tools against the concrete in removing the forms. Promptly repair any concrete found defective after form removal.

3.16 CURING OF CONCRETE

A. Cure concrete by one of the following methods appropriate to the weather conditions and local construction practices, against loss of moisture, and rapid temperature changes for at least seven days from the beginning of the curing operation. Protect unhardened concrete from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready to install before actual concrete placement begins. Provide protection as necessary to prevent cracking of the pavement due to temperature changes during the curing period. If any selected method of curing does not afford the proper curing and protection against concrete cracking, remove and replace the damaged pavement and employ another method of curing as directed by the Owner’s Representative.

B. Burlap Mat: Provide a minimum of two layers kept saturated with water for the curing period. Mats shall overlap each other at least 150 mm (6 inches).

C. Impervious Sheeting: Use waterproof paper, polyethylene-coated burlap, or polyethylene sheeting. Polyethylene shall be at lease 0.1 mm (4 mils) in thickness. Wet the entire exposed concrete surface with a fine spray of water and then cover with the sheeting material. Sheets shall overlap each other at least 300 mm (12 inches). Securely anchor sheeting.

D. Liquid Membrane Curing:

1. Apply pigmented membrane-forming curing compound in two coats at right angles to each other at a rate of 5 m2/L (200 square feet per gallon) for both coats.

2. Do not allow the concrete to dry before the application of the membrane.

3. Cure joints designated to be sealed by inserting moistened paper or fiber rope or covering with waterproof paper prior to application of the curing compound, in a manner to prevent the curing compound entering the joint.

4. Immediately re-spray any area covered with curing compound and damaged during the curing period.

3.17 CLEANING

A. After completion of the curing period:

1. Remove the curing material (other than liquid membrane).

2. Sweep the concrete clean.

3. After removal of all foreign matter from the joints, seal joints as herein specified.

4. Clean the entire concrete of all debris and construction equipment as soon as curing and sealing of joints has been completed.

3.18 PROTECTION

A. The contractor shall protect the concrete against all damage prior to final acceptance by the Owner. Remove concrete containing excessive cracking, fractures, spalling, or other defects and reconstruct the entire section between regularly scheduled joints, when directed by the Owner's Representative, and at no additional cost to the Owner. Exclude traffic from vehicular pavement until the concrete is at least seven days old, or for a longer period of time if so directed by the Owner's Representative.

3.19 FINAL CLEAN-UP

A. Remove all debris, rubbish and excess material from the site.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This work shall cover the composition, mixing, construction upon the prepared subgrade, and the protection of hot asphalt concrete pavement. The hot asphalt concrete pavement shall consist of an aggregate or asphalt base course and asphalt surface course constructed in conformity with the lines, grades, thickness, and cross sections as shown. Each course shall be constructed to the depth, section, or elevation required by the drawings and shall be rolled, finished, and approved before the placement of the next course.

B. This Section includes specifications for constructing new asphalt concrete wearing surface Type A, 1/2-inch maximum with medium grading, at the locations and to the dimensions shown on plans as directed by the Owner's Representative.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 ALIGNMENT AND GRADE CONTROL

A. The Contractor's Registered Professional Land Surveyor shall establish and control the pavement (aggregate or asphalt base course and asphalt surface course) alignments, grades, elevations, and cross sections as shown on the Drawings.

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Data and Test Reports:

1. Aggregate Base Course: Sources, gradation, liquid limit, plasticity index, percentage of wear, and other tests required by Section 39 of Caltrans Standard Specifications (CTSS).

2. Asphalt Base/Surface Course: Aggregate source, gradation, soundness loss, percentage of wear, and other tests required by Section 39 of CTSS.

3. Job-mix formula.

C. Certifications:

1. Asphalt prime and tack coat material certificate of conformance to Section 39 of CTSS requirements.

2. Asphalt cement certificate of conformance to CTSS requirements.

3. Job-mix certification - Submit plant mix certification that mix equals or exceeds Section 39 of CTSS.

4. Prior to starting construction, the Contractor shall submit the asphalt concrete mix design including the amount of asphalt binder to be mixed with the dry

aggregate to the Engineer for approval. No resurfacing work will be allowed prior to the approval of the mix design. Asphalt concrete mix design shall conform to Section 39 of CTSS.

5. The Contractor shall submit electronic copies of manufacturer's literature, specifications, applications and installations for filler and/or sealer material to the Owner's Representative for approval at least five (5) calendar days in advance of performing the filling and/or sealing work.

1.05 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Refer to the latest edition of all referenced Standards and codes.

B. State of California Department of Transportation (CalTrans):

1. Standard Specifications (CTSS)

PART 2 PRODUCTS

2.01 GENERAL

A. Aggregate base, Asphaltic base and asphalt concrete materials shall conform to the requirements of the following and other appropriate sections of the latest version of Section 39 of CTSS, including amendments, addenda and errata. Where the term "Engineer" is referenced in Section 39 of CTSS, it shall mean the Owner's Representative.

2.02 MATERIALS

A. Asphalt: In accordance with the requirements of Section 39-2.01 of CTSS, except that asphalt shall be either PG 64-10 or AR-4000.

B. Aggregate: In accordance with the requirements of Section 39-2.02 of CTSS, except that aggregate grading shall be as follows:

Sieve Sizes	Limits of Proposed Gradation	Operating Range	Contract Compliance
3/4"	----------	100	100
1/2"	----------	95-100	89-100
3/8"	----------	80-95	75-100
No. 4	59-66	X$\pm$5	X$\pm$8
No. 8	43-49	X$\pm$5	X$\pm$8
No. 30	22-27	X$\pm$5	X$\pm$8
No. 200	----------	3-8	0-11

C. Minimum Durability Index: When tested in accordance with Caltrans Test Method 229 shall be 50.

D. Tack coat in accordance with Section 39 of CTSS.

2.03 EQUIPMENT

A. Spreading Equipment: In accordance with the requirements of Section 39 of CTSS.

B. Compacting Equipment: In accordance with the requirements of Section 9 of CTSS.

PART 3 EXECUTION

3.01 GENERAL

A. The Asphalt Concrete Paving equipment, weather limitations, job-mix formula, mixing, construction methods, compaction, finishing, tolerance, and protection shall conform to the requirements of the appropriate sections of Section 39 of CTSS for the type of material specified.

3.02 MIXING ASPHALTIC CONCRETE MATERIALS

A. Provide hot plant-mixed asphaltic concrete paving materials.

1. Temperature leaving the plant: 143 degrees C (290 degrees F) minimum, 160 degrees C (320 degrees F) maximum.

2. Temperature at time of placing: 138 degrees C (280 degrees F) minimum.

3.03 SUBGRADE

A. Shape to line and grade and compact with self-propelled rollers.

B. All depressions that develop under rolling shall be filled with acceptable material and the area re-rolled.

C. Soft areas shall be removed and filled with acceptable materials and the area re-rolled.

D. Should the subgrade become rutted or displaced prior to the placing of the subbase, it shall be reworked to bring to line and grade.

E. Proof-roll the subgrade with maximum 50 ton gross weight dump truck as directed by Owner's Representative. If pumping, pushing, or other movement is observed, rework the area to provide a stable and compacted subgrade.

3.04 BASE COURSES

A. Base:

1. Spread and compact to the thickness shown on the drawings.

2. Rolling shall begin at the sides and continue toward the center and shall continue until there is no movement ahead of the roller.

3. After completion of the base rolling there shall be no hauling over the base other than the delivery of material for the top course.

C. Thickness tolerance: Provide the compacted thicknesses shown on the Drawings within a tolerance of minus 0.0mm (0.0") to plus 12.7mm (0.5").

D. Smoothness tolerance: Provide the lines and grades shown on the Drawings within a tolerance of 5mm in 3m (3/16 inch in ten feet).

E. Moisture content: Use only the amount of moisture needed to achieve the specified compaction.

3.05 PLACEMENT OF ASPHALTIC CONCRETE PAVING

A. Remove all loose materials from the compacted base.

B. Apply the specified prime coat, and tack coat where required, and allow to dry in accordance with the manufacturer's recommendations as approved by the Owner.

C. Receipt of asphaltic concrete materials:

1. Do not accept material unless it is covered with a tarpaulin until unloaded, and unless the material has a temperature of not less than 130 degrees C (280 degrees F).

2. Do not commence placement of asphaltic concrete materials when the atmospheric temperature is below 10 degrees C (50 degrees F), not during fog, rain, or other unsuitable conditions.

D. Spreading:

1. Spread material in a manner that requires the least handling.

2. Where thickness of finished paving will be 76mm (3") or less, spread in one layer.

E. Rolling:

1. After the material has been spread to the proper depth, roll until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown own the drawings.

2. Roll in at least two directions until no roller marks are visible.

3. Finished paving smoothness tolerance:

a. No depressions which will retain standing water.

b. No deviation greater than 3mm in 1.8m (1/8" in six feet).

3.06 APPLICATION OF SEAL COAT

A. Prepare the surfaces, mix the seal coat material, and apply in accordance with the manufacturer's recommendations as approved by the Owner.

B. Apply one coat of the specified sealer.

C. Achieve a finished surface seal which, when dry and thoroughly set, is smooth, tough, resilient, of uniform black color, and free from coarse textured areas, lap marks, ridges, and other surface irregularities.

3.07 PROTECTION

A. Protect the asphaltic concrete paved areas from traffic until the sealer is set and cured and does not pick up under foot or wheeled traffic.

3.08 FINAL CLEAN-UP

A. Remove all debris, rubbish, and excess material from the work area.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Section includes specifications for precast concrete wheel stops for vehicular parking stalls in parking structures and parking lots as indicated.

1.02 REFERENCE STANDARDS

A. State of California, Department of Transportation Caltrans, Standard Specifications (CTSS)

1.03 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Product Data: Submit manufacturers' product data of precast stops and epoxy adhesive for approval.

1.04 QUALITY ASSURANCE:

A. Precast wheel stops shall be manufactured for the intended purpose by a company or firm specializing in the manufacture of precast concrete parking appurtenances.

PART 2 PRODUCTS

2.01 MATERIALS

A. Wheel Stops: Precast, 3.5% minimum air-entrained concrete; 4000 psi minimum compressive strength. Each stop shall be reinforced with two No. 4 deformed steel reinforcing bars, minimum. Provide chamfered corners and drainage slots on underside, and provide holes for dowel-anchoring to substrate. Unless indicated otherwise, provide stops of half octagonal configuration and 30-inch length.

B. Adhesive for Anchoring Stops to Concrete Slabs, At-Grade Concrete Pavements, and At-Grade Asphalt Pavements: Epoxy adhesive manufactured for the purpose, similar and equal to the adhesives specified in Caltrans Standard Specifications, Section 95-2.04 or 95-2.05.

C. Adhesive for Bonding Dowel to Wheel Stop: As proposed by Contractor and approved by the Engineer, suitable for application.

D. Steel Bars for Installation: Galvanized 5/8” diameter steel dowels or galvanized

PART 3 EXECUTION

3.1 INSTALLATION

A. Securely attach wheel stops into at-grade concrete and at-grade asphalt pavement with not less than two galvanized steel dowels embedded in holes cast into wheel stops. Firmly bond each dowel to wheel stop and to pavement.

B. At concrete pavement, drill holes in pavement for dowels.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This work shall consist of furnishing and applying paint areas restricted to accessible stalls, crosswalks, and other detail pavement markings, in accordance with the details as shown or as prescribed by the Owner's Representative. Conform to the Manual on Uniform Traffic Control Devices for Streets and Highways, published by the U.S. Department of Transportation, Federal Highway Administration, CBC 2016, 11B and ADAAG 2010 for details not shown.

1.02 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples

B. Furnish Manufacturer's Certificates and Data certifying that the following materials conform to the requirements specified:

1. Paint.

1.03 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. Federal Specifications (Fed. Spec.):

TT-B-1325C .....Beads (Glass Spheres); Retro-Reflective

TT-P-1952D .....Paint, Traffic Black, and Airfield Marking, Waterborne

C. Master Painters Institute (MPI):

Approved Product List – 2019

PART 2 PRODUCTS

2.01 PAINT

A. Paint for marking pavement (parking lot and zone marking) shall conform to MPI No. 97, color as shown. Paint for obliterating existing markings shall conform to Fed. Spec. TT-P-1952D. Paint shall be in containers of at least 5 gallons. A certificate shall accompany each batch of paint stating compliance with the applicable publication.

2.02 PAINT APPLICATOR

A. Apply all marking by approved mechanical equipment. The equipment shall provide constant agitation of paint and travel at controlled speeds. Synchronize one or more paint "guns" to automatically begin and cut off paint flow in the case of skip lines. The equipment shall have manual control to apply continuous lines of varying length and marking widths as shown. Provide pneumatic spray guns for hand application of paint in

areas where a mobile paint applicator cannot be used. If the equipment does not have a glass bead dispenser, use a separate piece of equipment. An experienced technician that is thoroughly familiar with equipment, materials, and marking layouts shall control all painting equipment and operations.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Thoroughly clean all surfaces to be marked before application of paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement with scrapers, wire brushings, sandblasting, mechanical abrasion, or approved chemicals as directed by the Owner's Representative. The application of paint conforming to Fed. Spec. TT-P-1952D is an option to removal of existing paint markings on asphalt pavement. Apply the black paint in as many coats as necessary to completely obliterate the existing markings. Where oil or grease are present on old pavements to be marked, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application. After cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint. Pavement marking shall follow as closely as practicable after the surface has been cleaned and dried, but do not begin any marking until the Owner's Representative has inspected the surface and gives permission to proceed. The Contractor shall establish control points for marking and provide templates to control paint application by type and color at necessary intervals. The Contractor is responsible to preserve and apply marking in conformance with the established control points.

3.02 APPLICATION

A. Apply uniformly painted and reflective pavement marking of required color(s), length, and width with true, sharp edges and ends on properly cured, prepared, and dried surfaces in conformance with the details as shown and established control points. The length and width of lines shall conform within a tolerance of plus or minus 3 inches and plus or minus 1/8 inch, respectively, in the case of skip markings. The length of intervals shall not exceed the line length tolerance. Temperature of the surface to be painted and the atmosphere shall be above 50 degrees F and less than 95 degrees F. Apply the paint at a wet film thickness of 0.015 inch. Disperse reflective glass beads evenly on the wet paint at a rate of 6 pounds per gallon of paint. Apply paint in one coat. At the direction of the Owner's Representative, markings showing light spots may receive additional coats. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of asphalt, and pick-up, displacement, or discoloration by tires of traffic. If there is a deficiency in drying of the marking, discontinue paint operations until cause of the slow drying is determined and corrected. Remove and replace marking that is applied at less than minimum material rates; deviates from true alignment; exceeds stipulated length and width tolerances; or shows light spots, faulty distribution of beads, smears, or other deficiencies or irregularities. Use carefully controlled sand blasting, approved grinding equipment, or other approved method to remove marking so that the surface to which the marking was applied will not be damaged.

3.03 PROTECTION

A. Conduct operations in such a manner that necessary traffic can move without hindrance. Protect the newly painted markings so that, insofar as possible, the tires of passing vehicles will not pick up paint. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic. Efface and replace damaged portions of markings at no additional cost to the Owner.

3.04 DETAIL PAVEMENT MARKING

A. Use Detail Pavement Markings, exclusive of actual traffic lane marking, at exit and entrance islands and turnouts, on curbs, at crosswalks, at parking bays, and at such other locations as shown. Show the International Accessibility Symbol at indicated parking spaces. Color shall be as shown. Apply paint for the symbol using a suitable template that will provide a pavement marking with true, sharp edges and ends. Place detail pavement markings of the color(s), width(s) and length(s), and design pattern at the locations shown.

3.05 FINAL CLEAN-UP

A. Remove all debris, rubbish and excess material from the site.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Chain link fence, gates, accessories and access control.

2. Relocation of moving gates and controllers.

1.02 RELATED REQUIREMENTS

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

1. A392-11a - Zinc-Coated Steel Chain-Link Fence Fabric.

2. A817-12 - Metal-Coated Steel Wire for Chain-Link Fence Fabric and Marcelled Tension Wire.

3. F567-14a - Installation of Chain-Link Fence.

4. F626-14 - Fence Fittings.

5. F900-11 - Industrial and Commercial Swing Gates.

6. F1043-16 - Strength and Protective Coatings on Steel Industrial Fence Framework.

7. F1083-16 - Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

C. Chain Link Fence Manufacturing Institute (CLFMI):

1. Product Manual.

D. Federal Specifications (Fed. Spec.):

1. FF-P-110J - Padlock, Changeable Combination.

E. Master Painters Institute (MPI):

1. No. 18 - Primer, Zinc Rich, Organic.

1.04 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Submittal Drawings:

1. Show size, configuration, and fabrication and installation details.

C. Manufacturer's Literature and Data:

1. Description of each product.

2. Installation instructions.

D. Certificates: Certify each product complies with specifications.

1. Fence alignment.

E. Qualifications: Substantiate qualifications comply with specifications.

1. Installer with project experience list.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Regularly manufactures specified products.

B. Installer Qualifications:

1. Regularly installs specified products.

2. Installed specified products with satisfactory service on five similar installations for minimum five years.

a. Project Experience List: Provide contact names and addresses for completed projects.

C. Welders and Welding Procedures Qualifications: AWS D1.1/D1.1M.

1.06 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.07 STORAGE AND HANDLING

A. Protect products from damage during handling and construction operations.

PART 2 PRODUCTS

2.01 PRODUCTS - GENERAL

A. Provide fences and gates from one manufacturer.

2.02 CHAIN-LINK FENCING AND GATES

A. General: Conform to CLFMI Product Manual.

B. Fence Framework:

1. Round Steel Pipe and Rail: ASTM F1043, Group IA Heavy Industrial Fence Framework, ASTM F1083 schedule 40 galvanized pipe.

a. Line post: 60 mm (2.375 inch) diameter.

b. End, Corner, Pull post: 60 mm (2.375 inch) diameter.

c. Brace rails, top, bottom, and intermediate rails, 42 mm (1.660 inch) diameter, 3.38 kg/m (2.27 lb./ft.).

2.03 TENSION WIRE

A. Metallic Coated Steel Marcelled Tension Wire: ASTM A817.

B. Polymer Coated Steel Tension Wire: ASTM F1664. Wire gauge specified is the core wire gauge.

2.04 FITTINGS

A. General: ASTM F626.

B. Tension and Brace Bands: Galvanized pressed steel.

C. Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves: Pressed steel galvanized.

D. Truss Rod Assembly: Steel truss rod with a pressed steel tightener.

E. Tension Bars: Galvanized steel one-piece length 50 mm (2 inches) less than the fabric height.

F. Polymer Coated Color Fittings: Polymer coating minimum thickness 0.15 mm (0.006 inches) fused and adhered to zinc coated fittings and match color to fence system.

2.05 TIE WIRE and HOG RINGS

A. Galvanized: Minimum zinc coating 366 g/sq. m (1.20 oz./sq. ft.); 3.76 mm (0.148 inch) diameter steel wire.

B. Polymer coated; match coating, class and color to that of the chain link fabric.

2.06 GATES

A. Swing Gates: ASTM F900, single swing type.

1. Galvanized steel:

a. Frame: ASTM F1043 and ASTM F1083 Group IA schedule 40 pipe 48.3 mm (1.900 inches) OD. Apply galvanized repair paint on welded joints. Gate width clearance shall be minimum 36 inches.

b. Hardware:

1) Hinges: 180 degree gate hinges per leaf.

2) Gate closer.

3) Positive locking gate latch, 7.9 mm (5/16 inches) thick by 44 mm (1 3/4 inches).

4) Relocate mechanical pin gate locks.

c. Gate Controls: Card Reader: Land side. Standalone proximity reader, power supply, programmer and 250 cards. 50,000 user capacity, 6” read range.

d. Knox Box 3200 Series: Custom mounted in galvanized steel sheet that supports knox box, mounted between fence rails.

2.07 CONCRETE

A. Concrete: As specified in Section 32 05 23, Cement and Concrete for Exterior Improvements.

2.08 FINISHES

A. Finish exposed surfaces after fabrication.

B. Aluminum Anodized Finish: NAAMM AMP 500.

1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.018 mm (0.7 mil) thick.

2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.

3. Clear Anodized Finish: AA-C22A31; Class II Architectural, 0.01 mm (0.4 mil) thick.

4. Color Anodized Finish: AA-C22A32 or AA-C22A34; Class II Architectural, 0.01 mm (0.4 mil) thick.

2.09 ACCESSORIES

A. Barrier Coating: ASTM D1187/D1187M.

B. Welding Materials: AWS D1.1/D1.1M, type to suit application.

C. Galvanizing Repair Paint: MPI No. 18.

D. Touch-Up Paint: Match shop finish.

E. Screening Slats, Faux Hedge green slats.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Remove existing fences and gates to permit new installation.

1. Retain existing fences and gates for reuse.

2. Retain existing gate motors and controls for reuse.

3. Dispose of other removed materials.

D. Apply barrier coating to steel surfaces in contact with cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.02 INSTALLATION

A. Layout fence and locate position of post.

B. Installation:

1. General: Comply with ASTM F567.

2. Framework:

a. Posts: Set plumb in concrete footings with 600 mm (24 inches) minimum depth.

1) Minimum Footing Diameter: Four times largest cross section of post, up to 100 mm (4 inches) O.D. and three times largest cross section of post greater than 100 mm (4 inches). O.D.

2) Provide larger footings for gate posts. Top of post concrete footing, crowned to shed water away from the post.

3) Space line posts not exceeding 3 m (10 ft.) on center.

b. Top rail: Install 6.4 m (21 ft.) lengths of rail continuous thru line post arm loop top. Splice rail using top rail sleeves minimum 150 mm (6 inches) long.

1) Secure rail to terminal post by brace band and rail end.

2) Field cut and secure bottom rail or intermediate rail to line posts with boulevard bands or rail ends and brace bands.

3) Provide mid rail for fences 3.7 m (12 feet) high or higher.

c. Terminal posts: Brace and truss end, corner, pull and gate posts for fence 1.8 m (6 ft.) and higher and for fences 1.5 m (5 ft.) in height without top rail.

d. Tension wire: Install tension wire 100 mm (4 inches) up from bottom of fabric. Fences without top rail, install tension wire 100 mm (4 inches) down from the top of the fabric.

1) Stretched taut tension wire independently, between terminal posts and secure with brace band.

2) Secure tension wire to chain link fabric with 3.76 mm (0.15 inch) hog rings 450 mm (18 inches) on center and to each line post with tie wire.

C. Chain Link Fabric:

1. Install fabric inside of the framework with ground clearance of 50 mm (2 inches) maximum.

2. Stretch fabric between terminal posts and secure with tension bar.

3. Cut off and bend excess wire to prevent injury.

D. Gate:

1. Swing Gates: Comply with ASTM F567. Gates plumb in closed position with 75 mm (3 inches) bottom clearance. Install electrically operated gates according to manufacturer’s instructions.

2. Opening hardware shall be located between 34” to 44” above grade. Maximum opening force of gate shall be 5 pounds.

E. Nuts and Bolts:

1. Bolts: Install carriage bolts with head on the secure side of the fence. All bolts shall be peened over to prevent removal of the nut.

F. Access supports:

1. Install customized fabricated steel plates, angles, bars and supports for access control hardware, camera and knox box for fire fighter access.

G. Touch up damaged factory finishes:

1. Repair galvanized surfaces with galvanized repair paint.

2. Repair painted surfaces with touch up primer.

3.03 CLEANING

A. Clean exposed fence surfaces. Remove contaminants and stains.

3.04 PROTECTION

A. Protect fence from traffic and construction operations.

B. Repair damage.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies site furnishings.

1. Bike Rack

B. All site furnishings shall be ADA compliant.

1.02 QUALITY ASSURANCE

A. Installer Qualification: An experienced installer who has completed installation of site furnishings and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: Experienced site furniture manufacturer for ten (10) years.

1.02 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Manufacturer’s Literature and Data:

1. Include manufacturer's address and telephone number.

2. Include catalog or model numbers and illustrations and descriptions of equipment and accessories.

C. Shop Drawings: Provide assembly and installation details for each product, materials, finishes and colors.

D. Maintenance Data: For each product

1.03 DELIVERY, STORAGE AND HANDLING

A. Store products in original undamaged packaging in a dry location until ready for installation.

B. Deliver to site in manufacture’s original, unopened containers and packaging.

1.04 WARRANTY

A. Warrant products to be free from defects in materials and workmanship.

PART 2 PRODUCTS

2.01 BIKE RACK

A. Bike Rack

1. Kimo, Inc. - Yale Classic Bike rack

2. Stainless steel, Type 304, 3 inch bend radius

B. All site furnishings shall be ADA compliant.

PART 3 EXECUTION

3.01 INSTALLATION

A. Handle and install products according to manufacturer's recommendations and written instructions.

B. Install level.

C. Anchor security in place.

3.02 CLEAN-UP

A. At completion of the installation, clean and adjust furniture as required to produce ready-for-use condition.

B. Where surfaces are damaged during installation procedures, repair finishes to match adjoining undamaged surfaces.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section specifies materials and procedures for designing, furnishing and installing a complete automatically-controlled landscape dripline irrigation system, including water meter, backflow preventer, shut-off valves, filters, pressure relief, pressure regulator, controllers, piping, valves, fittings, control wiring, electrical connections, dripline laterals, control zone kit, bubblers and all other necessary accessories as shown on the Drawings described herein and required for fully operational and controlled irrigation system for plants specified and conditions described.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 ABBREVIATIONS

A. FPT: Female pipe thread

B. HDPE: high-density polyethylene plastic

C. PVC: Polyvinyl chloride plastic

D. PE: Polyethylene

E. O.D.: Outside diameter

F. I.D.: Inside diameter

G. GPH: Gallons per hour

H. GPM: Gallons per minute

1.04 REFERENCE, CODES AND STANDARDS

A. All current California Building Code, state, local, federal, standards, regulations, and ADA requirements shall pertain to this project. These may include but not limited to, architectural, structural, mechanical, electrical, fire and life safety codes. The project shall follow the most stringent and current rules codes, standards, and regulations.

1. AB1881 State of California Model Water Efficient Landscape Ordinance, California Code of Regulation

2. Water Use Classification of Landscape Species (WUCOLS)

3. America Society of Irrigation Consultant (ASIC) Design Guidelines

4. California Landscape Standards, California Landscape Contractors Association (CLCA), Sacramento, California

5. CAL-OSHA, Title 8, Subchapter 4-Construciton Safety Orders, and Subchapter 7-General Industry Safety Orders

6. California Electrical Code

7. California Health Laws Related to Recycled Water, “The Purple Book”.

8. California Plumbing Code (UPC) published by the Association of Western Plumbing Officials

9. National Electric Code (NEC).

10. National Fire Protection Association (NFPA) 24, Section 10.4 Depth of Cover

11. South Bay Water Recycling (SBWR) Rules and Regulations

12. Underwriters Laboratories (UL): Electrical wiring, controls, motors and devices, UL listed and so labeled.

13. American Society of Testing Materials (ASTM)

14. Water Efficient Landscape Ordinance (WELO)

1.05 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society of Mechanical Engineers (ASME):

B16.18-2018 Cast Copper Alloy Solder Joint Pressure Fittings

B16.22-2018 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

B16.24-2016 Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500 and 2500

B18.2.1-2015 Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)

B40.100-2013 Pressure Gauges and Gauge Attachments

C. American Society of Sanitary Engineering (ASSE):

1013-2011 ..... Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers

D. American Society for Testing and Materials (ASTM):

A53-12..... Standard specifications for pipe, steel, black and hot dipped zinc coated (galvanized) welded and seamless, for ordinary uses.

B32-08..... Solder Metal

B61-15..... Steam or Valve Bronze Castings

B62-17..... Composition Bronze or Ounce Metal Castings

B88-16.....Seamless Copper Water Tube

B813-16.....Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube

D883-19 .....Standard definitions of terms relating to plastics.

D1600-14 .....Standard abbreviations of terms relating to plastics.

D1784-11 .....Standard specifications for rigid polyvinylchloride (PVC) compounds and chlorinated polyvinyl chloride (CPVC) compounds.

D1785-15e1 .....Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and 120

D2241-15 .....Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)

D2464-15 .....Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

D2466-17 .....Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

D2467-15 .....Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

D2564-04(2009)e1 .....Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems

D2609-15 .....Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe

D2683-14 .....Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

D-2672-14 .....Standard specifications for bell-end polyvinylchloride (PVC) pipe.

D-2774-12 .....Standard recommended practice for underground installation of thermoplastic pressure pipe.

D2855-15 .....Making Solvent Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings

D3261-16 .....Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

F477-14.....Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F656-15.....Primers for Use in Solvent Cement Joints of PVC Plastic Pipe and Fittings

E. American Water Works Association (AWWA):

C504-15 .....Rubber-Seated Butterfly Valves

C906-15 .....Polyethylene (PE) Pressure Pipe and Fittings, 4 inches through 63 inches, for Water Distribution and Transmission

F. American Welding Society (AWS):

A5.8-2011.....Filler Metals for Brazing and Braze Welding

G. Manufacturers Standardization Society (MSS):

SP-70-2011 .....Gray Iron Gate Valves, Flanged and Thread Ends

1.06 QUALITY ASSURANCE:

A. General Criteria

1. The Contractor, personally or through an authorized representative, shall supervise the work constantly, and shall keep the same foreman and workers on the job from commencement to completion.

2. The Contractor should be an employer of workers that include a landscaping contractor licensed by the State of California and a certified irrigation contractor (CIC) qualified by The Irrigation Association. Contractor shall have a minimum of five (5) years of experience in installing irrigation systems of a similar size.

B. Products Criteria:

1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.

2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

C. System Requirements:

1. Full and complete coverage is required. The Contractor shall, at no additional cost to the Owner, make minor adjustments necessary to avoid plantings and obstructions such as signs, utilities and light standards and achieve full and complete coverage of irrigated areas without overspray on roadways, sidewalks, window wells, or buildings and to protect trees from close high spray velocity.

2. Layout work as closely as possible to Drawings. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown. Lines are to be common trenched whenever possible.

D. Submittals:

1. Prepare detailed working drawings that are signed by Landscape Contractor. The installer remains responsible for final adjustments of landscape equipment, piping and controls to meet intent shown on the Drawings and as defined in the County and State standards and laws governing landscape water conservation. Include site plan, irrigation system calculations, watering schedule, maintenance recommendations, piping layout, irrigation control and other system parts identification.

1.07 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Qualification Data

1. Provide qualification data, including contractor license and certificate by Irrigation Association, and a list of three (3) projects of similar size and three (3) references.

C. Material List

1. Submit product data as one package for each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Complete material list shall be submitted prior to performing any work.

2. Equipment or materials installed or furnished without prior approval of the Project Manager may be rejected and the Contractor required to remove such materials from the site at Contractor's own expense.

D. System Design

1. Bear seal and signature of licensed landscape architect responsible for landscape design in accordance with Water Efficient Landscape Ordinance.

E. Record and As-Built Drawings

2. The Contractor shall provide record and as-built drawings.

3. The original "as-built" plan shall be submitted to the Project Manager for approval prior to the making of the Controller Chart.

4. Drawings shall include depth, if applicable, and dimensions from two permanent points of reference, building corners, sidewalk, or road intersections, the location of the following items:

a. Connection to existing water lines

b. Connection to existing electrical power

c. Relocated existing equipment

d. Gate valves

e. Master valve and flow sensor

f. Lateral line piping

g. Routing of sprinkler pressure lines (dimension maximum 100 feet along routing)

h. Sprinkler control valves

i. Routing of control wiring (dimension maximum 100 feet along routing)

j. Quick coupling valves

k. Controller location

l. Other related equipment as directed by the Owner

5. Identify all valves as to size, station, number and type of irrigation. All changes made during construction shall be shown in color red. Label plans "AS-BUILT" with date and the General Contractor's and Landscape Contractor's name, address and phone number.

6. Submit hard copy plans of approved record drawing prints at original scale and PDF format, and an electronic CAD file in conformance with the Owner CAD Standards. Deliver the above items to Project Manager prior to final inspection.

7. All costs associated with this work will be included in the Contract prices paid for the various items of work and no additional compensation will be allowed therefore.

8. Complete the following checklist at the end of the project, using the format shown:

   a. Plumbing permits (if none are required, so note)

   b. Material approvals (approved by and date)

   c. Pressure main line pipe tests (by whom and date)

   d. Record drawings completed (received by and date)

   e. Satellite controller charts completed (received by and date)

   f. Materials furnished (received by and date)

   g. Operation and maintenance manuals furnished (received by and date)

   h. System equipment operation instructions (received by and date; total hours of instruction given)

   i. Manufacturer warranties, if required (received by and date)

   j. Written guarantee (received by and date)

   k. Written verification irrigation timers, volume and operation are set to meet planting watering recommunication.

   l. Certificate of Completion, see attachment.

   m. Certificate of Installation, see attachment.

   n. Irrigation Schedule of Landscape and Irrigation Maintenance, see attachment.

9. Signed and dated checklist must be forwarded to Owner before final acceptance of the project.

F. Controller Chart

1. Provide one controller chart showing the area covered by controller for each automatic controller supplied at the maximum size controller door will allow. Chart shall be a reduced drawing of the actual "as-built" system. If controller sequence is not legible when the drawing is reduced to door size, the drawing shall be enlarged to a size that is readable and placed folded, in a sealed plastic container, inside the controller door.

2. Chart shall be a blackline print with a different color used to show area of coverage for each station. Charts must be completed and approved prior to final inspection of the irrigation system.

G. Maintenance and Operating Instructions and Manuals

1. Contractor shall prepare an Operation and Maintenance Manual in accordance with Division 01 General Requirements, organized in a 3-ring binder containing the following information.

   a. Contractor's name, address, and telephone number

   b. Duration of guarantee, periods as specified herein

   c. List of equipment with names and addresses of local manufacturer's representatives with duration of written warranties

   d. Complete operating and maintenance instructions on all equipment

   e. Spare parts lists and related manufacturer's information

2. Submit two (2) copies of the Operation and Maintenance Manual to Project Manager within 10 Calendar Days of completion of work of this Section and as a condition of its acceptance.

3. Instruct the Airport Maintenance personnel about the complete operation and maintenance of the irrigation system after the system has been approved by the Owner. Provide a minimum of four (4) hours of instruction.

4. In addition to the above-mentioned maintenance manuals, provide Owner’s maintenance personnel with instructions for major equipment and show evidence in writing to Project Manager at the conclusion of the project that this service has been rendered.

H. Shop Drawings

1. Layout of all irrigation components including meter, backflow preventer, controller, filters, flow sensors, gate valves, remote control values, pressure regulators and tubing components.

2. Layout and wiring diagram of system controller, control valves and wire racing.

3. Zoning of irrigation systems.

4. Hydraulic calculations matching sails type, dripline system, pressure reduction and length losses.

5. Lateral line spacing worksheets including adjustments to layout.

I. Extra tools and equipment

J. Submit to the Owner, all descriptive data and samples for the work as required by these specifications, and any alternatives, if any. Check and coordinate the submittals with the work of other trades involved and ensure submittal package is complete before submitting to the Owner.

1.08 EXTRA MATERIALS

A. Furnish extra materials, as listed below, that match products installed. The extra materials shall be packaged with protective covering for storage and identified with labels describing contents.

1. Rotator and Spray Head Sprinklers, Bubblers: Provide two (2) for each type and size installed for the project.

2. Two (2) sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve installed for the project.

3. Two (2) 5-foot valve keys for operation of gates valves

4. Two (2) keys for each automatic controller

5. Two (2) quick coupler keys and matching hose swivels for every type of quick coupling valve installed

6. Hand-held remote-control unit(s) for remote activation of remote-control valves

B. The above-mentioned equipment shall be delivered to the owner at the conclusion of the project. Before final inspection can occur, evidence that the Owner has received material must be shown to the Project Manager.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic piping protected from direct sunlight. Support pipe to prevent sagging and bending.

C. Any section of pipe that has been dented or damaged will be discarded and, if installed, be replaced with new piping.

1.10 WARRANTY

A. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting there from within a period of one (1) year from final acceptance. Further, the Contractor will provide all manufacturers' and supplier's written guarantees and warranties covering materials and equipment furnished under this Contract.

PART 2 PRODUCTS

2.01 PIPES, FITTINGS AND ACCESSORIES

A. Comply with requirements in the piping schedule for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

B. Manufacturer: PW Pipe, JM Pipe, or approved equal.

C. PVC pipe: Use only new, non-corroded, defect free materials of brands and types that meet the specified standards specified herein, or approved equals.

1. Irrigation Mains:

a. Manufacturer: PW Pipe, JM Pipe, or approved equal.

b. Material:

i. Polyvinylchloride (PVC) plastic in conformance with ASTM D1784 (cell class 12454-B).

ii. PVC color: Purple

c. Type:

i. 2-1/2-inch or smaller: Schedule 40 PVC plastic pipe with solvent-cement joints.

1. Identification marking: Pipe shall be clearly marked by the manufacturer at regular intervals indicating the manufacturer's name, nominal pipe size, schedule or class, pressure rating in PSI, and date of extrusion.

2. Irrigation Laterals:

a. Manufacturer: PW Pipe, JM Pipe, or approved equal.

b. Material:

i. Polyvinylchloride (PVC) plastic in conformance with ASTM D1784 (cell class 12454-B).

ii. PVC color: white

c. Type: Schedule 40 PVC plastic pipe with solvent-cement joints.

d. Identification marking: Pipe is to be clearly marked by the manufacturer at regular intervals indicating the manufacturer's name, nominal pipe size, schedule or class, pressure rating in PSI, and date of extrusion.

3. Water Meter and Backflow Preventer:

a. Water Meter – Rain Bird FMD series water meter sized for flow range and piping size.

b. Backflow Preventer – Double check valve sized for application.

4. Threaded Pipe: Polyvinyl Chloride, ASTM D1785, PVC 1120, Schedule 80, for threaded connections, risers and swing joints

5. All PVC pipes shall bear the following markings:

a. Manufacturer's name

b. Nominal pipe size

c. Schedule of class

d. Pressure rating in psi

e. NSF (National Sanitation Foundation) approval

f. Date of extrusion

6. (NA) Pipes shall be purple color for irrigation system using reclaimed water

D. Fittings:

1. Irrigation Mains:

a. Metallic push-on fittings (3-inch and larger main line pipe):

i. Manufacturer: Harco, Leemco, or approved equal.

ii. Material: Ductile iron

iii. Pressure rating: 350 PSI

iv. Joints: Push-on rubber gasketed

b. Metallic threaded fittings:

i. Manufacturer: Anderson Metals, or approved equal.

ii. Material: Cast bronze or brass.

iii. Weight: Standard.

iv. Joints: Threaded IPT.

v. Socket, solvent cemented or threaded (2-1/2-inch and smaller main line pipe):

1. Manufacturer: Lasco, Dura, or approved equal.

2. Material: Polyvinyl chloride (PVC) plastic in conformance with ASTM D-1784 (cell classification 12454-B). Injection molded IPT threaded or socket for solvent cemented joints in conformance with ASTM D-2464, D-2466, and D-2467.

3. Schedule: 40 or 80

2. Irrigation Laterals:

a. Manufacturer: Lasco, Dura, or approved equal.

b. Material: Polyvinyl chloride (PVC) plastic in conformance with ASTM D-1784 (cell classification 12454-B). Injection molded IPT threaded or socket for solvent cemented joints in conformance with ASTM D-2464, D-2466, and D-2467.

c. Schedule: 40 or 80

2.02 PIPE JOINING MATERIALS

A. Brazing filler metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

B. Solvent cements for joining PVC piping: ASTM D2564. Include primer according to ASTM F656.

C. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.03 VALVES

A. Underground Manual Shut-Off Valves:

1. Gate valves:

a. Manufacturer: Mueller.

b. Components:

i. Full port iron body gate valve

ii. Non-rising stem (NRS)

iii. Solid iron wedge, symmetrical and fully encapsulated with molded rubber: no exposed iron

iv. Stainless steel fasteners: Type 316

v. Female I.P.S. threaded connections.

vi. Connections:

1. 2; 2-1/2; and 3-inch: threaded connections

2. 4-inch and larger: gasketed slip on connections

B. Pressure Reducing Valve:

1. Manufacturer: Wilkins.

2. Components:

    a. Cast bronze body and cover, lead free

    b. Stainless steel internals

    c. Maximum working water pressure: 300 psi

    d. Reduced pressure range: 25 – 75 psi

    e. 2-inch and smaller: Model No.: 600XL (Threaded)

    f. 2.5 or 3-inch: Model No.: 500XLFC (Flanged)

    g. 4-inch and larger: (Flanged) (per project requirements)

C. Ball Valves:

1. Manufacturer: Nibco.

2. Components:

    a. Full port bronze body ball valve.

    b. Stainless steel ball.

    c. Zinc plated steel, clear chromate, plastisol handle.

    d. TFE seals with stainless steel trim.

    e. Female I.P.S. threaded connections.

D. Remote Control Valves:

1. Install valves in manifold clusters with a ball valve connection upstream to the main.

2. Valves shall be globe type of heavy-duty construction and shall have manual shut-off and flow control adjustment and provide for manual operation.

3. Cast iron body with brass bonnet, trim and renewable seat and have two inlet taps (furnish with one inlet tap plugged) to allow installation as either a straight or angle pattern valve.

    a. Install valves with unions on each side to allow for easy removal.

    b. Valves shall have a minimum of 150 psi working pressure.

    c. Each sprinkler section shall be automatically operated by a remote-control valve installed underground and operated by a 24-volt AC electric solenoid.

    d. Each valve shall be in a valve vault.

4. Valves to operate at no more than 7 psi pressure loss at manufacturers maximum recommended flow rate.

5. Valves shall be completely serviceable from the top without removing valve body from the system.

2.04 VALVE BOXES

A. Manufacturer: Carson, Brooks Plastics, Inc., Applied Engineering Products, or approved equal.

B. Material: Structural foam with polyester resins and ultraviolet inhibitors.

C. Color: Purple.

D. Remote Control Valve Boxes: 11-3/4-inch by 17-inch by 12-inch deep. Lid: Bolt lockable T cover type, marked “IRRIGATION”.

E. Gate Valve Boxes: 10-inch diameter by 10-1/4-inch deep. Bolt lockable T-cover type, marked “IRRIGATION” for irrigation valves.

F. Low Voltage Pull/Splice Boxes: 10-inch diameter by 10-1/4-inch deep. Lid: Bolt lockable T-cover type, marked “IRRIGATION.”

G. Set box cover flush with finish grade

H. Label boxes by heat branding the designated controller and circuit number into the lid. Size of numbers shall be a minimum two (2) inches. Numbers shall be located at center of valve cover and shall face nearest main road or service road.

I. All valve boxes in pavement shall be precast concrete with a cast iron lid. Compressive concrete strength shall be in excess of 4000 psi.

J. Valve Identification Tags:

1. Manufacturer: T. Christy Enterprises, or approved equal (no known equal.)

a. Material: Polyurethane behrdesopan

2. Attributes:

a. 2.25-inch by 2.75-inch hot stamped with 1-1/8-inch black letters on a yellow background.

b. Indicates satellite controller letter or number and valve station number.

2.05 SENSORS

A. Manufacturer: Badger (Data Industrial) as designed by Contractor. Monitor system and each individual zone.

B. Real-time weather conditions sensor. Solar sync with Hunter ET based system.

2.06 AUTOMATIC CONTROL EQUIPMENT - INDEPENDENT ELECTRIC CONTROLLERS

A. The number of units and location of the installations are to be designed by Contractor.

B. The Controller System shall consist of an independent controller, flow sensor, weather sensor, ground moisture sensor and all accessories necessary to operate the irrigation system. All of these components and software shall be a standard package.

C. The independent controller shall UL and C-UL approved and have the following equipment, characteristics and capabilities:

1. A minimum of four (4) completely independent programs with two (2) start times

    a. Watering time for each station shall be capable of being set from 1 minute to 9 hours and 59 minutes in 1-minute increments, at minimum.

    b. Watering days for each program shall be capable of being based on a seven-day week or a skip-a-day routine allowing a program to skip from 1 to 30 days.

2. A real time clock that retains the actual time during power outages without batteries, eliminating the need to reset the clock in case of power outages

3. A non-volatile memory that retains the program(s) indefinitely during power outages or seasonal shutdowns

4. Built-in remote-control capability

5. Compatible with a weather sensor that automatically adjusts the run times of stations based on local weather condition and turns off the irrigation system due to the onset of precipitation, depending on the intensity.

6. A percentage key to increase or decrease all station runtimes on a percentage basis in 1 percent increments from 0 to 300 percent by program.

7. The ability to select cycle and soak

8. The controller shall have the ability to monitor the flow rate and include the following features:

    a. Main line break flow detection with the ability to automatically close a normally open master valve on main line breaks or unscheduled overflow.

    b. Unscheduled flow detection

    c. Station upper limit flow detection with intelligent upper-limit processing for concurrent station operation

    d. Automatic flow learn mode for setting individual station limits or manual entry or semi-automatic monitor/set mode

    e. Global percentage adjust to automatically factor upper flow limits for stations, automatic station advancement for station overflow

9. Flow Sensor:

a. Manufacturer: Badger (Data Industrial) as designed by contractor.

10. 15-50 PSI pressure regulation

11. Air Vacuum Relief Valves

12. Flush valve and PDL cap

13. Pop-up flow indicators

D. The controller shall be furnished with the following programmable features:

1. Master-valve operation, normally closed.

2. Pump controls.

3. Stacking or no stacking feature

4. Rain shut down to allow the selection for the number of days the controller will stay off in rain shut down mode before it goes back to the automatic mode.

E. Controller shall be housed in a stainless-steel pedestal enclosure. The controller will be housed within a NEMA 3R-rated, weather-resistant, UL-approved enclosure with a key-locking entry.

1. Pedestal enclosure shall be stainless steel shall be 304 Grade stainless steel, designed for exterior use. The controller shall be remote control ready.

F. Manufacturer: HydroPoint WeatherTrak LC with internet management software application.

1. Components:

a. Cast iron body and cover, globe configuration.

b. Normally open configuration.

c. Manual on-off bleed screw for manual operation.

d. Manual flow stem to adjust the speed of closure.

e. Integral union and ball valve.

f. Solenoid: 24 VAC 50/60 HZ.

2. Components shall be serviceable from the top without removing the main valve body.

2.07 MAINTENANCE REMOTE

A. Manufacturer: Compatible with installed components

B. Components:

1. Cast iron body and cover, globe configuration.

2. Pressure regulated.

3. Manual on-off bleed screw.

4. Manual flow stem to adjust the speed of closure.

5. Solenoid: 24 VAC 50/60 HZ.

6. Valve shall provide manual operation.

7. Components shall be serviceable from the top without removing the main valve body.

C. Operating range shall be up to 1 mile (line-of-sight)

D. Timed station operation selectable from 1 to 60 minutes.

2.08 DRIPLINE EMITTERS

A. Manufacturer's standard unit designed to provide uniform coverage over entire area as indicated on Drawings. Internal control zone kit assembly includes filter screen, capable of removal.

1. Dripline Emitters: Pressure compensating, permanently assembled type with protective coating.

2. Emitter Distribution: Constructed of UV resistant vinyl material, 5.5 mm (0.22 inch) O.D. and 4 mm (0.16 inch) I.D., manufactured by same manufacturer as drip emitters.

2.09 QUICK COUPLERS

A. Quick couplers shall have all parts contained in a two-piece unit and shall consist of a coupler water seal valve assembly and a removable upper body to allow the spring and key track to be serviced without shut down of the main.

B. Metal parts shall be bronze.

C. Lids shall be lockable vinyl covered and have springs for positive closure on key removal. Also see 2.04 VALVE BOXES of this Section.

D. Manufacturer: Rain Bird 44NP or approved equal.

E. Size: 1-inch

F. Components:

1. Bronze construction with female I.P.T. threaded connections.

2. Valve body: Two-piece construction

3. Cover: Bronze with thermoplastic purple cover.

4. Quick coupling valve key to be of the same manufacturer as the QCV.

2.10 LOW VOLTAGE CONTROL VALVE WIRE

A. Manufacturer: Paige Electric, Regency, or approved equal.

B. Attributes:

1. Soft-annealed, uncoated copper.

2. Single conductor, with PVC insulating jacket, 600 volt rated UL listed Type UF for direct burial in soil.

C. Wire color:

3. Common ground wire: white insulating jacket.

4. Control wire: choose a different color for each satellite controller.

5. Spare wire to have an insulating jacket color other than white or the color of the satellite control wires.

D. Wire size:

1. Control wires and spare wires: less than 2000-feet long use #14-1 AWG-UF; greater than 2000-feet long use #12-AWG-UF.

2. Common wires: #12-1 AWG.

E. Wire shall be solid copper wire, Underwriters Laboratories Inc. approved for direct burial in ground.

F. Size of wire shall be in accordance with manufacturer's recommendations, never less than No. 14.

2.11 SPLICING MATERIALS:

A. Manufacturer: 3M Company 3M-DBY splice kit, Paige Electric DBM-L, or approved equal.

B. Attributes:

1. Direct bury splice kit with a Y electrical spring connector.

2. Voltage rating: 30 volts maximum. Splicing materials shall be epoxy waterproof sealing packet.

2.12 SLEEVE MATERIAL

A. Manufacturer: PW Pipe, JM Pipe, or approved equal.

B. Material: Polyvinylchloride (PVC) plastic in conformance with ASTM D1784 (cell class 12454-B).

C. Schedule or Class: Class 200 PVC plastic pipe (or) Schedule 40 PVC plastic pipe with solvent cemented joints, whichever has the thickest wall thickness.

D. Identification marking: Pipe is to be clearly marked by the manufacturer at regular intervals indicating the manufacturer's name, nominal pipe size, schedule or class, pressure rating in PSI, and date of extrusion.

2.13 WARNING TAPE

A. Manufacturer: T. Christy Enterprises, Inc. or approved equal

1. It shall consist of a minimum 4.0 mil (0.004) thickness, inert 100% linear low-density polyethylene plastic film formulated for extended use underground.

2. The tape tensile strength shall be in accordance with ASTM D882 and not be less than 4100 MD and 3650 TD.

3. Elongation properties shall be in accordance with ASTM D882 and be greater than 550%+ at break point.

4. Tape flexibility shall be in accordance with ASTM D671 and shall remain pliable.

5. The materials shall be acid and alkali resistant.

6. Width of warning tape shall be 6 inches.

B. Color Coding: The tape shall conform to the American Public Works Association Color code as follows:

1. Recycled/Reclaimed Water Pipelines: Tape color shall alert purple.

2. Potable Water Pipelines: Tape color shall be safety green.

C. Message Inscription: The tape shall include an inscription in black letters to identify the type of utility pipeline on or over which it is installed. The inscription shall be impregnated with colorfast, lead-free, organic pigments suitable for direct burial and prolonged exposure to the elements normally encountered in moderately corrosive type soils. The height of the message letters shall be 1.5 inches minimum, and the message inscription shall be repeated at approximately 3-foot intervals. The message inscription for the different types of pipelines shall be as follows:

1. Recycled/Reclaimed Water Pipelines:

a. Model for recycled water: TA-ND-6-P-RW (6 inches wide; purple color; recycled water)

b. The message on the tape shall be: "CAUTION RECYCLED/RECLAIMED WATER LINE BURIED BELOW"

D. Potable Water Pipelines:

1. Model for potable water: TA-ND-6-G-PW (6 inches wide; green color; potable water)

2. The message on the tape shall be: "CAUTION POTABLE WATER LINE BURIED BELOW"

2.14 TRACER WIRES

A. Tracer Wires shall be No. 14, Green, Type TW plastic-coated copper tracer wire shall be installed with irrigation main lines.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Progress observations: In addition to the observations specified below, the Owner will make periodic progress observations.

B. Notify the Owner in advance of the following observation meetings:

C. Field layout: 7-day notice.

D. Pressure supply line installation and testing: 48-hour notice.

E. Coverage test: 48-hour notice.

F. Maintenance period observations: 7-day notice.

G. Final observation: 7-day notice.

H. The Owner will not allow review if a site visit is scheduled without specified Record Drawings, without completing previously noted corrections, or without preparing the system for review.

3.02 COORDINATION

A. Inspect, become familiar with, and protect existing utilities.

B. Coordinate placement of items to be embedded into concrete work.

C. Verify static pressure at point of connection before starting construction and notify the Owner if it is less than or greater than the static PSI stated on the Drawings.

3.03 HANDLING AND STORAGE

A. Protect work and materials from damage during construction and storage.

B. Handle plastic pipe carefully; especially protect it from prolonged exposure to sunlight.

3.04 LAYOUT

A. Before installation, stake layout of pressure main line pipes, valves, and sprinklers for approval by the Owner. Coordinate with existing layout of utilities, monuments, and trees. Adjust as directed by the Owner.

B. Drawings are diagrammatic. Provide necessary fittings and offsets to adapt to existing conditions and prevent conflicts with other work and existing improvements. Keep 90-degree elbow fittings to a minimum in pressure main line pipe - use 45-degree fittings to keep water flow in a minimum turbulence condition.

C. Minimum pipe clearance:

a. Irrigation system pipes: 3-inches.

b. Irrigation pipes to other utilities: Per Owner.

c. Electrical wires or conduit: 4-feet minimum horizontal clearance, 6-inch minimum vertical clearance.

d. Potable water main: 10-feet minimum horizontal clearance, 1-foot minimum vertical clearance.

e. Sanitary sewers: 10-feet minimum horizontal clearance, 1-foot minimum vertical clearance.

f. Storm drains, telephone conduits, and other utilities: 4-feet minimum horizontal clearance, 6-inch minimum vertical clearance.

g. Pipes crossing at angles between 45 and 90 degrees: 1-foot vertical clearance.

D. Do not install pipe parallel to and directly over another irrigation or utility line without approved separation.

E. Install pipes and low voltage wiring in common trenches wherever practical.

3.05 EXCAVATION AND TRENCHING

A. Excavate trenches with ample space to permit the pipes to be laid at the elevations intended and to permit ample space for joining.

B. Dig trenches straight and support pipe continuously on bottom of trench. Keep trenches 18 inches away from paving. Lay pipe to even grade.

C. Provide minimum cover from finish grade as follows:

1. 24-inch minimum cover over 3-inch or larger main line pipe.

2. 18-inch minimum cover over 2-1/2-inch or smaller main line pipe.

3. 18-inch minimum cover over low voltage wires.

4. 12-inch minimum cover over lateral line pipe to pop-up shrub spray sprinkler heads.

D. PVC pipe is flexible and can be curved longitudinally without affecting performance. Therefore lateral line pipe trenches may be curved to meet the following allowable longitudinal minimum pipe bending radius for 20 foot pipe lengths.

E. Allowable minimum pipe bending radius:

1. Pipe Diameter Bend Radius

a. Pipe Diameter Bend Radius

b. 3/4-inch 15 feet - 0 inches

c. 1-inch 19 feet - 0 inches

d. 1-1/4-inch 32 feet - 0 inches

e. 1-1/2-inch 32 feet - 0 inches

f. 2-inch 40 feet - 0 inches

g. 2-1/2 inch 48 feet - 0 inches

h. 3-inch 59 feet - 0 inches

i. 4-inch 75 feet - 0 inches

j. 6-inch 110 feet - 0 inches

k. 8-inch 144 feet - 0 inches

F. Restore surfaces and existing underground utilities, damaged or cut as a result of excavations, to original conditions. Obtain approval from the Owner.

G. Where other utilities interfere with irrigation trenching and pipework, adjust the trench depth as instructed by the Owner.

3.06 SLEEVES (PVC PIPES)

A. Install minimum 12-inches below bottom of pavement base, and at least as deep as required depth of pipe.

B. Backfill and compact as specified in Section - Backfilling.

C. Sleeve internal diameter is to be minimum twice the outside diameter for all pipes contained within sleeve and extend minimum 24-inches beyond edge of pavement. In-line fittings are not permitted in sleeves less than 20-feet long. Provide wooden caps at ends of sleeves until pipe is installed.

D. Install an extra 2-inch sleeve parallel to each sleeve and cap each end. Show locations on Record Drawings.

E. Install sleeves level and in straight line.

F. Backfill with 4-inches of clean sand around circumference of sleeve and compact by tamping.

3.07 PIPE ASSEMBLY

A. Install pipe in a dry trench and provide for expansion and contraction as described by the manufacturer of the pipe.

B. Cut plastic pipe with a pipe cutter or hack saw with the assistance of a squared-in sawing vice, or in a manner to ensure a square cut. Remove burrs at cut ends prior to installation to obtain a smooth unobstructed flow.

C. Use PVC pipe cleaner and primer on solvent weld PVC pipe before PVC solvent cement is applied.

D. Install piping in trench with manufacturer's markings (manufacturer, pipe size, Schedule or Class, pressure rating, etc.) facing up and readable to Owner during installation.

E. Paint below grade brass or galvanized iron pipe and fittings with two coats of a corrosion preventative coating which is a composition of a coal tar base pitch, fast evaporating solvents and selected fillers.

F. PVC pipe with push-on gasketed ductile iron joints:

G. PVC pipe with solvent weld joints:

1. Instruct each pipe installer in the proper assembly of solvent joints from a representative of the pipe, cement or fitting manufacturer before starting a job, unless the installer has been previously instructed in the recommended solvent cement procedures.

2. Prepare joint by first making sure the pipe end is square, then deburring the pipe end and cleaning pipe and fitting of dirt, dust and moisture with PVC pipe cleaner.

3. Dry-insert pipe into fitting to check for proper sizing. Pipe should enter fitting 1/3 to 2/3 depth of socket.

4. Coat the inside socket surface of the fitting and the external surface of the male end of the pipe with primer. Apply cement liberally to the male end of the pipe and apply cement lightly to the inside of the socket. Apply a second coat of cement to the pipe end.

5. Insert pipe immediately into fitting and turn 1/4 turn to distribute cement and remove air bubbles. The pipe must seat to the bottom of the socket and fitting. Check alignment of the fitting. Align pipe and fitting properly without strain to either.

6. Hold joint still for approximately thirty (30) seconds and wipe the excess cement from the pipe and fitting.

7. Cure joint a minimum of thirty (30) minutes before handling and at least six (6) hours before allowing water in the pipe.

H. Threaded Joints:

1. Field threading of plastic pipe or fittings is not permitted. Factory-made threads are the permitted method.

2. Use factory-made metallic nipples whenever possible. Field-cut threads in metallic pipe will be permitted, but only where necessary. Cut threads accurately on axis with sharp dies.

3. Install threaded joints with pipe joint compound. Apply compound to male threads and first two female threads.

4. Where assembling metallic pipe to metallic fitting or valve, expose no more than three (3) full threads when joint is finished.

5. Where assembling threaded plastic fittings, take up joint no more than one full turn beyond hand tight.

6. Where assembling soft metal (brass or copper) or plastic pipe, use strap type friction wrench; do not use metal-jawed wrench.

7. Wherever there is a threaded connection between PVC and metallic fittings, it must consist of male PVC threads into female metallic threads only. A male metallic threaded fitting into a female PVC threaded fitting is not acceptable.

I. Cap open pipe ends as pipe is assembled to prevent entrance of dirt or obstruction. Remove caps only when necessary to continue assembly.

J. Where pipes or control wires pass through sleeves, provide removable non-decaying plug material at ends of sleeve to prevent entrance of soil.

K. Tracer Wires: All live main lines buried under hard surface areas (roads, paths, etc.) shall have a solid copper tracer wire incorporated in the trench.

L. Provide clearance of recycled water piping to potable or sewer piping per Water Efficient Landscape Ordinance (WELO) regulations.

3.08 MARKING TAPE (MAIN LINE PIPE)

A. Install marking tape above constant pressure recycled and potable main line pipe for easy below ground identification, protection and warning as follows:

1. Bury approximately 12 to 18 inches below the surface.

2. Bury a minimum of 12 to 18 inches above the pipeline being protected.

3. Place legend/message side face up.

3.09 SPRINKLER SPACING

A. Construct the irrigation system to the sizes, grades, and locations shown on the Drawings. Pipe routing shown on the Drawings is diagrammatic. Establish the locations of sprinkler heads, etc. at the time of construction. Spacing of the sprinkler heads is shown on the Drawings and the maximum spacing (head to head) is indicated in the irrigation legend on the Drawings. Exceed spacing only with the approval of the Owner.

3.10 GATE AND BALL VALVE

A. Provide excavation and backfill, the furnishing and installing of fittings and valve, and other work in accordance with the Drawings and Specifications.

B. Set the valve box flush with finish grade unless otherwise designated on the Drawings.

C. Thoroughly flush pipe before installing valve.

D. Locate and install as shown on the Drawings and details.

E. Unless otherwise noted on the Drawings, place the valve in the open position when system is finished.

F. Install recycled water use tag to valve as detailed on the Drawings.

3.11 MASTER CONTROL VALVE

A. Provide excavation and backfill, furnishing, installing and testing of riser, fittings, and valve.

B. Install in landscape area.

C. Thoroughly flush main line pipe before installing valve.

D. Label valve with an identification tag, indicating identification of valve which states: “MCV-controller letter”). Permanently attach label to solenoid control wire.

E. Provide master control valve with its own threaded riser and connection to main line pipe.

3.12 FLOW SENSOR

A. Provide excavation and backfill, fittings, flow sensor.

B. Install in landscape area.

C. Thoroughly flush main line pipe before installing flow sensor.

D. Label flow sensor with an identification tag, indicating identification letter of controller. Permanently attach label to sensor wire.

3.13 REMOTE CONTROL VALVE

A. Provide excavation and backfill, furnishing, installing and testing of risers, fittings, and valve.

B. Group together where practical and in landscape areas. Limit one remote control valve per box. No exceptions.

C. Thoroughly flush main line pipe before installing valves.

D. Label each valve with an identification tag, indicating identification number of valve (controller and station number). Permanently attach label to solenoid control wire.

E. Provide each remote-control valve with its own threaded riser and connection to main line pipe. Do not manifold valves to a single riser from main line.

3.14 QUICK COUPLING VALVE

A. Provide excavation and backfill, the furnishing, installing, testing of risers, fittings, and valve.

B. Set the valve perpendicular to the finish grade.

C. Thoroughly flush lines before installing valve.

D. The design intent is to position valves 90 to 120-feet on center.

3.15 VALVE BOX INSTALLATION

A. Do not saw cut the plastic valve boxes for any reason.

1. Rectangular Valve Boxes:

a. Locate valve boxes 12 inches from and perpendicular to walk edges, buildings, and walls. Provide 12-inches between valve boxes where valves are grouped together.

b. Install four common bricks (one at each corner of box) under base of box for support.

c. Install 3/8-inch diameter pea gravel inside box for drainage.

d. No soil or collection of water permitted inside box. Install 10-mil Polyethylene tape to box side cutouts and pipe where pipe exits box (where applicable).

e. Heat stamp remote control valve numbers on valve box lids, centered on lid. Use a Christy Products valve box brander Model No. #004X. Brand controller letter and station number.

2. Round Valve or Splice Boxes:

a. Locate valve boxes 12 inches from walk edges, buildings, and walls. Provide 12 inches between valve boxes where valves are grouped together.

b. Install two common bricks (one on each side) under base of box for support.

c. Install 1/2-inch to 3/4-inch diameter crushed rock inside box for drainage.

d. No soil or collection of water permitted inside box. Install 10-mil polyethylene tape to box side cutouts and pipe where pipe exits box (where applicable).

e. Indicate splice box locations on Record Drawings and note which field satellite the wires originate from and the quantity of wires available.

f. Lock each box lid at end of project.

g. Do not install more than three (3) boxes in one location.

3.16 SPRINKLERS AND BUBBLERS

A. Provide excavation and backfill, furnishing, installing and testing of risers, fittings, sprinkler heads, bubblers.

B. Thoroughly flush PVC lateral line piping before installing heads.

C. Do not use pipe joint compound on bubbler inlet threads.

D. Locate and install heads distributed for proper lawn area coverage.

E. Adjust spray or rotor sprinkler heads for proper distribution, and trim.

3.17 SATELLITE CONTROLLER

A. Provide excavation and backfill, furnishing and installing of concrete base, controller assembly, conduits, grounding.

B. Coordinate and provide 120 VAC connections to satellite controller.

C. Coordinate and provide phone line connection to satellite controller.

D. Set controller assembly perpendicular to the finish grade.

E. Connect low voltage wire to controller station terminals.

F. Provide hand-held remote assembly and connections.

G. Coordinate controller certification with controller vendor and provide final certification documents to the Owner.

H. Set irrigation zones, times and duration.

3.18 LOW VOLTAGE WIRING

A. Install wiring alongside main line piping unless it is impossible.

B. Tie wires in bundles with pipe wrapping tape at 10-foot intervals and allow slack for contraction between tape.

C. Loop a minimum of 3 feet of extra wire in a 1-inch diameter coil at each splice.

D. Make connections to wiring by twisting bare wires, securing with wire connectors and sealing with weatherproof wire splice assembly.

E. Splicing of valve control wire other than at valve or satellite controller is permitted only on runs exceeding 2500-feet. For this condition, locate splices within a separate 10-inch diameter valve box.

F. Where low voltage wires pass under pedestrian paving, install wire through Schedule 40 electrical conduit.

G. Install wire at a depth of 18-inches minimum.

H. Install the wire in a logical manner, avoiding existing shrubs, trees, light posts, monuments, and signs.

3.19 BACKFILLING

A. Do not allow the Work to be covered or enclosed until it has been inspected, tested and approved in writing by the Owner. Work that is enclosed or covered before inspection and test may be required to be uncovered at no additional expense to the Owner.

B. Backfill material: Earth excavated from the trenches, free from rock pieces exceeding 3 inches in the largest dimension, concrete chunks, and other foreign or coarse materials. Select backfill that is to be placed next to plastic pipe to avoid any sharp objects which may damage the pipe.

C. Backfill PVC plastic pipe under asphalt paving with 6-inches of clean sand on all sides of pipe unless it is contained within a sleeve.

D. Place backfill in the trench in lifts not exceeding eight inches in loose thickness and compacted with a mechanical tamper. Compact soils to 88% to 92% relative compaction. The moisture content should be at least three percent above optimum at the time of compaction. Compact non-clay to a minimum of 90%, with the moisture content at or above the optimum level. This density is recommended for all subgrades supporting structures, with the upper twelve inches compacted to at least 95% in areas supporting asphalt concrete pavement subject to vehicle loadings. Jetting of backfills is not permitted.

E. If any areas of soft subgrade are exposed in the bottom of the trench excavation, place a geotextile fabric such as Mirafi 500 X, Supac 4NP, or an approved equivalent, in the bottom of the excavation prior to placing pipe bedding material.

F. Utility trench side slopes in clay soils will remain near vertical to a depth of five feet or so. Trenches in sandy soils, especially in loose zones, should expect to have sloughing and sidewall stability problems. Sidewall slope flattening will probably be required. Trench wall instability should also be anticipated during time of high groundwater levels when soils are saturated or nearly saturated, and also due to moisture loss and equipment vibration.

G. Safety of trench excavation is the responsibility of the contractor. Excavation construction practices conform to requirements presented by OSHA 29 CFR Park 1926 (Occupation Safety and Health Standards – Excavations; Final Rule).

H. Grade areas to finish grade and remove excess soil, rocks or debris remaining after backfilling is completed.

I. If settlement occurs along trenches, and adjustment of pipes, valves and sprinkler heads, soil, or paving is necessary to bring these items to the proper level or the permanent grade, provide adjustments at no additional expense to the Owner.

3.20 FLUSHING

A. Prior to leakage testing, thoroughly flush piping with water to remove debris introduced into the piping during the construction operations. Open valve outlets and continue flushing operations until clear water flows.

3.21 TESTS

A. General. Test pipelines for leakage in accordance with the requirements specified for each type of pipe. Provide materials and labor required for the leakage test including pumps, gauges, temporary plugs, and thrust blocks. Following completion of the leakage test, dispose of the water in conformance with state and local regulations. Use laboratory calibrated test gauges recalibrated by a certified laboratory at the Contractor’s expense prior to the leakage test if requested by the Owner. Block off valves and appurtenances which might be damaged by the test pressure and provide suitable thrust restraints. If the test of any section of pipe results in leakage greater than the specified allowable amount, repair the defective work and retest that section until the leakage is within the allowable amount. Water for testing will be furnished from available sources at the site. Pay for the cost of water and perform testing at no additional expense to the Owner.

B. Notify the Owner at least three (3) days in advance of testing.

C. Center load piping with small amount off backfill to prevent arching or slipping under pressure. Do not cover fittings.

D. Leakage testing of main line pipe.

E. Use hydraulic pump with water. Do not use an air compressor.

F. Exhaust air from main line piping, using quick coupling valves.

G. Fill main line slowly with water to avoid water hammer damage.

H. PVC pipe (solvent weld joints) - Apply the following tests after solvent weld plastic pipe joints have cured at least 24 hours:

a. Main line pipe: Conduct the leakage test at a test pressure of 125 PSI for a minimum period of 6 hours. Visually inspect for leaks while system is holding constant. Pressure should not drop more than 5 PSI during test. Correct leakage point and retest if pressure does not hold.

b. Lateral line pipe: Test piping downstream of remote-control valve with water at line pressure and visually inspect for leaks. Retest after correcting defects.

I. Remake any faulty joints with new materials. Use of cement or caulking to seal leaks is absolutely prohibited.

3.22 REMOVAL OF EXISTING IRRIGATION EQUIPMENT

A. Where instructed, disconnect, remove and return existing irrigation. Return equipment to the Owner. Do not cause damage to existing equipment during the removal process.

3.23 PROTECTION OF PROPERTY

A. Field verify the sizes, location, and proper operation of existing equipment to remain operational within and beyond the Contract Area. This includes, but is not limited to the following:

a. Sprinkler coverage at interface areas between the Contract Area and adjacent irrigation areas which are to remain operational.

b. Utilities servicing buildings within and beyond the Contract Area.

c. Potable (domestic) water services to buildings within and beyond the Contract Area.

B. Notify the Owner prior to field verification of existing utilities and irrigation. Report, in writing to the Owner for review and possible revision, any deviation of existing services and irrigation equipment as shown on the Drawings.

3.24 GUARANTEE

A. Fill and repair depressions due to the settlement of irrigation trenches for one year following completion and acceptance of the job.

B. Guarantee materials, equipment and workmanship furnished to be free of defects and agree to replace at no additional expense to the Owner, upon demand within one year after installation is accepted, defective components or installations that may be found.

3.25 CLEAN-UP

A. When Work of this section has been completed and at such other times as may be directed by the Owner, remove all trash, debris, surplus materials and equipment from site.

3.26 WARRANTY

A. It shall be the responsibility of the Contractor to fill and repair all depressions and replace all necessary lawn and planting due to the settlement of irrigation trenches for one (1) year following completion and acceptance of the job.

B. Guarantee materials, equipment and workmanship furnished to be free of defects and agree to replace at no additional expense to the Owner, upon demand within one year after installation is accepted, defective components or installations that may be found.

END OF SECTION

MWELO SUBMITTAL CHECKLIST

Submittal Date: _____

Project Address: _____

Applicant Name: _____ Phone: _____

The following checklist provides a list of information that must be included on the plans before your permit application can be processed. This checklist covers both the performance compliance method and the prescriptive compliance method. Please indicate which compliance method is used and provide the appropriate information on the plans.

☐ Performance Approach ☐ Prescriptive Approach (Skip to Page Four)

PERFORMANCE APPROACH
(>2,500 sq ft of landscape area)

Landscape Documentation Package (Title 23, Chapter 2.7 §492.3)

- ☐ The project's address, total landscape area, water supply type, and contacts shall be stated on the plans.
- ☐ Add, sign and date the following statement on the plans: "I agree to comply with the requirements of the water efficient landscape ordinance and submit a complete Landscape Documentation Package."
- ☐ Water Efficient Landscape Worksheet that includes a hydrozone information table and water budget calculations shall be submitted for plan check.
- ☐ A landscape design plan and irrigation design plan shall be submitted for plan check.
- ☐ A soil management report shall be submitted with the initial submittal unless the project scope includes mass grading. If a grading permit is required, the report shall be submitted with the Certificate of Completion.

Model Water Efficient Landscape Worksheet (Title 23, Chapter 2.7 §492.4 and §492.13)

- ☐ Incorporate the Water Efficient Landscape Worksheet into plans. Show that the Maximum Applied Water Allowance (MAWA) meets or exceeds the calculated Estimated Total Water Use (ETWU).
- ☐ The evapotranspiration adjustment factor (ETAF) for the landscape project shall not exceed a factor of (0.55 for residential areas) (0.45 for non-residential areas).
- ☐ The plant factor used shall be from WUCOLS or from horticultural researchers with academic institutions. WUCOLS plants database can be found on-line at: http://ucanr.edu/sites/WUCOLS/
- ☐ All water features shall be included in the high water use hydrozone. All temporary irrigated areas shall be included in the low water use hydrozone.
- ☐ All Special Landscape areas shall be identified on the plans. The ETAF for new and existing (non-rehabilitated) Special Landscape Areas shall not exceed 1.0.
- ☐ For the purpose of calculating ETWU, the irrigation efficiency is assumed to be 0.75 for overhead spray devices and 0.81 for drip system devices.

Landscape Design Plan (Title 23, Chapter 2.7 §492.6)

- ☐ The landscape design plans, at a minimum, shall:
  - ☐ Delineate and label each hydrozone by number, letter, or other methods.
  - ☐ Identify each hydrozone as low, moderate, high water, or mixed water use.

- ☐ Identify recreational areas, areas solely dedicated to edible plants, areas irrigated with recycled water, type and surface area of water features, impermeable and permeable hardscape, and any infiltration systems.

☐ For hydrozone with a mix of both low and moderate water use plants or both moderate and high water use plants, the higher plant factor or the plant factor based on the proportions of the respective plant water uses shall be used. Hydrozones containing a mix of low and high water use plants is not permitted.

☐ Turf is not allowed on slopes greater than 25% where the toe of the slope is adjacent to an impermeable hardscape.

☐ Add note to plans: "Recirculating water systems shall be used for water features"

☐ Add note to plans: "A minimum 3-inch layer of mulch shall be applied on all exposed soil surfaces of planting areas except turf areas, creeping or rooting groundcovers, or direct seeding applications where mulch is contraindicated."

☐ Add note to plans: "For soils less than 6% organic matter in the top 6 inches of soil, compost at a rate of a minimum of four cubic yards per 1,000 square feet of permeable area shall be incorporated to a depth of six inches into the soil"

Irrigation Design Plan (Title 23, Chapter 2.7 §492.7)

☐ The irrigation plans, at a minimum, shall contain the following:

- ☐ Location and size of spate water meters for landscape
- ☐ Location, type, and size of all components of the irrigation system, including controllers, main and lateral lines, valves, sprinkler heads, moisture sensing devices, rain switches, quick couplers, pressure regulators, and backflow prevention devices.
- ☐ Static water pressure at the point of connection the public water supply
- ☐ Flow rate (gallons per minute), application rate (inches per hour), and design operating pressure (pressure per square inch) for each station.

☐ A dedicated water service meter or private submeter shall be installed for all (non-residential irrigated landscapes of at least 1,000sqft) (residential irrigated landscape areas of at least 5,000sqft).

☐ Add note to plans: "Pressure regulating devices are required if water pressure is below or exceeds the recommended pressure of the specified irrigation devices."

☐ Manual shut-off valves shall be required, as close as possible to the point of connection of the water supply, to minimize water loss in case of an emergency or routine repair.

☐ Add note to plans: "Check valves or anti-drain valves are required on all sprinkler heads where low point drainage could occur."

☐ Areas less than 10-feet in width in any direction shall be irrigated with subsurface or drip irrigation.

☐ Overhead irrigation shall not be permitted within 24-inches of any non-permeable surface.

Soil Management Report (Title 23, Chapter 2.7 §492.5)

☐ The soil management report, at a minimum, shall contain the following:

- ☐ soil texture; N-P-K and minor trace elements
- ☐ infiltration rate determined by laboratory test or soil texture infiltration rate table;
- ☐ pH
- ☐ total soluble salts
- ☐ sodium
- ☐ percent organic matter
- ☐ recommendations

☐ The soil management report shall be both integrated into the plans and submitted as a separate document.

Required Statements and Certification (Title 23, Chapter 2.7 §492.6, §492.7 and §492.9)

- ☐ Add the following statement on the landscape and irrigation plans: "I have complied with the criteria of the ordinance and applied them for the efficient use of water in the landscape design plans".
- ☐ The final set of landscape and irrigation plans shall bear the signature of a licensed landscape architect, licensed landscape contractor, certified irrigation designer, licensed architect, licensed engineer, licensed land surveyor, or personal property owner.
- ☐ Add note to plans: "A diagram of the irrigation plan showing hydrozones shall be kept with the irrigation controller for subsequent management purposes."
- ☐ Add note to plans: "A Certificate of Completion shall be filled out and certified by either the designer of the landscape plans, irrigation plans, or the licensed landscape contractor for the project".
- ☐ Add note to plans: "An irrigation audit report shall be completed at the time of final inspection."

LANDSCAPE CERTIFICATION

2013 California Green Building Code

(This form is required at final inspection)

Project Information:

Site Address: _____ Permit Number: _____

Section A: Landscape Designer

- ☐ I certify that I am qualified by the State of California to perform landscape design services; the landscape design and water use calculations for this project were prepared by me or under my supervision; the landscape design and water use calculations comply with the requirements of the Model Water Efficient Landscape Ordinance, and the Landscape Documentation Package is complete; **OR**
- ☐ Interior T.I., no landscape work performed **(do not need to complete sections B or C below); OR**
- ☐ This project is not subject to the Model Water Efficient Landscape Ordinance.

Name: _____ Relationship to Project:_____

Company Name (if applicable): _____ State License # (if applicable): _____

Signature: _____ Date: _____

Section B: Landscape Installer

- ☐ I certify that (a) I am qualified by the State of California to provide landscape design services; the landscape project for this project was installed by me or under my supervision; (b) the landscaping for the identified property has been installed in substantial conformance with the approved Landscape Documentation Package and complies with the requirements of the Model Water Efficient Landscape Ordinance; (c) a diagram of the irrigation plan showing hydrozones is kept with the irrigation controllers; (d) the Certificate of Completion has been completed in compliance with the requirements of the Model Water Efficient Landscape Ordinance and shall be implemented.

Name: _____ Relation to Project: _____

Company Name (if applicable): _____ State License # (if applicable): _____

Signature: _____ Date: _____

Section C: Owner/Representative

- ☐ I certify that I am the property owner or an authorized representative and have received copies of all the documents within the Landscape Documentation Package and the Certificate of Completion and that it is my responsibility to see that the project is maintained in accordance with the Landscape and Irrigation Maintenance Schedule.

Signature: _____ Date: _____

Qualified irrigation service provider: *The following individuals are authorized to provide services required by the Model Water Efficient Landscape Ordinance in the State of California: Landscape Architects, Landscape Contractors, Landscape Designers and Irrigation Consultants. Personal property owners may design and sign plans for work on any property they own. (Sections 5500.1, 5615, 5641, 5641.1, 5641.2, 5641.3, 5641.4, 5641.5, 5641.6, 6701, 7027.5 of the Business and Professions Code, Section 832.27 of Title 16 of the California Code of Regulations, and Section 6721 of the Food and Agricultural Code.)*

Revised 12-01-2015

CERTIFICATE OF COMPLETION

This certificate is filled out by the project applicant upon completion of the landscape project.

PART 1. PROJECT INFORMATION SHEET

Date		
Project Name		
Name of Project Applicant	Telephone No.	
	Fax No.	
Title	Email Address	
Company	Street Address	
City	State	Zip Code

Project Address and Location:

Street Address		Parcel, tract or lot number, if available.
City		Latitude/Longitude (optional)
State	Zip Code	

Property Owner or his/her designee:

Name	Telephone No.	
	Fax No.	
Title	Email Address	
Company	Street Address	
City	State	Zip Code

Property Owner

"I/we certify that I/we have received copies of all the documents within the Landscape Documentation Package and the Certificate of Completion and that it is our responsibility to see that the project is maintained in accordance with the Landscape and Irrigation Maintenance Schedule."

_____

Property Owner Signature Date

PART 2. CERTIFICATION OF INSTALLATION ACCORDING TO THE LANDSCAPE DOCUMENTATION PACKAGE

"I/we certify that based upon periodic site observations, the work has been completed in accordance with the ordinance and that the landscape planting and irrigation installation conform with the criteria and specifications of the approved Landscape Documentation Package."

Signature*	Date	
Name (print)	Telephone No.	
	Fax No.	
Title	Email Address	
License No. or Certification No.		
Company	Street Address	
City	State	Zip Code

*Signer of the landscape design plan, signer of the irrigation plan, or a licensed landscape contractor.

PART 3. IRRIGATION SCHEDULING
Attach parameters for setting the irrigation schedule on controller per ordinance Section 492.10.

PART 4. SCHEDULE OF LANDSCAPE AND IRRIGATION MAINTENANCE
Attach schedule of Landscape and Irrigation Maintenance per ordinance Section 492.11.

PART 5. LANDSCAPE IRRIGATION AUDIT REPORT
Attach Landscape Irrigation Audit Report per ordinance Section 492.12.

PART 6. SOIL MANAGEMENT REPORT
Attach soil analysis report, if not previously submitted with the Landscape Documentation Package per ordinance Section 492.6.\

Attach documentation verifying implementation of recommendations from soil analysis report per ordinance Section 492.6.

PART 1 GENERAL

1.01 DESCRIPTION

A. This work consists of furnishing and installing all planting materials required for landscaping

1.02 TESTING LABORATORY SERVICES

A. Materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained and paid for by Contractor

1.03 EQUIPMENT

A. Maintain all equipment, tools and machinery while on the project in sufficient quantities and capacity for proper execution of the work.

1.04 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section

1.05 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples

B. Product Data: Manufacturer's current catalog cuts and specifications of the following:

1. Plants

2. Fertilizers

3. Iron Sulfate

4. Filter Fabric

5. Watering and maintenance instructions

C. Samples: Submit following samples along with certificates of compliance / analytical data from approved laboratory for degree of compliance: Plants: Submit typical sample of each variety or entire quantity to site for approval by Owner’s Representative.

1. Organic Mulch: Submit 1-pint sample with list of ingredients

2. Organic (Soil) Amendment: Submit 1-pint sample with Technical Data Sheet and STA certification

3. Imported Planting Soil: Submit 1-pint sample

4. Submit 1-quart sample of composted organic amendment along with composter's Compost Technical Data Sheet and STA certification to soil and plant laboratory for analytical packages as specified in Part 2 - Products below. Upon approval of the Laboratory's recommendations by the Owner’s Representative, the recommendations in the report shall become a part of the Specifications.

D. Delivery Receipts

1. Provide delivery receipts for quantities of organic soil amendments delivered to the site.

E. Topsoil Analysis (Soil Management) Report, per County ordinance Section 492.6

1. After approval of rough grading and topsoil placement, obtain minimum of four representative one quart samples of topsoil taken from accepted site locations at depth of 4" to 6" below finish grade and submit to an accredited Soils Laboratory for evaluation of physical and chemical properties of soil including all major nutrients; pH, salinity, boron, sodium, micronutrients, copper, zinc, manganese and iron; and infiltration rate, soil texture and organic content, along with a summary describing the degree of compliance with the specified requirements. The report shall also include recommendations for modification of the soil for agricultural suitability.

2. Upon request by Owner, submit documentation verifying implementation of soil analysis report recommendations to the local agency with Certificate of Completion as required by the State of California Model Water Ordinance

F. Subsoil Analysis

1. Besides the above required soil samples, take one representative sample of any subgrade soil that is to receive a layer of imported planting soil over it. The laboratory report shall include the subgrade soil's total combined silt and clay content for determining the total desirable combined silt and clay content of the final imported planting soil cover specified herein.

G. Imported Planting Soil Analysis

1. See Imported Planting Soil Analysis requirements elsewhere in this specification for comparison to existing soil analysis.

H. Approval of Laboratory Report

1. Upon approval of the Laboratory's report by the Owner’s Representative, the recommendations in the report shall become a part of the Specifications and the quantities of soil amendment, fertilizer and other additives shall be adjusted to conform with the report at no additional cost to the owner. Request Testing Laboratory to send one copy of test results directly to Owner’s Representative. Note that there is a minimum quantity of organic amendment specified elsewhere in this specification section.

I. Irrigation and Maintenance Schedule

1. Irrigation Scheduling, per County ordinance Section 492.10

2. Schedule of Landscape and Irrigation Maintenance, per County ordinance Section 492.11

3. Landscape Irrigation Audit Report, per County ordinance Section 492.12

1.06 PROJECT/SITE CONDITIONS

A. Site Visit: At beginning of work, visit and walk the site with the Owner's Representative to clarify scope of work and understand existing project/site conditions

1.07 WARRANTY AND REPLACEMENT,

A. Pre-Emergence Weed Killer: Warrant the work against weed growth for a period of four (4) months after application

B. Warrant all plants and planting to be in a healthy, thriving condition until the end of the maintenance period, and deciduous trees beyond that time until active growth is evident.

C. Replace all dead plants and plants not in a vigorous condition immediately upon discovery and as directed by the Owner's Representative at Contractor's expense. Install replacement plants before the final acceptance at the size specified.

D. Warrant all plant material for a period of one year after final acceptance of the maintenance period against plant materials with defects at the time of installation

E. Warrant plant installation and maintenance by Contractor against defects for a period of one year

F. Samples: Submit the following samples for approval before work is started:

Inert Mulch	2 quarts of each type to be used.
Organic Mulch	2 quarts of each type to be used.

G. Certificates of Conformance or Compliance: Before delivery, notarized certificates attesting that the following materials meet the requirements specified shall be submitted to the Owner's Representative for approval:

1. Plant Materials (Department of Agriculture certification by State Nursery Inspector declaring material to be free from insects and disease).

2. Fertilizers

H. Manufacturer's Literature and Data:

1. Pre-emergent herbicide

I. Soil laboratory testing results and any soil amendment recommendations from the Contractor.

1.08 DELIVERY AND STORAGE

A. Delivery:

1. Notify the Owner's Representative of the delivery schedule in advance so the plant material may be inspected upon arrival at the job site. Remove unacceptable plant material from the job site immediately.

2. Protect plants during delivery to prevent damage to root balls or desiccation of leaves. Protect trees during transport by tying in the branches and covering all exposed branches.

3. Deliver fertilizer **t**o the site in the original, unopened containers bearing the manufacturer's warrantee-ed chemical analysis, name, trade name or trademark, and in conformance to state and federal law.

B. Storage:

1. Keep fertilizer in dry storage away from contaminants.

2. Store plants not installed on the day of arrival at the site as follows:

a. Shade and protect plants from the wind when stored outside

C. Keep plants in a moist condition until planted.

1.09 PLANTING INSTALLATION CONDITIONS

A. Perform planting operations after the irrigation system is installed, tested, and approved.

B. No work shall be done when the ground is too wet or in an otherwise unsuitable condition for planting. Special conditions may exist that warrants a variance. Submit a written request to the Owner's Representative stating the special conditions and proposal variance.

1.10 PLANT ESTABLISHMENT PERIOD

A. The Establishment Period for plants shall begin immediately after installation, with the approval of the Owner's Representative, and continue until the date that the Owner accepts the project or phase for beneficial use and occupancy. During the Plant Establishment Period the Contractor shall:

1. Water all plants to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is the equivalent of 25 mm (1 inch) of absorbed water per week either through natural rainfall or augmented by periodic watering. Apply water at a moderate rate so as not to displace the mulch or flood the plants.

2. Prune plants and replace mulch as required.

3. In all planting areas remove grass, weeds, and other undesired vegetation, including the root growth, before they reach a height of 75 mm (3 inches).

4. Spray with approved insecticides and fungicides to control pests and ensure plant survival in a healthy growing condition, as directed by the Owner's Representative.

5. Remove plants that die during this period and replace each plant with one of the same size and species.

1.11 PLANT WARRANTY

A. All work shall be in accordance with the following:

1. A One Year Plant Warranty will begin on the date that the Owner accepts the project or phase for beneficial use and occupancy. The Contractor shall have completed, located, and installed all plants according to the plans and specifications. All plants are expected to be living and in a healthy condition at the time of final inspection.

2. The Contractor will replace any dead plant material immediately. A one-year warranty for the plants that was replaced, will begin on the day the work is completed.

3. Replacement of relocated plants, that the Contractor did not supply, is not required unless they die from improper handling and care during transplanting. Loss through Contractor negligence requires replacement in kind and size.

4. The Owner will reinspect all plants at the end of the One Year Warranty. The Contractor will replace any dead, missing, or defective plant material immediately. The Warranty will end on the date of this inspection provided the Contractor has complied with the work required by this specification. The Contractor shall also comply with the following requirements:

a. Replace dead, missing or defective plant material prior to final inspection.

b. Mulch and weed plant beds. Just prior to this inspection, treat these areas to a second application of approved pre-emergent herbicide.

c. From plants having been installed for one year, remove stakes, guy wires and any required tree wrappings.

d. Complete remedial measures directed by the Owner's Representative to ensure plant survival.

e. Repair damage caused while making plant replacements.

1.12 PLANT MAINTENANCE PERIOD

A. Contractor shall begin a 90-day Maintenance Period after Complete Project acceptance by the Owner. Contractor shall provide a CLIN on the bid documents and approved schedule of values for this Period after acceptance, to be reviewed and approved by the Owner's Representative. Contractor shall begin a 90-day Maintenance Period after Complete Project acceptance by the Owner. Contractor shall provide a CLIN on the bid documents and approved schedule of values for this Period after acceptance, to be reviewed and approved by the Owner's Representative.

B. Replace all dead and damaged plants and plants not in a vigorous condition immediately upon discovery and as directed by the Owner's Representative. Install replacement plants before the end of the Maintenance Period.

C. Keep all walks and paved areas clean. Keep the site clear of debris resulting from landscape work and maintenance operations.

D. Check sprinkler systems at each watering; adjust and clean and repair non-functioning heads immediately. Adjust timing of sprinkler controller to prevent runoff and flooding.

E. Maintain adequate moisture depth in soil to ensure vigorous growth, without overwatering.

F. Keep Contract areas free from weeds by cultivating, hoeing or hand pulling. Use of chemical weed killers will not relieve the Contractor of the responsibility of keeping areas free of weeds over 1-inch high at all times.

G. Protect all areas against damage, including erosion, trespass, insects, rodents, deer, disease, etc. and provide proper safeguards, including trapping of rodent and applying protective sprays and fencing to discourage deer browsing. Maintain and keep all temporary barriers erected to prevent trespass.

H. Repair all damaged planted areas. Replace plants and reseed or re-sod turf immediately upon discovery of damage or loss, including damage from Deer and Rodents.

I. Maintain during the entire establishment period by regular watering, cultivating, weeding, repair of stakes and ties, and spraying for insect pests. Prune when requested by the Landscape Architect.

J. Keep watering basins in good condition and weed-free at all times.

K. Replace all damaged, unhealthy or dead trees, shrubs, and ground covers with new stock immediately; size as indicated on the drawings.

L. Upon approval and after submitting fertilizer delivery tags, maintenance fertilization shall begin 30 days after planting is complete. Fertilize all ground cover areas by broad-casting Type C (21-7-14) fertilizer at the rate of 5 lbs. per 1,000 square feet evenly throughout. Reapply every forty-five (45) days until acceptable.

M. Early spring and fall substitute a complete fertilizer such as 15-15-15 applied at the rate of 6 lbs. per 1,000 square feet, to help insure continuing adequate phosphorus and potassium.

N. Apply ammonium sulfate fertilizer as necessary to maintain vigorous, green grass between fertilizings mentioned above.

O. Observe plant's color, and if a soil pH imbalance is suspected, take soil samples and obtain laboratory analysis for confirmation. Take necessary action recommended in laboratory analysis such as top dressing with soil sulfur, leaching soil, etc.

P. At the conclusion of the Maintenance Period, schedule a final review with the Owner's Representative. On such date, all project improvements and all corrective work shall have been completed.

Q. Submit written notice requesting review at least 10 days before the anticipated review.

R. Prior to review, weed and rake all planted areas, repair plant basins, mow and edge turf, plumb tree stakes, clear the site of all debris and present in a neat, orderly manner.

1.13 APPLICABLE PUBLICATIONS

A. The publications listed below, form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

B. Ordinances and Regulations: All local, municipal and state laws, codes and regulations governing or relating to all portions of this work are hereby incorporated into and made a part of these Specifications. Anything contained in these Specifications shall not be construed to conflict with any of the herein listed codes, 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 than is required by the above mentioned codes and regulations, the provisions of these Specifications and Drawings shall take precedence. Furnish without extra charge additional materials and labor required to comply with above rules and regulations

C. American National Standards Institute (ANSI) Publications:

1. Z60.1-04 Nursery Stock

D. Hortus Third, A Concise Dictionary of Plants Cultivated in the U.S. and Canada.

E. Contractor shall be familiar with and follow the State of California Model Water Ordinance, California Code of Regulations, Title 23 Waters, Division 2, Department of Water Resources, Chapter 2.7. Also, the Contractor is responsible to follow all local water ordinances and the Soil Management/Analysis Report with verifying implementation.

F. American Society for Testing and Materials (ASTM) Publications:

1. C136-06 Sieve Analysis of Fine and Coarse Aggregates

G. U. S. Department of Agriculture Federal Seed Act.

1. Rules and Regulations

H. American Wood Protection Association (AWPA):

1. C2-02 Lumber, Timbers, Bridge Ties and Mine Ties, Pressure Treatment

I. "Sunset Western Garden Book," Lane Publishing Co., Menlo Park, California; current edition.

J. US Composting Council Compost Analysis Program (CAP)

K. Test Methods for the Evaluation of Composting and Compost (TMECC)

L. International Society of Arboriculture, Guide for Plant Appraisal, latest version.

M. United States Composting Council (USCC) Seal of Testing Assurance (STA) program.

N. TMECC: Refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC)

O. References to "Caltrans Standard Specifications" shall mean the Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS.

P. Manufacturer's recommendations

PART 2 PRODUCTS

2.01 GENERAL

A. All plant material shall conform to the varieties specified or shown in the plant list and be true to botanical name as listed in Hortus Third.

2.02 PLANTS

A. Plants shall be nursery grown in containers and in accordance with ANSI Z60.1, except as otherwise stated in the specifications or shown on the plans. Where the drawings or specifications are in conflict with ANSI Z60.1, the drawings and specification shall prevail.

B. Plant the variety, quantity and size indicated. The total quantity tabulated on the drawings are considered approximate and furnished for convenience only. Contractor shall perform his/her own plant quantity calculations and shall provide all plants shown to fill areas shown on drawings.

C. Tag plants of the type or name indicated and in accordance with the standard practice recommended by the American Association of Nurserymen.

D. Install healthy, shapely and well rooted plants with no evidence of having been root-bound, restricted or deformed

E. Take precautions to ensure that the plants will arrive at the site in proper condition for successful growth. Protect plants in transit from windburn and sunburn. Protect and maintain plants on site by proper storage and watering.

F. Substitutions will not be permitted, except as follows:

1. If proof is submitted to the Owner’s Representative that any plant specified is not obtainable, a proposal will be considered for use of nearest equivalent size or variety with an equitable adjustment of contract price

2. Substantiate and submit proof of plant availability in writing to the Owner’s Representative within 10 days after the effective date of Notice to Proceed

2.03 FERTILIZERS

A. Commercial fertilizer, pelleted or granular form, conform to the requirements of Chapter 7, Article 2, of the Agricultural Code of the State of California for fertilizing materials as follows:

1. Type A:
6% Nitrogen, 20% Phosphorus Acid and 20% Potash, (6-20-20)

2. Type B:
21-gram planting tablets 20% Nitrogen, 10% Phosphoric Acid and 5% Potash (20-10-5) available from Agriform or 10gm BestPacks packets 20% Nitrogen, 10% Phosphoric Acid and 5% Potash (20-10-5) available from Best Fertilizer Co.

3. Type C:
Complete fertilizer 21% Nitrogen, 7% Phosphoric Acid and 14% Potash (21-7-14)

4. If commercial fertilizer having this analysis is not obtainable, other similar commercial fertilizer may be used providing it meets the approval of the Owner's Representative

B. Maintenance Fertilizer: Type C

2.04 ORGANIC AMENDMENT FOR IN SITU SOILS (ON-GRADE):

A. Ground Fir Bark with the following properties:

1.

Percent Passing		Sieve Designation
100		9.51 mm, 3/8"
50-60		6.35 mm, 1/4"
20-40	4.76 mm	No. 4
0-20	2.38 mm	No. 8 8 mesh

Ground Fir and/or Pine Bark
Dry bulk density, lbs. per cu. yd., Min. 350
Nitrogen stabilized - dry weight basis, min. 0.5%

Salinity (ECe):	4.0 maximum
Organic Content:	90% minimum
Reaction (pH):	4.0 minimum

B. Submit sample along with analytical data from an approved laboratory for degree of compliance to the Owner's Representative within two weeks after award of Contract.

2.05 COMPOSTED YARD WASTE AMENDMENT:

A. The above Ground Redwood or Ground Fir Bark or Ground Pine Bark (ORGANIC AMENDMENT FOR IN SITU SOILS) is the specified organic amendment material required. Acceptance of Composted Yard Waste Amendment in lieu of the above specified ORGANIC AMENDMENT FOR IN SITU SOILS (ON-GRADE) material will be considered if the in situ planting soil salinity and soil structure is favorable for the inclusion of recycled yard waste organic matter, as approved by the Owner's Representative. It is the Contractor's responsibility to secure test samples of both the planting soil and the proposed composted yard waste amendment (2-quart samples) and submit to Soils and Plant Laboratory for evaluation and recommendations. The composted yard waste amendment sample shall be a grab sample from the currently available material that has been tested within the last 30 days and shall include the composter's Compost Technical Data Sheet that includes lab analytical test results and directions for product use along with list of ingredients. The composted yard waste amendment shall be a mixture of feedstock materials including green material consisting of chipped, shredded, or ground vegetation and mixed food waste, or clean processed recycled wood products. Single source, Biosolids (sewage waste) compost will not be acceptable.

B. Based on the Soils and Plant Laboratory evaluation, the addition of composted yard waste amendment shall not be acceptable if it creates a leaching requirement.

C. The addition of the compost shall result in a final ECe of the amended soil of less than 4.0 dS/m @ 25 degrees C. as determined in a saturation extract. Use the following table to determine the maximum allowable Ece (dS/m of saturation extract) of compost at desired use rate and allowable Ece increase.

DESIRED USE RATE		MAXIMUM ALLOWABLE Ece INCREASE FROM AMENDMENT		
Cu. Yds. Amendment Per 1000 Sq. Ft. for Incorporation to 6" depth	Volume percentage of amendment	1 dS/m	2 dS/m	3 dS/m
		Maximum ECe of Compost		
1	5	14	28	42
2	11	7	14	21
3	16	5	9.5	14
4	22	3.5	7	10.5
5	27	3	5.5	8.5
6	32	2.5	4.5	7

1. Example: Specification calls for 6 cu. Yds. Compost per 1000 sq. ft. for incorporation to 6" depth, and site soil has an ECe of 2.0. In order to avoid exceeding ECe of 4 in final blend, compost ECe shall be less than 4.5 dS/m

D. Composted Yard Waste Soil Amendment Properties as follows:

1. Gradation:

Percent Passing by weight	Sieve Designation	
90		1/2"
85-100	9.51 mm	3/8"
50-80	2.38 mm	No. 8, 8 mesh
0-40	500 micron	No. 35, 32 mesh

Maximum length 4 inches

2. Organic Content: Minimum 45% based on dry weight and determined by ash method

3. Carbon to nitrogen ratio: Maximum 35:1 if material is claimed to be nitrogen stabilized

4. pH: 5.5 - 8.0 as determined in saturated paste

5. Soluble Salts: See above

6. Moisture Content: 35-60%

7. Physical Contaminants:

   a. The compost shall be free of contaminants such as glass, metal and visible plastic per Man Made Inert Removal and Classification: TMECC 02.02, %> 4mm fraction. Combined total less than 1.0.

   b. Man Made Inert Removal and Classification: Sharps % > 4mm fraction. (sewing needles, hypodermic needles) Non-Detected

8. Pathogens: TMECC 07.01-B Fecal Coliform Bacteria <1000 MPN/gram dry wt. <1000 (Pass)

9. Pathogens: TMECC 07.01-B Salmonella <3 MPN/4grams dry wt. <3 (Pass)

10. Maturity: Physical characteristics suggestive of maturity include:

    a. Color: Dark brown to black

    b. Acceptable Odor: None, soil-like, musty or moldy

    c. Unacceptable Odor: Sour, ammonia or putrid

    d. Particle Characterization: Identifiable wood pieces are acceptable, but the balance of the material shall be soil-like without recognizable grass or leaves.

    e. TMECC 07.01-A Germination and Vigor, % Relative to Positive Control for Seed Emergence and Seedling Vigor: 80 or above.

E. Submit planting soil and composted yard waste amendment samples along with laboratory report from Soils and Plant Laboratory for degree of compliance as specified above and composter's Compost Technical Data Sheet that includes lab analytical test results and directions for product use along with list of ingredients to the Owner’s Representative a minimum of 3 weeks prior to beginning soil prep. The laboratory report shall include recommendations for adjusting fertilizer and amendment quantities. Upon approval of the Laboratory's report by the Owner’s Representative, the recommendations in the report shall become a part of the Specifications and the quantities of soil amendment and fertilizer shall be adjusted to conform with the report at no additional cost to the owner.

2.06 IRON SULFATE

A. Type: Dry form

2.07 PLANT BACKFILL

A. Except for acid loving plants (Azaleas, Rhododendrons, Ferns, Camellias, etc.), use a mixture of 2 parts soil from the hole, and 1 part amendment with iron added at the following rates:

1. Size Rate

1	gallon can plants	iron, 1/4 cup
5	gallon can plants	iron, 1/3 cup
15	gallon can plants	iron, 1/2 cup
24"	box and larger	iron, 1 cup

2. Mix the iron, amendment and soil thoroughly for use only in the top 8 inches of backfill around plants. For acid loving plants, mixture to be 1/2 soil from the hole and 1/2 amendment only in the top 8 inches.

2.08 MULCH

A. Organic Mulch: Fir tree or pine tree bark, natural in color; 3/4-inch to 1-inch size.

B. Submit samples of organic mulches to the Owner's Representative for approval within two weeks of award of Contract. Resubmit until acceptable to Owner's Representative, at no extra cost.

2.09 PLANTING SOIL (TOPSOIL):

A. Planting soil is defined as screened imported soil. Satisfactory planting soil shall be free of subsoil, clay, lumps, stones, and other objects over 2" in diameter, and without weeds, roots, and other objectionable material.

2.10 IMPORTED PLANTING SOIL (TOPSOIL):

A. Imported planting soil shall be fertile, friable, natural, productive soil containing a normal amount of humus, and shall be capable of sustaining healthy plant life. Planting soil shall be free of subsoil, heavy or stiff clay, rocks, gravel, brush, roots, weeds, noxious seeds, sticks, trash, and other deleterious substances. Soil shall not be infested with nematodes or with other noxious animal life or toxic substances. Soil shall be obtained from well-drained, arable land, and shall be of an even texture. Soil shall not be taken from areas on which are growing any noxious weeds such as Morning Glory, Sorrel, or Bermuda Grass.

B. Imported planting soil shall have a pH value of between 6.0 and 7.5, a boron concentration of the saturation extract of less than 1 ppm, salinity of the saturation extract at 25 degrees C. of less than 4.0 millimoles, and a sodium absorption rate (SAR) of less than 8.

C. The silt and clay content of imported planting soil shall not exceed that of the existing soil it is to be placed over. It shall be a "Sandy Loam" as classified in accordance with USDA Standards with a combined total of between 25%to 40% Clay and Silt. Provide existing site soil sample analysis report for comparison with the imported soil report.

D. Make the site of the source of supply of planting soil available to the Owner's Representative for observation and approval prior to any hauling or placing of soil. In addition, submit for approval a 1-quart sample of soil, together with a standard soil analysis report by an accredited soils analyst showing chemical analysis stating source, fertility, agricultural suitability and particle size distribution of the soil. Deliver the sample

to the Owner's Representative two weeks before starting the contemplated hauling of the soil. Following approval of the sample, provide a one-half cubic yard sample, which shall be stored at the site of work for comparison with subsequent loads of soil. The comparison sample shall be protected by a cover until the furnishing of all soil has been completed and accepted. Should the soil submittal lack certain requirements which can be added to the soil, the Owner's Representative will consider a request by the Contractor to amend the soil as recommended by the Soils Analyst at the Contractor's expense.

2.11 FILTER FABRIC

A. Mirafi140N, Propex Geotex 401, Reed & Graham RG45N or SKAPS GT142 nonwoven geotextile composed of polypropylene fibers.

2.12 PRE-EMERGENCE WEED KILLER

A. Clean non-staining as recommended by a licensed pest control specialist.

PART 3 EXECUTION

3.01 FINE GRADING AND SOIL PREPARATION

A. General:

1. Soil in all planting areas shall be moist, but not so moist that it sticks to a hand shovel, and loose and friable to a minimum depth of 12 inches with a relative maximum compaction of 85%. Rip and scarify and dry any areas that do not meet this requirement. Mix (15, 15, 15) soil amendment fertilizer in sub-soil layer prior to placement of topsoil.

2. Prior to excavating for plant pits and bed, verify the location of any underground utilities. Damage to utility lines shall be repaired at the Contractor's expense. Where lawns have been established prior to planting operation, cover the surrounding turf before excavations are made in a manner that will protect turf areas. Barricade existing trees, shrubbery, and beds that are to be preserved in a manner that will effectively protect them during the project construction

3. No work shall be done when the ground is too wet or in an otherwise unsuitable condition for earthwork and planting. Special conditions may exist that warrants a variance. Submit a written request to the Owner's Representative stating the special conditions and proposal variance.

4. Before proceeding with the work: Carefully inspect all areas and verify all dimensions and quantities. Immediately inform the Owner's Representative of any discrepancy between the drawings and specifications and actual conditions and secure approval to proceed.

B. Planting Soil Placement:

1. Inspect planting areas and remove all base rock and other foreign material. Rip all planting areas in two directions full depth of compacted fill (to a minimum of 12 inches) into undisturbed native soil prior to backfilling. Scarification of any

planting area which cannot be accomplished with a tractor shall be accomplished by an alternative method approved by the Owner's Representative to the specified depth to ensure proper percolation/drainage.

2. Prior to placing planting soil secure the Owner's Representative acceptance of the planting areas subgrade condition. Test depth of loose soil with hand shovel in presence of Owner's Representative in several locations as directed. After acceptance of the planting areas subgrade condition, uniformly distribute and spread planting soil backfill over scarified subgrade in planting areas as specified and compact to a maximum of 85% relative compaction.

3. Do not work planting soil in a wet or muddy condition or dump or spread in areas where subgrade is not in proper condition.

4. Water settling, puddling, and jetting of fill and backfill materials as a compaction method is not acceptable.

5. Provide a minimum of 12" depth in planting areas, or more where shown or specified otherwise.

C. Planting Soil Placement in Planting Islands and Adjacent to Pavement Areas:

1. Provide planting soil as a final lift in all planting areas within and adjacent to paved areas and other construction where native site soil has been covered by engineered fill and/or base rock. Remove all engineered fill, base rock and compacted subgrade full depth of compaction and replace with approved planting soil, a minimum lift of 12". Unless shown otherwise, finish grade in planting islands shall be crowned with a minimum 2 % pitch to the edges.

D. All planting areas soil shall be loose and friable prior to planting.

E. Planting operations shall be performed only during periods when beneficial results can be obtained. When excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped until conditions are satisfactory.

F. Thoroughly wet down the planting areas to settle the soil and confirm irrigation coverage and operation. Allow soil to dry so as to be workable as described herein.

G. Drag to a smooth, even surface. Grade to form all swales. Pitch grade with uniform slope to catch basins, streets, curb, etc., to ensure uniform surface drainage. Areas requiring grading include adjacent transition areas that shall be uniformly sloped between finish elevations. Slope surface away from walls so water will not stand against walls or buildings. Control surface water to avoid damage to adjoining properties or to finished work on the site. Take required remedial measures to prevent erosion of freshly graded areas and until such time as permanent drainage and erosion control features have been installed.

H. Finish Grade: Hold finish grade and/or mulch surface in planting areas 1/2-inch below adjacent pavement surfaces, tops of curbs, manholes, etc. The subgrade of the mulch in mulched planting areas shall be a minus 2 inches for a distance of 12- to 18-inch from the edge of pavement. The remainder of the planting area shall be graded to receive the required 3-inch layer of mulch.

I. In Situ Soil Preparation:

1. Spread organic amendment, iron and Type A fertilizer evenly over installed and rough graded topsoil in all planting areas including ground cover and shrub areas at the following rates:

   a. Organic Amendment: 6 cubic yards per 1,000 square feet

   b. Fertilizer: Type A (6-20-20) at 20 lbs. per 1,000 square feet.

   c. Iron Sulfate: 10 lbs. per 1,000 square feet

2. Rototill above additives into soil 6 to 8 inches deep. Keep iron sulfate off pavement and other surfaces to prevent rust staining. Correct all rust damage to work.

3. Planting soil shall have a pH range of 6.5 to 7.5.

J. After the rototill work, float areas to a smooth, uniform grade as indicated on the drawings. Slope all planting areas to drain. Roll, scarify, rake and level as necessary to obtain true, even planting surfaces. Remove rocks, sticks and debris 2 inches or larger in shrub and ground cover areas. Secure approval of the grade by the Owner's Representative before any planting.

3.02 GROUND COVER PLANTING

A. Plant in neat, straight, parallel and staggered rows as indicated on plan. Plant first row one-half required ground cover spacing behind adjacent curbs, structures, or other plant bed limits. Plant ground cover to edge of water basins of adjacent trees and shrubs.

B. Coordinate plant location with underground landscape dripline irrigation system, adjust location of plantings as necessary.

3.03 MULCH

A. Except where rock mulch is required, mulch all tree, shrub and ground cover areas with organic mulch to a 3-inch depth, except adjacent to walkways where soil grade is 2 inches below top of pavement, mulch shall be 2 inches deep, and 2-inches deep where planting ground cover plants from flats. Hold bark mulch away from base (trunk) of plant 4" or as directed by the Owner's Representative. Individual trees and/or shrubs planted in non-irrigated areas shall, at minimum, receive bark mulch over their watering basin and berm. No mulch is required around trees in bioswales or biodetention basins.

3.04 ROOT BARRIER

A. Install in linear fashion along and adjacent to the edges of the planting area as detailed or, if not shown, in accordance with manufacturer's recommendations. Set top of barrier approximately ½-inch above finished soil surface to allow concealment with mulch, as accepted by Owner's Representative.

3.05 PRE-EMERGENCE WEED KILLER

A. Apply pre-emergence weed killer in all areas to receive ground cover planting. Work shall be done under the supervision of a person licensed by the State of California as a pest control applicator and holding a qualified applicator license or a Qualified Applicator Certificate. Obtain approval of the finish grades prior to applying weed killer and

coordinate planting and watering with the pest control specialist prior to planting. Take care to keep weed killer off areas to be seeded.

3.06 WATERING

A. Water trees, shrubs and ground cover immediately after planting. Apply water to plants as often and in sufficient amount as conditions may require to keep the plants in a healthy vigorous growing condition until completion of the Contract. Do supplemental hand watering of trees and shrubs during the first 3 weeks of plant establishment.

3.07 RESTORATION AND CLEAN-UP

A. Where existing areas have been damaged or scarred during planting and construction operations, restore disturbed area to their original condition. Keep at least one paved pedestrian access route and one paved vehicular access route to each building clean at all times. In areas where planting work have been completed, clear the area of all debris, spoil piles, and containers. Clear all other paved areas when work in adjacent areas is completed. Remove all debris, rubbish and excess material from the station.

3.08 CONSTRUCTION WASTE MANAGEMENT

A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor’s Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

END OF SECTION

PART 1 GENERAL

1.01. DESCRIPTION:

A. Underground water and fire water distribution system complete, ready for operation, including all appurtenant structures, fire water and domestic water, backflow preventers, meters, shut-offs and connections to existing water supply mains.

1.02. RELATED WORK:

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03. DEFINITIONS:

A. Water Distribution: Pipelines and appurtenances which are part of the distribution system. The distribution system comprises the network of piping located throughout building areas and other areas of water use, including hydrants, valves, and other appurtenances used to supply water for domestic and fire-fighting/fire protection purposes.

B. Water Service Line: Pipeline connecting building piping to municipal water distribution lines.

C. Fire Service Line: Pipeline connecting building fire protection piping to municipal water distribution lines.

1.04. QUALITY ASSURANCE:

A. Products Criteria:

1. Multiple Units: When two or more units of the same type or class of materials or equipment are required, these units shall be product of one manufacturer.

2. Nameplate: Nameplate bearing manufacturer's name or identifiable trademark securely affixed in a conspicuous place on equipment or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

B. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Water lines and the extension, and/or modifications to Public Utility systems.

C. Comply with all rules and regulations of Federal, State, and Local Health Department, Department of Environmental Quality having jurisdiction over the design, construction, and operation of potable water systems.

D. All material surfaces in contact with potable water shall comply with NSF 61.

1.05. SUBMITTALS:

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Submit detailed 1:100 (1/8 inch) scale (minimum) working drawings include a site plan showing the piping from water supply to building connection.

C. Shop drawings:

1. Layout drawings with pipe types, joints, joint restraints, pipe elevations, slope, location and relationship to building and other systems.

D. Manufacturers' Literature and Data (Submit all items as one package):

(Ductile Iron Pipe and Polyvinyl Chloride [PVC] shall be in accordance with AWWA C600 and C605 respectively; and shall be provided to the Owner for approval.)

1. Piping.

2. Gaskets.

3. Valves.

4. Fire hydrants.

5. Vaults, frames and covers.

6. Valve boxes.

7. Joint restraint.

8. Disinfection products.

E. Testing Certifications:

1. Certification of Backflow Devices.

2. Hydrostatic Testing.

3. Certification of Disinfection, including free chlorine residuals, and bacteriological examinations.

1.06. APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American National Standards Institute (ANSI/ASME):

B16.1-98	Cast Iron Pipe Flanges and Flanged Fittings
B16.18	Cast Bronze Solder Joint Pressure Fittings

C. American Society for Testing and Materials (ASTM):

A536-04	Standard Specifications for Ductile Iron Castings
D1784-03	Standard Specifications for Rigid PVC Compounds and CPVC Compounds
D2464-99	Standard Specifications for Threaded PVC Pipe Fittings, Schedule 80

D2467-02	Standard Specifications for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D3139-98	Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
F477-02e1	Elastomeric Seals (Gaskets) for Joining Plastic Pipe

D. American Water Works Association (AWWA):

B300-04	Hypochlorites
B301-04	Liquid Chlorine
C104-04	Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
C105-99	Polyethylene Encasement for Gray and Ductile C.I. Piping for Water and Other Liquids
C110-03	Ductile-Iron and Gray-Iron Fittings, 80 mm (3 Inches) Through 1200 mm (48 Inches) for Water and Other Liquids
C111-01	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
C115-99	Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges
C150-02	American National Standard for Thickness Design of Ductile Iron Pipe
C151-96	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
C153-00	Ductile-Iron Compact Fittings, 80 mm (3 inches) Through 300 mm (12 Inches) for Water and Other Liquids
C500-02	Gate Valves for Water and Sewerage Systems
C503-97	Wet-Barrel Fire Hydrants
C509-01	Resilient Seated Gate Valve for Water System
C550-01	Protective Epoxy Interior Coatings for Valves and Hydrants
C600-01	Installation for Ductile-Iron Water Mains and Their Appurtenances
C605-94	Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
C651-92	Disinfecting Water Mains
C800-01	Underground Service Line Valves and Fittings
C900-97	Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches thru 12 Inches, for Water

E. National Fire Protection Association (NFPA):

24-95	Installation of Private Fire Service Mains and Their Appurtenances
291-01	Fire Flow Testing and Marking of Hydrants
1141-98	Fire Protection in Planned Building Groups

F. NSF International:

14-03	Plastics Piping Components and Related Materials
61-02	Drinking Water System Components-Health Effects (Sections 1-9)

PART 2 PRODUCTS

2.01. DUCTILE IRON PIPE AND FITTINGS:

A. Ductile iron pipe, direct buried:

1. Provide ductile iron pipe conforming to the requirements of AWWA C151, Pressure Class 350 for Pipe 4 inches through 12 inches in diameter and 250, minimum for pipe larger than 12 inches in diameter, with standard thickness cement mortar lining interior, and interior asphaltic seal coat and exterior asphaltic coating, in accordance with AWWA and ANSI Standards.

2. Below Grade: Supply pipe in lengths not in excess of a nominal 20 feet with rubber ring type push-on joints, mechanical joint or approved restrained joint. Provide flange joint pipe where shown on the drawings. Provide mechanical and restrained joint pipe with sufficient quantities of accessories as required for each joint.

3. When a polyethylene encasement over pipe, fittings, and valves is a requirement as indicated on the drawings, the material, installation and workmanship shall conform to applicable sections of AWWA C105. Make provisions to keep the polyethylene from direct exposure to sunlight prior to installation. Backfill following installation without delay to avoid exposure to sunlight.

B. Ductile Iron Pipe Above Grade or in Below Ground Concrete Pits:

1. Flanged ductile iron pipe, AWWA C115, with factory applied screwed long hub flanges except as otherwise specified hereinafter. Face and drill flanges after being screwed on the pipe, with flanges true to 90 degrees with the pipe axis and flush with end of pipe, ANSI B16.1, 850 kPa (125 psi) or 1725 kPa (250 psi) standard, for the purpose intended.

2. Pipe Thickness Class: Minimum of Class 53 as defined in AWWA C150 for all sizes of flanged pipe.

3. Rubber Ring Gaskets: Full face type, AWWA C111, 1/16 inch rubber ring gaskets and of approved composition suitable for the required service.

4. Bolts and Nuts on Flanged Fittings: Grade B, ASTM A307. Low alloy, high strength steel in accordance with AWWA C111. Assemble stainless steel bolts and nuts using anti-seize compound to prevent galling.

C. All Pipe Fittings: Ductile iron with a minimum pressure rating of 2400 kPa (350 psi). Fittings shall meet the requirements of ANSI and AWWA specifications as applicable. Rubber gasket joints shall conform to AWWA C111 for mechanical and push-on type joints. Ball joints shall conform to AWWA C151 with a separately cast ductile iron bell conforming to ASTM A148. Flanged fittings shall conform to AWWA C115 and be furnished flat faced and drilled to 850 kPa (125 psi) or 1725 kPa (250 psi) template in accordance with ANSI B16.1 with full faced gaskets.

D. Provide cement mortar lining and bituminous seal coat on the inside of the pipe and fittings in accordance with AWWA C104. Provide standard asphaltic coating on the exterior.

E. Provide a factory hydrostatic test of not less than 3.5 MPa (500 psi) for all pipe in accordance with AWWA C151.

F. Provide non-detectable adhesive backed identification tape on top and sides of all buried ductile iron pipe, extended from joint to joint along the length of the pipe and have black lettering identifying the pipe service at no more than 12-inch intervals. According to service, the tape background color shall be as follows: force main/sanitary-green; potable water-blue; reclaimed water-lavender.

2.02. POLYVINYL CHLORIDE PIPE AND FITTINGS:

A. Class-Rated Polyvinyl Chloride (PVC) Pipe:

1. PVC pipe and accessories, AWWA C900 “Polyvinyl Chloride (PVC) Pressure Pipe”, Class 200, DR 14, cast iron outside diameters, unless otherwise shown or specified.

B. Joints:

1. Pipe 3 inches and Greater in Diameter: Push-on type with factory installed solid cross section elastomeric ring meeting the requirements of ASTM F-477.

C. Fittings:

1. Class-Rated Pipe 3 inches in Diameter and Greater: Ductile iron with mechanical joints conforming to the requirements of AWWA C153.

2. For Schedule 80 Pipe less than 3 inches in Diameter: Threaded or solvent weld. Threaded PVC fittings shall conform to ASTM D2464. CPVC fittings shall conform to ASTM F437 for threaded fittings and ASTM F439 for solvent weld fittings.

2.03. VALVES:

A. Asbestos packing is not allowed.

B. Gate:

1. 3 inches and Larger: Resilient seated, ductile iron body, bronze mounted, inclined seats, non-rising stem type turning counter-clockwise to open, 1375 kPa (200 pound) WOG. AWWA C509. The resilient seat shall be fastened to the gate with stainless steel fasteners or vulcanizing methods. The interior and exterior shall be coated with thermo-setting or fusion epoxy coating in accordance with AWWA C550.

2. Operator:

   a. Underground: Furnish valves with 2-inch nut for socket wrench operation. Valves shall comply with the requirements of NFPA 24.

3. Joints: Ends of valves shall accommodate, or be adapted to, pipe installed.

2.04. VALVE BOX:

A. Box with screw or slide-type adjustment and flared base. Minimum thickness of metal shall be 3/16 inch. Box shall be adapted, without full extension, to depth of cover required over pipe at valve location. Cast the word "WATER" in cover. Provide "T" handle socket wrenches of 5/8 inch round stock long enough to extend 2 feet above top of deepest valve box.

2.05. CAST IRON FRAME AND COVER, STEPS, ETC.:

A. Cast iron frame and cover, steps, etc. shall comply with State Department of Transportation standard details. Identify cover as “WATER”.

2.06. POTABLE WATER:

A. Water used for filling, flushing, and disinfection of water mains and appurtenances shall conform to Safe Drinking Water Act.

2.07. DISINFECTION CHLORINE:

A. Liquid chlorine shall conform to AWWA B301 and AWWA C651.

B. Sodium hypochlorite shall conform to AWWA B300 with 5 percent to 15 percent available chlorine.

C. Calcium hypochlorite shall conform to AWWA B300 supplied in granular form or 5g tablets, and shall contain 65 percent chlorine by weight.

2.10 WARNING TAPE

A. Standard, 4-Mil polyethylene 3-inch wide tape, detectable type, blue with black letters, and imprinted with “CAUTION BURIED WATER LINE BELOW”.

2.11 BACKFLOW PREVENTER

A. Reduced pressure detector backflow preventer assembly.

1. Manufacturer: Wilkins or Zurn Company or approved equal.

   a. Model 375DA, epoxy finish.

b. ASTM A536, Grade 4 ductile iron.

c. ASSE Listed 1047.

d. Full part OS&Y gate valves.

e. Stainless steel stem, ASTM A276.

f. EPDM seat disc elastomers.

g. Checks and relief valve assessible without removing the device from the line.

h. Stainless steel, 300 series springs.

i. Stainless steel, braided hose sensing line.

j. Accessories as indicated.

k. Tamper switch.

PART 3 EXECUTION

3.01. REGRADING:

A. Raise or lower existing valve and curb stop boxes and fire hydrants to finish grade in areas being graded.

3.02. PIPE LAYING, GENERAL:

A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Owner.

B. Connect new pipelines to existing underground water supplies (expose and pot hole to locate).

C. All pipe and fittings shall be subjected to a careful inspection just prior to being laid or installed. If any defective piping is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Government. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.

D. All buried piping shall be installed to the lines and grades as shown on the drawings. All underground piping shall slope uniformly between joints where elevations are shown.

E. Contractor shall exercise extreme care when installing piping to shore up and protect from damage all existing underground water line and power lines, and all existing structures.

F. Do not lay pipe on unstable material, in wet trench, or when trench or weather conditions are unsuitable.

G. Do not lay pipe in same trench with other pipes or utilities unless shown otherwise on drawings.

H. Hold pipe securely in place while joint is being made.

I. Do not walk on pipes in trenches until covered by layers of earth well tamped in place to a depth of 12 inches over pipe.

J. Full length of each section of pipe shall rest solidly upon pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipes on wood blocking.

K. Tees, plugs, caps, bends and hydrants on pipe installed underground shall be restrained. See section 3.05 RESTRAINED JOINTS.

L. Close pipe openings with caps or plugs during installation. Tightly cover and protect equipment against dirt, water and chemical, or mechanical injury. At completion of all work, thoroughly clean exposed materials and equipment.

M. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by the manufacturer.

N. Warning tape shall be continuously placed 12 inches above buried water pipes.

3.03. DUCTILE IRON PIPE:

A. Installing Pipe: Lay pipe in accordance with AWWA C600 with polyethylene encasement if required in accordance with AWWA C105. Provide a firm even bearing throughout the length of the pipe by tamping selected material at the sides of the pipe up to the spring line.

B. All pipe shall be sound and clean before laying. When laying is not in progress, the open ends of the pipe shall be closed by watertight plug or other approved means.

C. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Bevel cut ends of pipe to be used with push-on bell to conform to the manufactured spigot end. Cement lining shall be undamaged.

D. Jointing Ductile-Iron Pipe:

1. Push-on joints shall be made in strict accordance with the manufacturer’s instruction. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the bell of the pipe to which it is joined, and pushed home with approved means.

2. Mechanical Joints at Valves, Fittings: Install in strict accordance with AWWA C111. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber gaskets with soapy water before tightening the bolts. Bolts shall be tightened to the specified torque.

3. Ball Joints: Install in strict accordance with the manufacturer's instructions. Where ball joint assemblies occur at the face of structures, the socket end shall be at the structure and ball end assembled to the socket.

4. Flanged joints shall be in accordance with AWWA C115. Flanged joints shall be fitted so that the contact faces bear uniformly on the gasket and then are made up with relatively uniform bolt stress.

3.04. PVC PIPE:

A. PVC piping shall be installed in strict accordance with the manufacturer's instructions and AWWA 605. Place selected material and thoroughly compacted to one foot above the top of the pipe and thereafter back filled as specified in Section 31 23 00, EXCAVATION AND BACKFILLING.

B. Copper Tracer Wire: Copper tracer wire consisting of No. 14 AWG solid, single conductor, insulated copper wire shall be installed in the trench with all piping to permit location of the pipe with electronic detectors. The wire shall not be spiraled around the pipe nor taped to the pipe. Wire connections are to be made by stripping the insulation from the wire and soldering with rosin core solder. Solder joints shall be wrapped with rubber tape and electrical tape. At least every 1000 feet, provide a 2.3 kg (5 pound) magnesium anode attached to the main tracer wire by solder. The solder joint shall be wrapped with rubber tape and with electrical tape. An anode shall be attached at the end of each line.

C. Magnetic markers may be used in lieu of copper tracer wire to aid in future pipe locating. Generally, install markers on 20-foot centers. If pipe is in a congested piping area, install on 10-foot centers. Prepare as-built drawing indicating exact location of magnetic markers.

3.05. RESTRAINED JOINTS:

A. Sections of piping requiring restrained joints shall be constructed using pipe and fittings with restrained "locked-type" joints and the joints shall be capable of holding against withdrawal for line pressures 50 percent above the normal working pressure but not less than 1375 kPa (200 psi). The pipe and fittings shall be restrained push-on joints or restrained mechanical joints.

B. The minimum number of restrained joints required for resisting force at fittings and changes in direction of pipe shall be determined from the length of retained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil. Restrained pipe length shall be as shown on the drawings.

C. Restrained joint assemblies with ductile iron mechanical joint pipe shall be "Flex-Ring", "Lok-Ring", or mechanical joint coupled as manufactured by American Cast Iron Pipe Company, "Mega-Lug" or approved equal.

D. Ductile iron pipe bell and spigot joints shall be restrained with EBBA Iron Sales, Inc. Series 800 Coverall or approved equal.

E. Ductile iron mechanical joint fittings shall be restrained with EBBA Iron Sales, Inc. Series 1200 Restrainer. The restraining device shall be designed to fit standard mechanical joint bells with standard T head bolts conforming to AWWA C111 and AWWA C153. Glands shall be manufactured of ductile iron conforming to ASTM A536. Set screws shall be hardened ductile iron and require the same torque in all sizes. Steel set screws not

permitted. These devices shall have the stated pressure rating with a minimum safety factor of 2:1. Glands shall be listed with Underwriters Laboratories and/or approved by Factory Mutual.

F. Thrust blocks shall not be permitted.

G. Where ductile iron pipe manufactured with restrained joints is utilized, all restrained joints shall be fully extended and engaged prior to back filling the trench and pressurizing the pipe.

H. PVC pipe bell and spigot joints shall be restrained with the Uni-Flange Corp. Series 1350 Restrainer or approved equal. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A536. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy steel meeting the requirements of ASTM A242.

I. Ductile iron mechanical joint fittings used with PVC pipe shall be restrained with UNI-Flange Corp. Series 1300 Restrainer, EBBA Iron, Inc, Series 2000 PV Mechanical Joint Restrainer Gland, or approved equal. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A-536. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy steel meeting the requirements of ASTM A242.

3.06. PIPE SEPARATION:

A. Horizontal Separation-Water Mains and Sewers:

1. Water mains shall be located at least 10 feet horizontally from any proposed drain, storm sewer, sanitary or sewer service connection.

2. Water mains may be located closer than 10 feet to a sewer line when:

a. Local conditions prevent a lateral separation of 10 feet; and

b. The water main invert is at least 18 inches above the crown of the sewer; and

c. The water main is either in a separate trench or in the same trench on an undisturbed earth shelf located one side of the sewer.

3. When it is impossible to meet (1) or (2) above, both the water main and drain or sewer shall be constructed of mechanical joint ductile iron pipe. Ductile iron pipe shall comply with the requirements listed in this specification section. The drain or sewer shall be pressure tested to the maximum expected surcharge head before back filling.

B. Vertical Separation-Water Mains and Sewers:

1. A water main shall be separated from a sewer so that its invert is a minimum of 18 inches above the crown of the drain or sewer whenever water mains cross storm sewers, sanitary sewers or sewer service connections. The vertical separation shall be maintained for that portion of the wear main located within 10 feet horizontally of any sewer or drain crossed. A length of water main pipe shall be centered over the sewer to be crossed with joints equidistant from the sewer or drain.

2. Both the water main and sewer shall be constructed of slip-on or mechanical joint ductile iron pipe or PVC pipe equivalent to water main standards of construction when:

   a. It is impossible to obtain the proper vertical separations described in (1) above; or

   b. The water main passes under a sewer or drain.

3. A vertical separation of 18 inches between the invert of the sewer or drain and the crown of the water main shall be maintained where a water main crosses under a sewer. Support the sewer or drain lines to prevent settling and breaking the water main.

4. Construction shall extend on each side of the crossing until the perpendicular distance from the water main to the sewer or drain line is at least 10 feet.

3.07. SETTING OF VALVES AND BOXES:

A. Provide a surface concrete pad 18 by 18 by 6 inches to protect valve box when valve is not located below pavement.

B. Clean valve and curb stops interior before installation.

C. Set valve and curb stop box cover flush with finished grade.

D. Valves shall be installed plumb and level and in accordance with manufacturer's recommendations.

3.08. FLUSHING AND DISINFECTING:

A. Flush and disinfect new water lines in accordance with AWWA C651.

B. Initial flushing shall obtain a minimum velocity in the main of 0.75 m/sec (2.5 feet per second) at 40 PSI residual pressure in water main. The duration of the flushing shall be adequate to remove all particles from the line.

Pipe Diameter		Flow Required to Produce 2.5 ft/sec(approx.) Velocity in Main		Number of Hydrant Outlets Size of Tap. in. (mm)			
				1 (25)	1 ½ (38)	2(51)	2 1/2-in (64 mm)
In	(mm)	gpm	(L/sec)	Number of taps on pipe			
4	(100)	100	(6.3)	1	--	--	1
6	(150)	200	(12.6)	--	1	--	1
8	(200)	400	(25.2)	--	2	1	1
10	(250)	600	(37.9)	--	3	2	1

12	(300)	900	(56.8)	--	--	3	2
16	(400)	1,600	(100.9)	--	--	4	2

The backflow preventers shall not be in place during the flushing.

C. The Contractor shall be responsible to provide the water source for filling, flushing, and disinfecting the lines. Only potable water shall be used, and the Contractor shall provide all required temporary pumps, storage facilities required to complete the specified flushing, and disinfection operations.

D. The Contractor shall be responsible for the disposal of all water used to flush and disinfect the system in accordance with all governing rules and regulations. The discharge water shall not be allowed to create a nuisance for activities occurring on or adjacent to the site.

E. The bacteriological test specified in AWWA C651 shall be performed by a laboratory approved by the Health Department, Department of Environmental Quality of the State. The cost of sampling, transportation, and testing shall be the responsibility of the Contractor.

F. Re-disinfection and bacteriological testing of failed sections of the system shall be the sole responsibility of the Contractor.

G. Before backflow preventers are installed, all upstream piping shall be thoroughly flushed.

3.09. HYDROSTATIC TESTING:

A. Hydrostatic testing of the system shall occur prior to disinfecting the system.

B. After new system is installed, except for connections to existing system and building, backfill at least 300 mm (12 inches) above pipe barrel, leaving joints exposed. The depth of the backfill shall be adequate to prevent the horizontal and vertical movement of the pipe during testing.

C. Prior to pressurizing the line, all joint restraints shall be completely installed and inspected.

D. If the system is tested in sections, and at the temporary caps at connections to the existing system and buildings, the Contractor shall provide and install all required temporary thrust restraints required to safely conduct the test.

E. The Contractor shall install corporation stops in the line as required to purge the air out of the system. At the completion of the test, all corporation stops shall be capped.

F. The Contractor shall perform pressure and leakage tests for the new system for 2 hours to 1375 kPa (200 psi). Leakage shall not exceed the following requirements.

G. Copper Tubing: No leaks.

H. Ductile Iron Pipe: AWWA C600.

I. Polyvinyl Chloride (PVC) AWWA C605.

END OF SECTION

PART 1 GENERAL

1. 01 DESCRIPTION:

A. Outside, underground sanitary sewer system, complete, ready for operation, including connections to new building and structure, existing sanitary sewer lines, and existing sanitary structures, and all other incidentals to adjust existing system for new conditions.

1.02 RELATED WORK:

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 QUALITY ASSURANCE:

A. Products Criteria:

1. Multiple Units: When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.

2. Nameplates: Nameplate bearing manufacturer's name, or identifiable trademark, including model number, securely affixed in a conspicuous place on equipment, or name or trademark, including model number cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

B. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Sanitary Sewer lines and the extension, and/or modifications to Public Utility Systems.

1.04 SUBMITTALS:

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Manufacturers' Literature and Data: Submit the following as one package:

1. Pipe, Fittings, and, Appurtenances.

2. Jointing Material.

3. Gate Valves.

4. Valve Boxes.

5. Check Valves.

C. Shop drawings:

1. Layout drawings with pipe types, joints, joint restraints, pipe elevations, slope, location and relationship to building and other systems.

1.05 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society for Testing and Materials (ASTM):

A48/A48M-03 ..... Gray Iron Castings

A536-84(2004) ..... Ductile Iron Castings

A615/A615M-06 ..... Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

A625/A625M-03 ..... Tin Mill Products, Black Plate, Single Reduced

A746-03..... Ductile Iron Gravity Sewer Pipe

C12-06 ..... Installing Vitrified Clay Pipe Lines

C76-05b/C76M-05b..... Reinforced Concrete Culvert, Storm Drain and Sewer Pipe

C150-05 ..... Portland Cement

C425-04 ..... Compression Joints for Vitrified Clay Pipe and Fittings

C478-06a/C478M-06a .. Precast Reinforced Concrete Manhole Sections

C700-05 ..... Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated

C828-03 ..... Low-Pressure Air Test of Vitrified Clay Pipe Lines

C857-95(2001)..... Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

D698-00ae1 ..... Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))

D2321-05 ..... Underground Installation of Thermoplastic Pipes for Sewers and Other Gravity-Flow Applications

D2412-02 ..... Determination of External Loading Characteristics of Plastic Pipe by Parallel- Plate Loading

D2992-01 ..... Practice for Obtaining Hydrostatic or Pressure Design Basis for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings

D3034-04a ..... Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

D3212-96a (2003) e1 .... Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

D3261-03 ..... Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

D3350-05 ..... Polyethylene Plastics Pipe and Fittings Materials

D4101-05a. ..... Polypropylene Injection and Extrusion Materials

F477-02e1 ..... Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F679-06 ..... Poly (vinyl chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

F714-05 ..... Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

F794-03 ..... Poly (Vinyl Chloride) (PVC) Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter

F894-05 ..... Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe

F949-03 ..... Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings

D. American Water Works Association (AWWA):

C105/A21.5-05 ..... Polyethylene Encasement for Ductile Iron Pipe Systems

C110/A21.10-03 ..... Ductile-Iron and Gray-Iron Fittings for Water

C111/A21.11-00 ..... Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings

C115-99 ..... Flanged Ductile-Iron Pipe with Threaded Flanges

C116-03 ..... Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile Iron Pipe and Gray Iron Fittings for Water Supply Service

C151-/A21.51-02 ..... Ductile-Iron Pipe, Centrifugally Cast for Water

C153-00 ..... Ductile-Iron Compact Fittings for Water Services

C508-01 ..... Swing Check Valves for Waterworks, 2 inches (50 mm) Through 24 inches (600 mm) NPS

C509-01 ..... Resilient Seated Gate Valves for Water-Supply Service

C515-01 ..... Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service

C512-04 ..... Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service

C550-05 ..... Protective Epoxy Interior Coatings for Valves and Hydrants

C600-05 ..... Installation for Ductile-Iron Water Mains and Their Appurtenances

C605-94 ..... Underground Installation of Polyvinyl (PVC) Pressure Pipe and Fittings for Water

C900-97 .....Polyvinyl Chloride (PVC) Pressure Pipe, 100 mm (4 inches) Through 300 mm (12 inches) for Water Distribution

C905-97 .....Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 350 mm through 1,200 mm (14 Inches through 48 Inches), for Water Transmission and Distribution

C906-99 .....Polyethylene (PE) Pressure Pipes and Fittings, 100 mm through 1575 mm (4 Inches through 63 Inches), for Water Distribution

D. American Association of State Highway and Transportation Officials (AASHTO):

M198-05.....Joints for Concrete Pipe, Manholes, and Precast Box Sections using Preformed Flexible Joint Sealants

E. Uni-Bell PVC Pipe Association:

Uni-B-6-98.....Recommended Practice Low Pressure Air Testing of Installed Sewer Pipe

PART 2 PRODUCTS

2.01 PIPING:

A. Gravity Flow Lines (Pipe and Fittings):

1. Polyvinyl Chloride (PVC):

a. Pipe and Fittings, 100 to 375 mm (4 to 15 inches) in diameter, shall conform to ASTM D3034. Pipe and fittings shall have elastomeric gasket joints providing a watertight seal when tested in accordance with ASTM D3212. Gaskets shall conform to ASTM F477. Solvent welded joints shall not be permitted.

b. Pipe and fittings, 450 to 900 mm (18 to 36 inches) in diameter, shall be solid wall or have a corrugated or ribbed exterior profile and a smooth interior. Pipe shall conform to the following:

1) Pipe and fittings shall conform to ASTM F949 corrugated sewer pipe with a smooth interior. The corrugated outer wall shall be fused to the smooth interwall at the corrugation valley. Pipe and fitting shall have a smooth bell, elastomeric joints conforming to ASTM D3212, and shall have a minimum pipe stiffness of 350 kPa (50 psi) at 5 percent deflection, when tested in accordance with ASTM D2412. Corrugation shall be perpendicular to the axis of the pipe to allow gaskets to be installed on field cut sections of pipe without the requirement for special fittings.

2) Ribbed wall PVC pipe and fittings shall conform to ASTM F794 ribbed sewer pipe with smooth interior pipe and fittings shall have a smooth bell, elastomeric joints conforming to ASTM D3212, and shall have a minimum pipe stiffness of 320 kPa (46 psi) when tested in accordance with ASTM D 2412, at 5 percent

vertical deflection. Joints shall not leak at 7.6 m (25 feet) of head under 5 percent deflection.

3) Solid wall pipe and fittings shall conform to ASTM F679, pipe and fittings shall gaskets conforming to ASTM F477, and shall be able to withstand a hydrostatic pressure of 345 kPa (50 psi).

2.02 JOINTING MATERIAL:

A. Gravity Flow Lines:

1. Polyvinyl Chloride (PVC) Pipe (Gravity Use): Joints, ASTM D3212. Elastomeric gasket, ASTM F477.

B. Gravity Flow with Secondary Containment: Tapered or straight bell and spigot with adhesive bond. Completed joint shall be equal or greater than the pressure rating of the pipe.

2.03 CONCRETE:

A. Concrete shall have a minimum compressive strength of 20 MPa (3000 psi) at 28 days. The cement shall be Type III conforming to ASTM C150. Concrete shall conform with the provisions of Division 03 of these specifications.

2.04 REINFORCING STEEL:

A. Reinforcing steel shall be deformed bars, ASTM A615, Grade 40 unless otherwise noted.

2.05 CONCRETE PROTECTIVE COATING:

A. Concrete coating for the interior of wet wells shall consist of an epoxy blended filler sealer, and a cross linked epoxy phenolic cured, resistant protective coating.

2.06 GATE VALVES:

A. AWWA C509, resilient seated gate valves rated for 1360 kPa (200 psi) WSP, reduced-wall resilient seated gates valves may be supplied in accordance with AWWA C515. Asbestos packing is prohibited. The interior and exterior of the valve shall be epoxy coated for AWWA C550.

B. Operation:

1. Shall turn counterclockwise to open.

2. Underground: 50 mm (2 inch) nut for socket wrench operation.

3. Above Ground and In Pits: Handwheels.

C. Joints: End of valve shall accommodate, or be adapted to, pipe furnished.

2.07 VALVE BOXES:

A. Cast iron extension box with screw or slide-type adjustment and flared base. Minimum thickness or metal shall be 5 mm (3/16 inch). Box shall be of such length as will be adapted, without full extension, to depth of cover required over pipe at valve location.

B. Cast the word "SEWER" on the cover.

C. Provide Three (3) "T" handle socket wrenches, of 16 mm (5/8 inch) round stock long enough to extend 600 mm (2 feet) above top of deepest valve box.

2.08 CHECK VALVES

A. Check valves shall be swing-check valves conforming to AWWA C508. The interior and exterior of the valve shall be epoxy coated per AWWA C550. The check valve shall be rated for minimum of 850 kPa (125 psi) working pressure.

2.09 WARNING TAPE:

A. Standard, .1mm (4Mil) polyethylene 76 mm (3 inch) wide tape detectable type, green with black letters and imprinted with “CAUTION BURIED SEWER LINE BELOW”.”

PART 3 EXECUTION

3.01 BUILDING SERVICE LINES:

A. Install sanitary sewer service lines to point of connection within approximately 1500 mm (5 feet) outside of buildings where service is required and make connections. Coordinate the invert and location of the service line with the Contractor installing the building lines.

B. Connections of service line to building piping shall be made after the new sanitary sewer system has been constructed, tested, and accepted for operation by the Owner. The Contractor shall install all temporary caps or plugs required for testing.

C. When building services have not been installed at the time when the sanitary sewer system is complete, provide temporary plugs or caps at the ends of all service lines. Mark the location and depth of the service lines with continuous warning tape placed 300 mm (12 inches) above service lines.

3.02 REGRADING:

A. Raise or lower existing manholes and structures frames and covers, cleanout frames and covers and valve boxes in regraded areas to finish grade. Carefully remove, clean and salvage cast iron frames and covers. Adjust the elevation of the top of the manhole or structure as detailed on the drawings. Adjust the elevation of the cleanout pipe riser, and reinstall the cap or plug. Reset cast iron frame and cover, grouting below and around the frame. Install concrete collar around reset frame and cover as specified for new construction.

B. During periods when work is progressing on adjusting manholes or structures cover elevations, the Contractor shall install a temporary cover above the bench of the structure or manhole. The temporary cover shall be installed above the high flow elevation within the structure, and shall prevent debris from entering the wastewater stream.

C. The Contractor shall comply with all OSHA confined space requirements when working within existing structures.

3.03 CONNECTIONS TO EXISTING MANHOLES:

A. During construction of new connections to existing manholes, it shall be the sole responsibility of the Contractor to maintain continued sanitary sewer service to all buildings and users upstream. The contractor shall provide, install, and maintain all pumping, conveyance system, dams, weirs, etc. required to maintain the continuous flow of sewage. All temporary measures required to meet this requirement shall be subject to the review of the Owner.

B. Core existing structure, install pipe at the design invert. Install an elastomeric gasket around the pipe, and grout the interstitial space between the pipe and the core.

C. The bench of the manhole shall be cleaned and reshaped to provide a smooth flowline for all pipes connected to the manhole.

D. Connections and alterations to existing manholes shall be constructed so that finished work conforms as nearly as practicable to the applicable requirements specified for new manholes, including concrete and masonry work, cutting and shaping.

3.04 GENERAL PIPING INSTALLATION:

A. Lay pipes true to line and grade. Gravity flow sewer shall be laid with bells facing upgrade. Pressure (force) mains shall have the bells facing the direction of flow.

B. Do not lay pipe on unstable material, in wet trench or when trench and weather conditions are unsuitable for the work.

C. Support pipe on compacted bedding material. Excavate bell holes only large enough to properly make the joint.

D. Inspect pipes and fittings, for defects before installation. Defective materials shall be plainly marked and removed from the site. Cut pipe shall have smooth regular ends at right angles to axis of pipe.

E. Clean interior of all pipe thoroughly before installation. When work is not in progress, open ends of pipe shall be closed securely to prevent entrance of storm water, dirt or other substances.

F. Lower pipe into trench carefully and bring to proper line, grade, and joint. After jointing, interior of each pipe shall be thoroughly wiped or swabbed to remove any dirt, trash or excess jointing materials.

G. Do not lay sewer pipe in same trench with another pipe or other utility. Sanitary sewers shall cross at least 600 mm (2 feet) below water lines.

H. Do not walk on pipe in trenches until covered by layers of bedding or backfill material to a depth of 300 mm (12 inches) over the crown of the pipe.

I. Warning tape shall be continuously placed 300 mm (12 inches) above sewer pipe

J. Install gravity sewer line in accordance with the provisions of these specifications and the following standards:

1. Polyvinyl Chloride (PVC) Piping: ASTM D2321.

3.05 CLEANOUTS:

A. 150 millimeters (6 inches) in diameter and consisting of a ductile iron 45 degree fitting on end of run, or combination Y fitting and l/8 bend in the run with ductile iron pipe extension, water tight plug or cap and cast frame and cover flush with finished grade. Center-set cleanouts, located in unpaved areas, in a 300 by 300 by 150 mm (12 by 12 by 6 inches) thick concrete slab set flush with adjacent finished grade. Where cleanout is in force main, provide a blind flange top connection. The center of the flange shall be equipped with a 50 mm (2 inches) base valve to allow the pressure in the line to be relieved prior to removal of the blind flange. Frames and covers for pressure (force) mains shall be 600 mm (24 inches) in diameter.

B. The top of the cleanout assembly shall be 50 mm (2 inches) below the bottom of the cover to prevent loads being transferred from the frame and cover to the piping.

3.06 SETTING OF GATE VALVES:

A. Avoid setting valves under pavement except where shown on the drawings.

B. Clean valve interior before installation.

C. Set valve plumb, restrain ends of valves when indicated on the drawing.

D. Set valve box cover flush with the finished grade. Valve box shall be centered over the operating nut.

3.07 SETTING OF CHECK VALVES:

A. Check valves shall be installed in a vault, direct burial of check valves shall not be permitted.

B. Check valves shall be set in the horizontal position, with adequate clearance to the structure to allow for movement of the lever and maintenance of the valve.

C. Clean the interior of the valve and check its operation prior to installation.

D. After installation, adjust the weight on the lever to provide proper operation in accordance with the manufacturer’s recommendations.

3.08 INSPECTION OF SEWERS:

A. Inspect and obtain the Owner's approval. Thoroughly flush out before inspection. Lamp test between structures and show full bore indicating sewer is true to line and grade. Lip at joints on the inside of gravity sewer lines are not acceptable.

3.09 TESTING OF SANITARY SEWERS:

A. Gravity

1. Air Test: Vitrified Clay Pipe ASTM C828. PVC Pipe, Uni-Bell Uni-B-6. Clean and isolate the section of sewer line to be tested. Plug or cap the ends of all branches, laterals, tees, wyes, and stubs to be included in the test to prevent air leakage. The line shall be pressurized to 28 kPa (4 psi) and allowed to stabilize. After pressure stabilization, the pressure shall be dropped to 24 kPa (3.5 psi) greater than the average back-pressure of any groundwater above the sewer. The minimum test time shall be as specified in Uni-Bell Uni-B-6.

2. Exfiltration Test:

   a. Subject pipe to hydrostatic pressure produced by head of water at depth of 900 mm (3 feet) above invert of sewer at upper manhole under test. In areas where ground water exists, head of water shall be 900 mm (3 feet) above existing water table. Maintain head of water for one hour for full absorption by pipe body before testing. During one-hour test period, measured maximum allowable rate of exfiltration for any section of sewer shall be 11 L (3.0 gallons) per hour per 30 m (100 feet).

   b. If measurements indicate exfiltration is greater than maximum allowable leakage, take additional measurements until leaks are located. Repair and retest.

B. Testing of Concrete Wet Well: No leakage with the wet well completely filled with water for a duration of 4 hours.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies materials and procedures for construction of outside, underground storm sewer systems that are complete and ready for operation. This includes piping, structures and all other incidentals.

B. New storm sewer systems shall be connected to existing on-site system. This includes adjustments to existing storm sewer structures.

C. Coordinate location of new piping with irrigation, water, electrical raceway and other site structures.

1.02 RELATED WORK

A. All Sections listed in the Table of Contents are a Condition of this Section.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe, and fittings in direct sunlight.

B. Handle manholes catch basins and storm water inlets according to manufacturer's written rigging instructions.

1.04 COORDINATION

A. Coordinate connection to storm sewer main with the Public Agency providing storm sewer off-site drainage.

B. Coordinate exterior utility lines and connections to building services up to the actual extent of building wall.

1.05 QUALITY ASSURANCE:

A. Products Criteria:

1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.

2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

1.06 SUBMITTALS

A. Submit in accordance with Division 01, Submittals, Shop Drawings Product Data and Samples.

B. Manufacturers' Literature and Data shall be submitted, as one package, for pipes, fittings and appurtenances, including jointing materials, hydrants, valves and other miscellaneous items.

C. Shop drawings:

Layout drawings with pipe types, joints, joint restraints, pipe elevations, slope, location and relationship to building and other systems.

1.07 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society for Testing and Materials (ASTM):

A185/A185M-07 ..... Steel Welded Wire Reinforcement, Plain, for Concrete

A242/A242M-04(2009).. High-Strength Low-Alloy Structural Steel

A615/A615M-09b ..... Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

C33/C33M-08..... Concrete Aggregates

C76-11 ..... Reinforced Concrete Culvert, Storm Drain, Pipe

C150/C150M-11..... Portland Cement

C443-10 ..... Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

C478-09 ..... Precast Reinforced Concrete Manhole Sections

C507-10b ..... Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe

C655-09 ..... Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe

C857-07 ..... Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

C891-09 ..... Installation of Underground Precast Concrete Utility Structures

C913-08 ..... Precast Concrete Storm Drain Structures

C923-08 ..... Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals

C924-02(2009)..... Testing Concrete Pipe by Low-Pressure Air Test Method

C990-09 ..... Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

C1479-10 ..... Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations

D448-08 ..... Sizes of Aggregate for Road and Bridge Construction

D698-07e1 ..... Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3))

D1056-07 ..... Flexible Cellular Materials—Sponge or Expanded Rubber

D1785-06 ..... Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

D2321-11 ..... Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

D3034-08 ..... Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

D3350-10 ..... Polyethylene Plastics Pipe and Fittings Materials

F477-10 ..... Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F679-08 ..... Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

F714-10 ..... Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

F794-03(2009) ..... Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter

F894-07 ..... Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe

F1417-11 ..... Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air

F1668-08 ..... Construction Procedures for Buried Plastic Pipe

C. American Association of State Highway and Transportation Officials (AASHTO):

M198-10 ..... Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

D. American Water Works Association (AWWA)

E. American Society of Mechanical Engineers (ASME):

A112.6.3-2001 ..... Floor and Trench Drains

A112.14.1-2003 ..... Backwater Valves

A112.36.2M-1991 ..... Cleanouts

F. American Concrete Institute (ACI):

318-05 ..... Structural Commentary and Commentary

350/350M-06 ..... Environmental Engineering Concrete Structures and Commentary

G. National Stone, Sand and Gravel Association (NSSGA): Quarried Stone for Erosion and Sediment Control

1.08 WARRANTY

A. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting there from within a period of one year from final acceptance. Further, the Contractor will furnish all manufacturers' and suppliers' written guarantees and warranties covering materials and equipment furnished under this Contract.

PART 2 PRODUCTS

2.01 FACTORY-ASSEMBLED PRODUCTS

A. Standardization of components shall be maximized to reduce spare part requirements. The Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

2.02 CONCRETE PIPE AND FITTINGS

A. Non-Reinforced-Concrete sewer pipe and fittings shall be ASTM C14, Class 3, with bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C443, rubber gaskets sealant joints with ASTM C990, bitumen or butyl-rubber sealant

B. Reinforced-Concrete sewer pipe and fittings shall be ASTM C76 or ASTM C655.

1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C443, rubber gaskets sealant joints with ASTM C990, bitumen or butyl-rubber sealant.

2. Class III: Wall A

2.03 CLEANOUTS

A. Cast-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

1. Top-Loading Classification(s): Heavy Duty

2. Pipe fitting and riser to cleanout shall be same material as main pipeline.

3. Plastic Cleanouts shall have PVC body with PVC threaded plug. Pipe fitting and riser to cleanout shall be of same material as main line pipe.

2.04 WARNING TAPE

A. Standard, 4-Mil polyethylene 3 inch (76 mm) wide tape detectable type, purple with black letters, and imprinted with "CAUTION BURIED STORM SEWER BELOW".

PART 3 EXECUTION

3.01 PIPE BEDDING

A. The bedding surface of the pipe shall provide a firm foundation of uniform density throughout the entire length of pipe. Concrete pipe requirements are such that when no bedding class is specified, concrete pipe shall be bedded in a soil foundation accurately shaped and rounded to conform with the lowest one-fourth of the outside portion of circular pipe. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall not be more than the length, depth, and width required for properly making the particular type of joint. Plastic pipe bedding requirements shall meet the requirements of ASTM D2321. Bedding, haunching and initial backfill shall be either Class IB or Class II material. Corrugated metal pipe bedding requirements shall conform to ASTM A798.

3.02 PIPING INSTALLATION

A. Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping as shown on the Drawings.

1. Adjust height and slope of pipe based on actual field conditions. Maintain minimum ground coverage, pipe slopes to minimize trench depths.

2. Field verify inverts of existing manholes, piping and other utilities prior to fabrication and installation of new manholes.

3. Adjust height of new manhole inlet as required to meet existing site conditions and maintain positive drainage. Adjust piping elevations, and slopes to transition to elevations of existing storm piping structures.

C. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

1. Do not lay pipe on unstable material, in wet trench or when trench and weather conditions are unsuitable for the work.

2. Support pipe on compacted bedding material. Excavate bell holes only large enough to properly make the joint.

3. Inspect pipes and fittings, for defects before installation. Defective materials shall be plainly marked and removed from the site. Cut pipe shall have smooth regular ends at right angles to axis of pipe.

4. Clean interior of all pipe thoroughly before installation. When work is not in progress, open ends of pipe shall be closed securely to prevent entrance of storm water, dirt or other substances.

5. Lower pipe into trench carefully and bring to proper line, grade, and joint. After jointing, interior of each pipe shall be thoroughly wiped or swabbed to remove any dirt, trash or excess jointing materials.

6. Do not walk on pipe in trenches until covered by layers of shading to a depth of 12 inches (300 mm) over the crown of the pipe.

7. Warning tape shall be continuously placed 12 inches (300 mm) above storm sewer piping.

D. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

E. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

F. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of micro-tunneling.

G. Install gravity-flow, non-pressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.

2. Install corrugated steel piping according to ASTM A798.

H. Existing stormwater drainage shall be maintained throughout construction utilizing temporary piping, pumps and other means as necessary.

3.03 REGRADING

A. Raise or lower existing manholes and structures frames and covers in regraded areas to finish grade. Carefully remove, clean and salvage cast iron frames and covers. Adjust the elevation of the top of the manhole or structure as detailed on the drawings. Reset cast iron frame and cover, grouting below and around the frame. Install concrete collar around reset frame and cover as specified for new construction.

B. During periods when work is progressing on adjusting manholes or structures cover elevations, the Contractor shall install a temporary cover above the bench of the structure or manhole. The temporary cover shall be installed above the high flow elevation within the structure, and shall prevent debris from entering the wastewater stream.

3.04 CONNECTIONS TO EXISTING MANHOLES

A. Make pipe connections and alterations to existing manholes so that finished work will conform as nearly as practicable to the applicable requirements specified for new manholes, including concrete and masonry work, cutting, and shaping.

B. Provide new cast and pre-cast concrete and reinforcing to adjust existing manholes to new grades and conditions.

3.05 CONNECTIONS

A. Connect non-pressure, gravity-flow drainage piping in building's storm building drains.

B. Encase entire connection fitting, plus 6-inch (150 mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

C. Make connections to existing piping and underground manholes.

1. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, use epoxy-bonding compound as interface between new and existing concrete and piping materials.

2. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

D. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use non-pressure-type flexible couplings where required to join gravity-flow, non-pressure sewer piping unless otherwise indicated.

2. Flexible couplings for same OD pipes.

3. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.

4. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

5. Use pressure-type pipe couplings for force-main joints.

3.06 IDENTIFICATION

A. Install green warning tape directly over piping and at outside edge of underground structures.

3.07 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Prior to final acceptance, provide a video record of all piping from the building to the municipal connection to show the lines are free from obstructions, properly sloped and joined.

1. Submit separate reports for each system inspection.

2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

c. Damage: Crushed, broken, cracked, or otherwise damaged piping.

d. Infiltration: Water leakage into piping.

e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Reinspect and repeat procedure until results are satisfactory.

3.08 TESTING OF STORM SEWERS:

A. Submit separate report for each test.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to requirements of authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.

4. Submit separate report for each test.

5. Air test gravity sewers. Concrete Pipes conform to ASTM C924, Plastic Pipes conform to ASTM F1417, all other pipe material conform to ASTM C828 or C924, after consulting with pipe manufacturer. Testing of individual joints shall conform to ASTM C1103.

6. Test force-main storm drainage piping. Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psi (1035 kPa).

C. Leaks and loss in test pressure constitute defects that must be repaired. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.09 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION