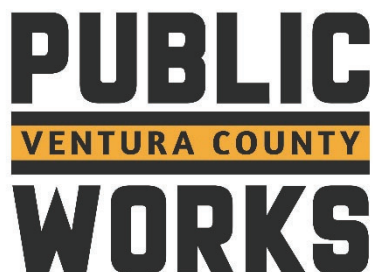


PLANS AND SPECIFICATIONS
FOR

**VENTURA COUNTY
MEDICAL CENTER
(VCMC) NORTH TOWER MRI**

SPECIFICATION NO. CP23-05

PROJECT NO. P6T21010



county of ventura
ENGINEERING SERVICES

COUNTY OF VENTURA PUBLIC WORKS AGENCY

NOTICE INVITING BIDS, PROJECT INFORMATION FORM, & SPECIFICATIONS

FOR

PROJECT NAME: VCMC NORTH TOWER MRI

LOCATION: 300 Hillmont Avenue, Ventura, CA 93003

SPEC. NO.: CP23-05

COST ACCOUNTING PROJECT NO.: P6T21010

DESIGNED BY: SWA Architects

CHECKED BY: Tina Go

REVIEWED BY: Shawna Schlageter

PROJECT MANAGER: Shawna Schlageter



RECOMMENDED BY:


Project Manager

APPROVED BY:


Deputy Director of Public Works Agency

APPROVED BY:


Director of Public Works Agency

Construction bidding documents, including plans, specifications, addenda and any supplementary documents are only available on the Ventura County Public Works Agency Web Site.

NOTICE TO BIDDERS, SUBCONTRACTORS AND SUPPLIERS **SOURCES OF INFORMATION**

DURING BIDDING PERIOD

PROJECT DOCUMENTS, PLAN HOLDERS LIST, & OTHER INFORMATION IS AVAILABLE
ON THE INTERNET AT THE BONFIRE WEBSITE AT:

<https://ventura.bonfirehub.com/portal/?tab=openOpportunities#department=Public%20Works%20Agency>

All questions concerning the plans, specifications, requirements, terms, schedule, addenda, and any other matters related to the solicitations shall be submitted using the Bonfire web site using the "Opportunity Q&A" tab.

Submit any questions early in the bidding period as an addendum may be required.

All addenda will be issued using the Bonfire web site.

Please do not call other staff members or consultant.

Note that our consultants are directed to refer all calls to the Project Managers.

AFTER BID OPENING

BID RESULTS are available on <https://www.vcpbublicworks.org/es/bidsandsubs/>,

AFTER AWARD OF CONTRACT

ALL QUESTIONS concerning project **AFTER AWARD** should be directed to the
Project Manager named in the Notice of Award

Any other information can be requested at (805) 654-2039

COUNTY OF VENTURA
VCMC NORTH TOWER MRI
SPECIFICATION NO.: CP23-05
PROJECT NO.: P6T21010

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COUNTY OF VENTURA

NOTICE INVITING FORMAL BIDS

Bids will be received, electronically, until **2:00 p.m.** on **August 10, 2023**, for **Ventura County Medical Center North Tower MRI**, Specification No. **CP23-05**, which consists of construction and renovation of an existing shell space to provide a new MRI exam room, control room and supporting equipment room. Construction includes new walls, RF Shielding, MEP for equipment in all rooms and new interior finishes.

Bids must be submitted on-line through Bonfire at:

<https://ventura.bonfirehub.com/portal/?tab=openOpportunities#department=Public%20Works%20Agency>

After the deadline for receiving bids, the bids will be opened, and the results made public.

The estimated cost of construction is \$ **1,500,000.00**.

All bidding documents, including plans, specifications, addenda, and any supplementary documents are available on the Bonfire website shown above.

A list of Plan Holders is available on the Bonfire website shown above.

An abstract of bids received will be available at <https://www.vcpublishworks.org/es/bidsandsubs/>

When projects are awarded, the award notification to the State will be posted at <https://www.vcpublishworks.org/es/awardedcontracts/>

Bids must be submitted electronically, using the forms provided, on the Bonfire Website.

Subcontractor list must include a valid Contractor's License Number. Contractor and any subcontractors must be registered with the Department of Industrial Relations prior to bid time.

Each bid must be accompanied by a bid guarantee in the amount of not less than 10% of the amount bid, **PAYABLE TO THE COUNTY OF VENTURA** and guaranteeing that the bidder will enter into a contract in accordance with the terms of the bidding documents, if award is made. The bid guarantee shall be in one of the following forms: a bid bond written by an admitted surety insurer on the form included with the Proposal form, a cashier's check drawn by a national bank, a check certified by a national bank or cash. Bid bonds must be submitted in hard copy with the original signatures of the principal and surety. Copies of the completed bond will not be accepted.

Bidders must have a **Class B** California Contractors License. Upon award, the Contractor will be required to furnish a Performance Bond and a Payment Bond, each in the amount of 100% of the contract price.

In accordance with Section 22300 of the Public Contract Code, securities may be substituted for funds withheld.

Bidders, contractors, and other interested parties can obtain wage rates pertaining to Ventura County projects at the link provided below.

California general prevailing wage rates for construction can be obtained from the following Web site: <http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm>.

The awarded contractor must post copies of the prevailing wage determinations at each job site.

PROJECT INFORMATION

FOR

VENTURA COUNTY MEDICAL CENTER NORTH TOWER MRI

**LOCATED IN
VENTURA COUNTY, CALIFORNIA**

**MAKE BID GUARANTEE TO COUNTY OF VENTURA
USE FORM PROVIDED (SEE PARAGRAPH 9, INSTRUCTION TO BIDDERS).**

SPECIFICATION NO. CP23-05 INCLUDING 97 SHEETS OF PLANS

BIDS WILL BE RECEIVED ELECTRONICALLY UNTIL AUGUST 10, 2023 AT 2:00 P.M.

AGENCY IS ALLOWED 90 DAYS TO AWARD A CONTRACT (SEE SECTION 2-1.1).

THE STARTING DATE OF CONTRACT WILL BE 28 CALENDAR DAYS AFTER AWARD OF CONTRACT (SEE SECTION 6-7.4).

COMPLETION TIME IS 125 WORKING DAYS (SEE SECTION 6-7).

LIQUIDATED DAMAGES ARE \$1,170.00 PER CALENDAR DAY (SEE SECTION 6-9).

CONTRACTOR'S LICENSE CLASSIFICATION REQUIRED IS CLASS B.

LIABILITY INSURANCE CLASS REQUIRED PER SECTION 7-4 IS L-B.

FEDERAL-AID CONTRACT PROVISIONS ARE NOT INCLUDED IN THESE SPECIFICATIONS.

NON-MANDATORY PREBID MEETING:

Date: 07/26/2023

Time: 01:00pm

Location: Ventura County Medical Center, 300 Hillmont Avenue Ventura, CA 93003.

(Section 10 00 01, Part 1, 1.02)

INSTRUCTION TO BIDDERS

1. LICENSING OF BIDDER. Before submitting bids, bidders shall be licensed in accordance with the provisions of Sections 7000 through 7145 of the Business and Professions Code of the State of California in the classification required for the work bid on. The bidder's license number, classification, and expiration date shall be inserted on Signature Sheet. The bidder's name shall correspond in all respects with the name shown on the license. License numbers and names are checked with the State.

2. SITE INSPECTION. Personally visit the worksite before submitting your bid to ascertain the existence of any surface or subsurface conditions affecting the cost of the work.

3. INTERPRETATION AND QUESTIONS. Carefully review the plans and specifications for any errors, omissions, or ambiguities. If you discover any or have specific questions, notify the Agency far enough in advance of the bid opening to allow time for the issuance of appropriate written addenda, if necessary. All questions concerning the plans, specifications, requirements, terms, schedule, addenda, and any other matters related to the solicitation shall be submitted through the Bonfire website using the "Opportunity Q&A" tab.

Written addenda shall be the sole means for modifying the plans and/or specifications prior to the bid opening. The Agency shall not be bound by oral communications purportedly modifying or interpreting the plans and/or specifications regardless of when or by whom such oral communications are made and you should not rely upon such oral communications in preparing your bid. Addenda will be posted on the Bonfire web site.

4. BID ITEMS. State in figures the unit prices, lump sum prices and extensions as indicated which shall be the prices for which you propose to supply all materials and services and perform all work required by the plans and specifications. All items described are to be construed as complete and in place. Include in the bid amount for items listed in the Bid Table the cost of performing all work shown on the plans or required by the specifications for which a specific bid item is not provided. Bid on all items listed under Schedule of Work and Prices unless otherwise indicated in the Bid Table.

5. SIGNING OF BID. Fill in all indicated blanks on the various forms provided. Bids will only be accepted if submitted electronically using the Bonfire website. Bids signed by an agent other than an owner, partner or corporate officer shall be accompanied by a power-of-attorney.

6. NON-COLLUSION AFFIDAVIT. The non-collusion affidavit required by Public Contract Code 7106 is included as a required document on the Bonfire website.

7. BID FORM NOT TO BE ALTERED. Do not change the wording of the Bid documents. Any additions, deletions, conditions, limitations or provisions by the bidder will render the Bid irregular and may cause its rejection.

8. CORRECTING BID. Corrections or adjustments to bids must be done using the Bonfire website and must be completed prior to the Bid Closure date and time.

9. **BID GUARANTEE.** A Bid Guarantee in the amount of not less than 10% of the amount bid and guaranteeing that the bidder will enter into a contract in accordance with the terms of the bidding documents if award is made to him must be submitted. The bid guarantee shall be in one of the following forms: A bid bond written by an admitted surety insurer on the form provided, a cashier's check drawn by a national bank, a check certified by a national bank or cash.

Original hard copies of the Bid Guarantee must be submitted and received by the County prior to the Time of Bid Closure. Bid Guarantee shall be mailed or delivered to:

Public Works Agency, County of Ventura
County Surveyor's Public Counter - 3rd Floor
Hall of Administration
800 South Victoria Ave.
Ventura, California 93009-1670.

For proper handling, mark the envelope as "BID GUARANTEE – SEALED BID" and show the specification number, project title, and the Bidder's name and address.

The bid bond must have the original wet signatures of the principal and surety.

Note: Performance and Payment Bonds are required from the bidder to whom a contract is awarded. See specifications Subsection 2-4 for contract bond requirements including limitations on the sureties that may issue the bonds.

10. **SUBMITTING BID.** Submit your bid using the Bonfire website at:

www.ventura.bonfirehub.com

Only bids submitted via the Bonfire website will be considered. All documentation listed as required on that website must be completed and submitted.

11. **TIME OF BID CLOSURE.** The time and date of the Bid closure is indicated on the Bonfire website solicitation as "Close Date". No bids will be accepted after that time.

12. **REVISION OR WITHDRAWAL OF BID.** Bids submitted using the Bonfire website can only be revised or withdrawn using the website. Once submitted, a bid that requires revisions or withdrawal must be accessed via the "Completed" tab under the "Your Submissions" section and action taken to revise or "unsubmit" (withdraw).

13. **ERRORS.** Bidder will not be released on account of errors. Bids submitted using the Bonfire website will be considered final. Bidders shall be careful to ensure all information that is submitted is complete and accurate.

14. **SUBCONTRACTOR LICENSE NUMBERS.** License numbers for subcontractors must be provided at the time the bid is received using the forms provided.

15. **PUBLIC WORKS CONTRACTOR REGISTRATION PROGRAM.** No contractor or subcontractor may be listed on a bid for a public works project 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)]

No contractor or subcontractor may be awarded a contract for public work on a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5

16. **LABOR COMPLIANCE MONITORING.** This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

The Prime Contractor shall post job site notices prescribed by regulation.

(See Chapter 8, California Code Regulation section 16451(d) for notice that previously was required for projects monitored by the Compliance Monitoring Unit.)

Printed Name of Officer:

LIST OF SUBCONTRACTORS

CONTRACTOR NAME: _____

Listing shall comply with the provisions of California Public Contract Code, Section 4104.

Name of Subcontractor	Contractor's License Number	Contractor's DIR Registration Number	Business Address	Items of Work

If more space is needed, add additional pages.

Public Contract Code Section 4104 provides that bidders must list:

- (a)(1) The name, the location of the place of business, and the California contractor license number of each subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State of California who, under subcontract to the prime contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of 1 percent of the prime contractor's total bid or, in the case of bids or offers for the construction of streets or highways, including bridges, in excess of one-half of 1 percent of the prime contractor's total bid or ten thousand dollars (\$10,000), whichever is greater.
- (b) The portion of the work that will be done by each subcontractor under this act. The prime contractor shall list only one subcontractor for each portion as is defined by the prime contractor in his or her bid.

BID TABLE

Schedule of work and prices for: VCMC NORTH TOWER MRI

Item No.	Units	Approx. Quantity	Item Description	Payment Reference	Unit-Prices (In Figures)	Item Total (In Figures)
1	LS	1	All Work Per Plans & Specifications	9-2		
			Total Amount Bid			

Bid Table is shown here for informational purposes.

Bid Table shall be filled out by Bidders using the Bonfire website. Bidders will access the Schedule of Work and Prices on the Bonfire website and input their Unit Prices.

SIGNATURE SHEET

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone Number: (____)____-_____

Email Address: _____

I make this proposal and certify or declare under penalty of perjury under the laws of the State of California that:

- The statements and attestations made and associated with this Proposal, and below my signature, are true and correct.
- The bidder has read the Bid documents and has abided by and agrees to the conditions herein and has carefully examined the project plans and read the specifications and does hereby propose to furnish all materials and do all the work required to complete the work in accordance with the plans and specifications for the unit prices or lump sums named in the Bid Table.
- The bidder, as Principal, acknowledges himself as being bound by the attached bond or other acceptable bid guarantee.

Dated: _____ At: _____
(City and State)

Signature: _____

Printed Name: _____

Position: _____
(Sole Owner, Partner, President, etc.)

Company Name: _____ Type of Organization: _____
(Individual, Partnership, Corp.)

License No.: _____ License Classification: _____

License Expiration Date: _____

BID BOND

Enter }
Name & }
Address }
of Bonding }
Company }

KNOW ALL MEN BY THESE PRESENTS: That we _____

_____, Principal,

and _____

_____, Surety, are held and firmly bound
unto

COUNTY OF VENTURA Obligee,
in the sum of Ten Percent of the total amount of the Bid for the payment of which we bind ourselves,
our legal representatives, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has submitted or is about to submit a bid or proposal to Obligee on a contract for
VENTURA COUNTY MEDICAL CENTER (VCMC) NORTH TOWER MRI

NOW, THEREFORE, if that contract be awarded to principal and principal shall, within such time as
specified, duly execute the contract in the prescribed form and deliver the same to obligee with all required
bonds/performance securities, certificates of insurance and such other items as required in the bidding or
contract documents then this obligation shall be null and void; otherwise to remain in full force and effect,
and if the contract is awarded to principal and principal fails, within the time specified, to duly execute the
contract in the prescribed form and deliver the same to obligee with all said required items, then surety
shall pay obligee the full sum of this bond.

Surety, for value received, hereby agrees that no extension of time, change, alteration, modification, or
addition to the bidding or contract documents, 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 same.

Signed, sealed and dated

(Principal)

by _____ (Seal)

(Surety)

by _____
Attorney-in-Fact

INDICATE COMPLETE ADDRESS OF SURETY TO WHICH
CORRESPONDENCE CONCERNING THIS BOND SHOULD BE
DIRECTED.

Telephone No. _____

PREVAILING WAGE INFORMATION

**COUNTY OF VENTURA
PUBLIC WORKS AGENCY**

PREVAILING RATES OF WAGES

As provided in Subsection 7-2.2 of these specifications, and in accordance with Section 1770 (*Amended by Stats. 2017, Ch. 28, Sec. 17. (SB 96) Effective June 27, 2017*), et. seq. of the California Labor Code, determinations of the generally prevailing wages for various classes of workers in Ventura County have been made by the California Director of Industrial Relations as required by the California Labor Code.

As required by California Labor Code Section 1777.5, properly indentured apprentices shall be employed on the work in the minimum ratio of not less than one apprentice for each five journeymen in a craft or trade classification. Travel and subsistence shall be paid in accordance with California Labor Code Section 1773.8.

The body awarding the contract shall cause to be inserted in the contract stipulations to effectuate this section. The stipulations shall fix the responsibility of compliance with this section for all apprenticeable occupations with the prime contractor.

The determinations made by the State are available on the Internet at

<http://www.dir.ca.gov/DLSR/PWD/Index.htm>

and are on file in the office of the Public Works Agency

The rate fixed for each craft, classification, or type of work shall be not less than the prevailing rate paid in the craft, classification, or type of work.

The Contractor shall post a copy of the wage rates at each jobsite at a location readily available to the workers.

EXCERPTS FROM THE CALIFORNIA LABOR CODE

Excerpts from the California Labor Code

These excerpts from the Labor Code include the sections listed in specification Section 7.2.2.2 that are required by Labor Code 1775(b)(1) to be included in all subcontracts. These excerpts also include sections recommended by the CA Department of Industrial Relations that contain information on the contractor registration requirements. These sections are furnished for the convenience of the contractor and in no way limit the required compliance with all laws.

1725.5. A contractor shall be registered pursuant to this section to be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code or engage in the performance of any public work contract that is subject to the requirements of this chapter. For the purposes of this section, "contractor" includes a subcontractor as defined by Section 1722.1.

(a) To qualify for registration under this section, a contractor shall do all of the following:

(1) (A) Register with the Department of Industrial Relations in the manner prescribed by the department and pay an initial nonrefundable application fee of four hundred dollars (\$400) to qualify for registration under this section and an annual renewal fee on or before July 1 of each year thereafter. The annual renewal fee shall be in a uniform amount set by the Director of Industrial Relations, and the initial registration and renewal fees may be adjusted no more than annually by the director to support the costs specified in Section 1771.3.

(B) Beginning June 1, 2019, a contractor may register or renew according to this subdivision in annual increments up to three years from the date of registration. Contractors who wish to do so will be required to prepay the applicable nonrefundable application or renewal fees to qualify for the number of years for which they wish to preregister.

(2) Provide evidence, disclosures, or releases as are necessary to establish all of the following:

(A) Workers' compensation coverage that meets the requirements of Division 4 (commencing with Section 3200) and includes sufficient coverage for any worker whom the contractor employs to perform work that is subject to prevailing wage requirements other than a contractor who is separately registered under this section. Coverage may be evidenced by a current and valid certificate of workers' compensation insurance or certification of self-insurance required under Section 7125 of the Business and Professions Code.

(B) If applicable, the contractor is licensed in accordance with Chapter 9 (commencing with Section 7000) of the Business and Professions Code.

(C) The contractor does not have any delinquent liability to an employee or the state for any assessment of back wages or related damages, interest, fines, or penalties pursuant to any final judgment, order, or determination by a court or any federal, state, or local administrative agency, including a confirmed arbitration award. However, for purposes of this paragraph, the contractor shall not be disqualified for any judgment, order, or determination that is under appeal, provided that the contractor has secured the payment of any amount eventually found due through a bond or other appropriate means.

(D) The contractor is not currently debarred under Section 1777.1 or under any other federal or state law providing for the debarment of contractors from public works.

(E) The contractor has not bid on a public works contract, been listed in a bid proposal, or engaged in the performance of a contract for public works without being lawfully registered in accordance with this section, within the preceding 12 months or since the effective date of the requirements set forth in subdivision (e), whichever is earlier. If a contractor is found to be in violation of the requirements of this paragraph, the period of disqualification shall be waived if both of the following are true:

(i) The contractor has not previously been found to be in violation of the requirements of this paragraph within the preceding 12 months.

(ii) The contractor pays an additional nonrefundable penalty registration fee of two thousand dollars (\$2,000).

(b) Fees received pursuant to this section shall be deposited in the State Public Works Enforcement Fund established by Section 1771.3 and shall be used only for the purposes specified in that section.

(c) A contractor who fails to pay the renewal fee required under paragraph (1) of subdivision (a) on or before the expiration of any prior period of registration shall be prohibited from bidding on or engaging in the performance of any contract for public work until once again registered pursuant to this section. If the failure to pay the renewal fee was inadvertent, the contractor may renew its registration retroactively by paying an additional nonrefundable penalty renewal fee equal to the amount of the renewal fee within 90 days of the due date of the renewal fee.

(d) If, after a body awarding a contract accepts the contractor's bid or awards the contract, the work covered by the bid or contract is determined to be a public work to which Section 1771 applies, either as the result of a determination by the director pursuant to Section 1773.5 or a court decision, the requirements of this section shall not apply, subject to the following requirements:

(1) The body that awarded the contract failed, in the bid specification or in the contract documents, to identify as a public work that portion of the work that the determination or decision subsequently classifies as a public work.

(2) Within 20 days following service of notice on the awarding body of a determination by the Director of Industrial Relations pursuant to Section 1773.5 or a decision by a court that the contract was for public work as defined in this chapter, the contractor and any subcontractors are registered under this section or are replaced by a contractor or subcontractors who are registered under this section.

(3) The requirements of this section shall apply prospectively only to any subsequent bid, bid proposal, contract, or work performed after the awarding body is served with notice of the determination or decision referred to in paragraph (2).

(e) The requirements of this section shall apply to any bid proposal submitted on or after March 1, 2015, to any contract for public work, as defined in this chapter, executed on or after April 1, 2015, and to any work performed under a contract for public work on or after January 1, 2018, regardless of when the contract for public work was executed.

(f) This section does not apply to work performed on a public works project of twenty-five thousand dollars (\$25,000) or less when the project is for construction, alteration, demolition, installation, or repair work or to work performed on a public works project of fifteen thousand dollars (\$15,000) or less when the project is for maintenance work.

(Amended by Stats. 2017, Ch. 28, Sec. 15. (SB 96) Effective June 27, 2017.)

1771. Except for public works projects of one thousand dollars (\$1,000) or less, not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the public work is performed, and not less than the general prevailing rate of per diem wages for holiday and overtime work fixed as provided in this chapter, shall be paid to all workers employed on public works.

This section is applicable only to work performed under contract, and is not applicable to work carried out by a public agency with its own forces. This section is applicable to contracts let for maintenance work.

(Amended by Stats. 1981, Ch. 449, Sec. 1.)

1771.1. (a) A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.

(b) Notice of the requirement described in subdivision (a) shall be included in all bid invitations and public works contracts, and a bid shall not be accepted nor any contract or subcontract entered into without proof of the contractor or subcontractor's current registration to perform public work pursuant to Section 1725.5.

(c) An inadvertent error in listing a subcontractor who is not registered pursuant to Section 1725.5 in a bid proposal shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive, provided that any of the following apply:

(1) The subcontractor is registered prior to the bid opening.

(2) Within 24 hours after the bid opening, the subcontractor is registered and has paid the penalty registration fee specified in subparagraph (E) of paragraph (2) of subdivision (a) of Section 1725.5.

(3) The subcontractor is replaced by another registered subcontractor pursuant to Section 4107 of the Public Contract Code.

(d) Failure by a subcontractor to be registered to perform public work as required by subdivision

(a) shall be grounds under Section 4107 of the Public Contract Code for the contractor, with the consent of the awarding authority, to substitute a subcontractor who is registered to perform public work pursuant to Section 1725.5 in place of the unregistered subcontractor.

(e) The department shall maintain on its Internet Web site a list of contractors who are currently registered to perform public work pursuant to Section 1725.5.

(f) A contract entered into with any contractor or subcontractor in violation of subdivision (a) shall be subject to cancellation, provided that a contract for public work shall not be unlawful, void, or voidable solely due to the failure of the awarding body, contractor, or any subcontractor to comply with the requirements of Section 1725.5 or this section.

(g) If the Labor Commissioner or his or her designee determines that a contractor or subcontractor engaged in the performance of any public work contract without having been registered in accordance with this section, the contractor or subcontractor shall forfeit, as a civil penalty to the state, one hundred dollars (\$100) for each day of work performed in violation of the registration requirement, not to exceed an aggregate penalty of eight thousand dollars (\$8,000) in addition to any penalty registration fee assessed pursuant to clause (ii) of subparagraph (E) of paragraph (2) of subdivision (a) of Section 1725.5.

(h) (1) In addition to, or in lieu of, any other penalty or sanction authorized pursuant to this chapter, a higher tiered public works contractor or subcontractor who is found to have entered into a subcontract with an unregistered lower tier subcontractor to perform any public work in violation of the requirements of Section 1725.5 or this section shall be subject to forfeiture, as a civil penalty to the state, of one hundred dollars (\$100) for each day the unregistered lower tier subcontractor performs work in violation of the registration requirement, not to exceed an aggregate penalty of ten thousand dollars (\$10,000).

(2) The Labor Commissioner shall use the same standards specified in subparagraph (A) of paragraph (2) of subdivision (a) of Section 1775 when determining the severity of the violation and what penalty to assess, and may waive the penalty for a first time violation that was unintentional and did not hinder the Labor Commissioner's ability to monitor and enforce compliance with the requirements of this chapter.

(3) A higher tiered public works contractor or subcontractor shall not be liable for penalties assessed pursuant to paragraph (1) if the lower tier subcontractor's performance is in violation of the requirements of Section 1725.5 due to the revocation of a previously approved registration.

(4) A subcontractor shall not be liable for any penalties assessed against a higher tiered public works contractor or subcontractor pursuant to paragraph (1). A higher tiered public works contractor or subcontractor may not require a lower tiered subcontractor to indemnify or otherwise be liable for any penalties pursuant to paragraph (1).

(i) The Labor Commissioner or his or her designee shall issue a civil wage and penalty assessment, in accordance with the provisions of Section 1741, upon determination of penalties pursuant to subdivision (g) and subparagraph (B) of paragraph (1) of subdivision (h). Review of a civil wage and penalty assessment issued under this subdivision may be requested in accordance with the provisions of Section 1742. The regulations of the Director of Industrial Relations, which govern proceedings for review of civil wage and penalty assessments and the withholding of contract payments under Article 1 (commencing with Section 1720) and Article 2 (commencing with Section 1770), shall apply.

(j) (1) Where a contractor or subcontractor engages in the performance of any public work contract without having been registered in violation of the requirements of Section 1725.5 or this section, the Labor Commissioner shall issue and serve a stop order prohibiting the use of the unregistered contractor or the unregistered subcontractor on all public works until the unregistered contractor or unregistered subcontractor is registered. The stop order shall not apply to work by registered contractors or subcontractors on the public work.

(2) A stop order may be personally served upon the contractor or subcontractor by either of the following methods:

(A) Manual delivery of the order to the contractor or subcontractor personally.

(B) Leaving signed copies of the order with the person who is apparently in charge at the site of the public work and by thereafter mailing copies of the order by first class mail, postage prepaid to the contractor or subcontractor at the address on file with either of the following:

(i) The Contractors' State License Board.

(ii) The Secretary of State.

(3) The stop order shall be effective immediately upon service and shall be subject to appeal by the party contracting with the unregistered contractor or subcontractor, by the unregistered contractor or subcontractor, or both. The appeal, hearing, and any further review of the hearing decision shall be governed by the procedures, time limits, and other requirements specified in subdivision (a) of Section 238.1.

(k) Failure of a contractor or subcontractor, owner, director, officer, or managing agent of the contractor or subcontractor to observe a stop order issued and served upon him or her pursuant to subdivision (j) is guilty of a misdemeanor punishable by imprisonment in county jail not exceeding 60 days or by a fine not exceeding ten thousand dollars (\$10,000), or both.

(l) This section shall apply to any bid proposal submitted on or after March 1, 2015, and any contract for public work entered into on or after April 1, 2015. This section shall also apply to the performance of any public work, as defined in this chapter, on or after January 1, 2018, regardless of when the contract for public work was entered.

(m) Penalties received pursuant to this section shall be deposited in the State Public Works Enforcement Fund established by Section 1771.3 and shall be used only for the purposes specified in that section.

(n) This section shall not apply to work performed on a public works project of twenty-five thousand dollars (\$25,000) or less when the project is for construction, alteration, demolition, installation, or repair work or to work performed on a public works project of fifteen thousand dollars (\$15,000) or less when the project is for maintenance work.

(Amended by Stats. 2018, Ch. 455, Sec. 2. (SB 877) Effective September 17, 2018.)

1775. (a) (1) The contractor and any subcontractor under the contractor shall, as a penalty to the state or political subdivision on whose behalf the contract is made or awarded, forfeit not more than two hundred dollars (\$200) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rates as determined by the director for the work or craft in which the worker is employed for any public work done under the contract by the contractor or, except as provided in subdivision (b), by any subcontractor under the contractor.

(2) (A) The amount of the penalty shall be determined by the Labor Commissioner based on consideration of both of the following:

(i) Whether the failure of the contractor or subcontractor to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily corrected when brought to the attention of the contractor or subcontractor.

(ii) Whether the contractor or subcontractor has a prior record of failing to meet its prevailing wage obligations.

(B) (i) The penalty may not be less than forty dollars (\$40) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rate, unless the failure of the contractor or subcontractor to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily corrected when brought to the attention of the contractor or subcontractor.

(ii) The penalty may not be less than eighty dollars (\$80) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rate, if the contractor or subcontractor has been assessed penalties within the previous three years for failing to meet its prevailing wage obligations on a separate contract, unless those penalties were subsequently withdrawn or overturned.

(iii) The penalty may not be less than one hundred twenty dollars (\$120) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rate, if the Labor Commissioner determines that the violation was willful, as defined in subdivision (c) of Section 1777.1.

(C) If the amount due under this section is collected from the contractor or subcontractor, any outstanding wage claim under Chapter 1 (commencing with Section 1720) of Part 7 of Division 2 against that contractor or subcontractor shall be satisfied before applying that amount to the penalty imposed on that contractor or subcontractor pursuant to this section.

(D) The determination of the Labor Commissioner as to the amount of the penalty shall be reviewable only for abuse of discretion.

(E) The difference between the prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing wage rate shall be paid to each worker by the contractor or subcontractor, and the body awarding the contract shall cause to be inserted in the contract a stipulation that this section will be complied with.

(b) If a worker employed by a subcontractor on a public works project is not paid the general prevailing rate of per diem wages by the subcontractor, the prime contractor of the project is not liable for any penalties under subdivision (a) unless the prime contractor had knowledge of that failure of the subcontractor to pay the specified prevailing rate of wages to those workers or unless the prime contractor fails to comply with all of the following requirements:

(1) The contract executed between the contractor and the subcontractor for the performance of work on the public works project shall include a copy of the provisions of this section and Sections **1771, 1776, 1777.5, 1813, and 1815**.

(2) The contractor shall monitor the payment of the specified general prevailing rate of per diem wages by the subcontractor to the employees, by periodic review of the certified payroll records of the subcontractor.

(3) Upon becoming aware of the failure of the subcontractor to pay his or her workers the specified prevailing rate of wages, the contractor shall diligently take corrective action to halt or rectify the failure, including, but not limited to, retaining sufficient funds due the subcontractor for work performed on the public works project.

(4) Prior to making final payment to the subcontractor for work performed on the public works project, the contractor shall obtain an affidavit signed under penalty of perjury from the subcontractor that the subcontractor has paid the specified general prevailing rate of per diem wages to his or her employees on the public works project and any amounts due pursuant to Section 1813.

(c) The Division of Labor Standards Enforcement shall notify the contractor on a public works project within 15 days of the receipt by the Division of Labor Standards Enforcement of a complaint of the failure of a subcontractor on that public works project to pay workers the general prevailing rate of per diem wages.

(Amended by Stats. 2011, Ch. 677, Sec. 1. (AB 551) Effective January 1, 2012.)

1776 (a) Each contractor and subcontractor shall keep accurate payroll records, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the public work. Each payroll record shall contain or be verified by a written declaration that it is made under penalty of perjury, stating both of the following:

(1) The information contained in the payroll record is true and correct.

(2) The employer has complied with the requirements of Sections 1771, 1811, and 1815 for any work performed by his or her employees on the public works project.

(b) The payroll records enumerated under subdivision (a) shall be certified and shall be available for inspection at all reasonable hours at the principal office of the contractor on the following basis:

(1) A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request.

(2) A certified copy of all payroll records enumerated in subdivision (a) shall be made available for inspection or furnished upon request to a representative of the body awarding the contract and the Division of Labor Standards Enforcement of the Department of Industrial Relations.

(3) A certified copy of all payroll records enumerated in subdivision (a) shall be made available upon request by the public for inspection or for copies thereof. However, a request by the public shall be made through either the body awarding the contract or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided pursuant to paragraph (2), the requesting party shall, prior to being provided the records, reimburse the costs of preparation by the contractor, subcontractors, and the entity through which the request was made. The public may not be given access to the records at the principal office of the contractor.

(C) Unless required to be furnished directly to the Labor Commissioner in accordance with paragraph (3) of subdivision (a) of Section 1771.4, the certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the division. The payroll records may consist of printouts of payroll data that are maintained as computer records, if the printouts contain the same information as the forms provided by the division and the printouts are verified in the manner specified in subdivision (a).

(d) A contractor or subcontractor shall file a certified copy of the records enumerated in subdivision (a) with the entity that requested the records within 10 days after receipt of a written request.

(e) Except as provided in subdivision (f), any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the awarding body or the Division of Labor Standards Enforcement shall be marked or obliterated to prevent disclosure of an individual's name, address, and social security number. The name and address of the contractor awarded the contract or the subcontractor performing the contract shall not be marked or obliterated. Any copy of records made available for inspection by, or furnished to, a multiemployer Taft-Hartley trust fund (29 U.S.C. Sec. 186(c)(5)) that requests the records for the purposes of allocating contributions to participants shall be marked or obliterated only to prevent disclosure of an individual's full social security number, but shall provide the last four digits of the social security number. Any copy of records made available for inspection by, or furnished to, a joint labor-management committee established pursuant to the federal Labor Management Cooperation Act of 1978 (29 U.S.C. Sec. 175a) shall be marked or obliterated only to prevent disclosure of an individual's social security number.

(f) (1) Notwithstanding any other provision of law, agencies that are included in the Joint Enforcement Strike Force on the Underground Economy established pursuant to Section 329 of the Unemployment Insurance Code and other law enforcement agencies investigating violations of law shall, upon request, be provided nonredacted copies of certified payroll records. Any copies of records or certified payroll made available for inspection and furnished upon request to the public by an agency included in the Joint Enforcement Strike Force on the Underground Economy or to a law enforcement agency investigating a violation of law shall be marked or redacted to prevent disclosure of an individual's name, address, and social security number.

(2) An employer shall not be liable for damages in a civil action for any reasonable act or omission taken in good faith in compliance with this subdivision.

(g) The contractor shall inform the body awarding the contract of the location of the records enumerated under subdivision (a), including the street address, city, and county, and shall, within five working days, provide a notice of a change of location and address.

(h) The contractor or subcontractor has 10 days in which to comply, subsequent to receipt of a written notice requesting the records enumerated in subdivision (a). In the event that the contractor or subcontractor fails to comply within the 10-day period, he or she shall, as a penalty to the state or political subdivision on whose behalf the contract is made or awarded, forfeit one hundred dollars (\$100) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due. A contractor is not subject to a penalty assessment pursuant to this section due to the failure of a subcontractor to comply with this section.

(i) The body awarding the contract shall cause to be inserted in the contract stipulations to effectuate this section.

(j) The director shall adopt rules consistent with the California Public Records Act (Chapter 3.5 (commencing with Section 6250) of Division 7 of Title 1 of the Government Code) and the Information Practices Act of 1977 (Title 1.8 (commencing with Section 1798) of Part 4 of Division 3 of the Civil Code) governing the release of these records, including the establishment of reasonable fees to be charged for reproducing copies of records required by this section.
(Amended by Stats. 2014, Ch. 28, Sec. 71. (SB 854) Effective June 20, 2014.)

1777.5. (a) (1) This chapter does not prevent the employment upon public works of properly registered apprentices who are active participants in an approved apprenticeship program.

(2) For purposes of this chapter, "apprenticeship program" means a program under the jurisdiction of the California Apprenticeship Council established pursuant to Section 3070.

(b) (1) Every apprentice employed upon public works shall be paid the prevailing rate of per diem wages for apprentices in the trade to which he or she is registered and shall be employed only at the work of the craft or trade to which he or she is registered.

(2) Unless otherwise provided by a collective bargaining agreement, when a contractor requests the dispatch of an apprentice pursuant to this section to perform work on a public works project and requires the apprentice to fill out an application or undergo testing, training, an examination, or other preemployment process as a condition of employment, the apprentice shall be paid for the time spent on the required preemployment activity, including travel time to and from the required activity, if any, at the prevailing rate of per diem wages for apprentices in the trade to which he or she is registered. Unless otherwise provided by a collective bargaining agreement, a contractor is not required to compensate an apprentice for the time spent on preemployment activities if the apprentice is required to take a preemployment drug or alcohol test and he or she fails to pass that test.

(c) Only apprentices, as defined in Section 3077, who are in training under apprenticeship standards that have been approved by the Chief of the Division of Apprenticeship Standards and who are parties to written apprentice agreements under Chapter 4 (commencing with Section 3070) of Division 3 are eligible to be employed at the apprentice wage rate on public works. The employment and training of each apprentice shall be in accordance with either of the following:

(1) The apprenticeship standards and apprentice agreements under which he or she is training.

(2) The rules and regulations of the California Apprenticeship Council.

(d) If the contractor to whom the contract is awarded by the state or any political subdivision, in performing any of the work under the contract, employs workers in any apprenticeable craft or trade, the contractor shall employ apprentices in at least the ratio set forth in this section and may apply to any apprenticeship program in the craft or trade that can provide apprentices to the site of the public work for a certificate approving the contractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected. However, the decision of the apprenticeship program to approve or deny a certificate shall be subject to review by the Administrator of Apprenticeship. The apprenticeship program or programs, upon approving the contractor, shall arrange for the dispatch of apprentices to the contractor. A contractor covered by an apprenticeship program's standards shall not be required to submit any additional application in order to include additional public works contracts under that program. "Apprenticeable craft or trade," as used in this section, means a craft or trade determined as an apprenticeable occupation in accordance with rules and regulations prescribed by the California Apprenticeship Council. As used in this section, "contractor" includes any subcontractor under a contractor who performs any public works not excluded by subdivision (o).

(e) Before commencing work on a contract for public works, every contractor shall submit contract award information to an applicable apprenticeship program that can supply apprentices to the site of the public work. The information submitted shall include an estimate of journeyman hours to be performed under the contract, the number of apprentices proposed to be employed, and the approximate dates the apprentices would be employed. A copy of this information shall also be submitted to the awarding body, if requested by the awarding body. Within 60 days after concluding work on the contract, each contractor and subcontractor shall submit to the awarding body, if requested, and to the apprenticeship program a verified statement of the journeyman and apprentice hours performed on the contract. The information under this subdivision shall be public. The apprenticeship programs shall retain this information for 12 months.

(f) The apprenticeship program supplying apprentices to the area of the site of the public work shall ensure equal employment and affirmative action in apprenticeship for women and minorities.

(g) The ratio of work performed by apprentices to journeymen employed in a particular craft or trade on the public work may be no higher than the ratio stipulated in the apprenticeship standards under which the apprenticeship program operates if the contractor agrees to be bound by those standards. However, except as otherwise provided in this section, in no case shall the ratio be less than one hour of apprentice work for every five hours of journeyman work.

(h) This ratio of apprentice work to journeyman work shall apply during any day or portion of a day when any journeyman is employed at the jobsite and shall be computed on the basis of the hours worked during the day by journeymen so employed. Any work performed by a journeyman in excess of eight hours per day or 40 hours per week shall not be used to calculate the ratio. The contractor shall employ apprentices for the number of hours computed as above before the end of the contract or, in the case of a subcontractor, before the end of the subcontract. However, the contractor shall endeavor, to the greatest extent possible, to employ apprentices during the same time period that the journeymen in the same craft or trade are employed at the jobsite. When an hourly apprenticeship ratio is not feasible for a particular craft or trade, the Administrator of Apprenticeship, upon application of an apprenticeship program, may order a minimum ratio of not less than one apprentice for each five journeymen in a craft or trade classification.

(i) A contractor covered by this section who has agreed to be covered by an apprenticeship program's standards upon the issuance of the approval certificate, or who has been previously approved for an apprenticeship program in the craft or trade, shall employ the number of apprentices or the ratio of apprentices to journeymen stipulated in the applicable apprenticeship standards, but in no event less than the 1-to-5 ratio required by subdivision (g).

(j) Upon proper showing by a contractor that he or she employs apprentices in a particular craft or trade in the state on all of his or her contracts on an annual average of not less than one hour of apprentice work for every five hours of labor performed by journeymen, the Administrator of Apprenticeship may grant a certificate exempting the contractor from the 1-to-5 hourly ratio, as set forth in this section for that craft or trade.

(k) An apprenticeship program has the discretion to grant to a participating contractor or contractor association a certificate, which shall be subject to the approval of the Administrator of Apprenticeship, exempting the contractor from the 1-to-5 ratio set forth in this section when it finds that any one of the following conditions is met:

(1) Unemployment for the previous three-month period in the area exceeds an average of 15 percent.

(2) The number of apprentices in training in the area exceeds a ratio of 1 to 5.

(3) There is a showing that the apprenticeable craft or trade is replacing at least one-thirtieth of its journeymen annually through apprenticeship training, either on a statewide basis or on a local basis.

(4) Assignment of an apprentice to any work performed under a public works contract would create a condition that would jeopardize his or her life or the life, safety, or property of fellow employees or the public at large, or the specific task to which the apprentice is to be assigned is of a nature that training cannot be provided by a journeyman.

(l) If an exemption is granted pursuant to subdivision (k) to an organization that represents contractors in a specific trade from the 1-to-5 ratio on a local or statewide basis, the member contractors shall not be required to submit individual applications for approval to local joint apprenticeship committees, if they are already covered by the local apprenticeship standards.

(m) (1) A contractor to whom a contract is awarded, who, in performing any of the work under the contract, employs journeymen or apprentices in any apprenticeable craft or trade shall contribute to the California Apprenticeship Council the same amount that the director determines is the prevailing amount of apprenticeship training contributions in the area of the public works site. A contractor may take as a credit for payments to the council any amounts paid by the contractor to an approved apprenticeship program that can supply apprentices to the site of the public works project. The contractor may add the amount of the contributions in computing his or her bid for the contract.

(2) (A) At the conclusion of the 2002–03 fiscal year, and each fiscal year thereafter, the California Apprenticeship Council shall distribute training contributions received by the council under this subdivision, less the expenses of the Department of Industrial Relations for administering this subdivision, by making grants to approved apprenticeship programs for the purpose of training apprentices. The grant funds shall be distributed as follows:

(i) If there is an approved multiemployer apprenticeship program serving the same craft or trade and geographic area for which the training contributions were made to the council, a grant to that program shall be made.

(ii) If there are two or more approved multiemployer apprenticeship programs serving the same craft or trade and county for which the training contributions were made to the council, the grant shall be divided among those programs based on the number of apprentices from that county registered in each program.

(iii) All training contributions not distributed under clauses (i) and (ii) shall be used to defray the future expenses of the Department of Industrial Relations for the administration and enforcement of apprenticeship standards and requirements under this code.

(B) An apprenticeship program shall only be eligible to receive grant funds pursuant to this subdivision if the apprenticeship program agrees, prior to the receipt of any grant funds, to keep adequate records that document the expenditure of grant funds and to make all records available to the Department of Industrial Relations so that the Department of Industrial Relations is able to verify that grant funds were used solely for training apprentices. For purposes of this subparagraph, adequate records include, but are not limited to, invoices, receipts, and canceled checks that account for the expenditure of grant funds. This subparagraph shall not be deemed to require an apprenticeship program to provide the Department of Industrial Relations with more documentation than is necessary to verify the appropriate expenditure of grant funds made pursuant to this subdivision.

(C) The Department of Industrial Relations shall verify that grants made pursuant to this subdivision are used solely to fund training apprentices. If an apprenticeship program is unable to demonstrate how grant funds are expended or if an apprenticeship program is found to be using grant funds for purposes other than training apprentices, then the apprenticeship program shall not be eligible to receive any future grant pursuant to this subdivision and the Department of Industrial Relations may initiate the process to rescind the registration of the apprenticeship program.

(3) All training contributions received pursuant to this subdivision shall be deposited in the Apprenticeship Training Contribution Fund, which is hereby created in the State Treasury. Upon appropriation by the Legislature, all moneys in the Apprenticeship Training Contribution Fund shall be used for the purpose of carrying out this subdivision and to pay the expenses of the Department of Industrial Relations.

(n) The body awarding the contract shall cause to be inserted in the contract stipulations to effectuate this section. The stipulations shall fix the responsibility of compliance with this section for all apprenticeable occupations with the prime contractor.

(o) This section does not apply to contracts of general contractors or to contracts of specialty contractors not bidding for work through a general or prime contractor when the contracts of general contractors or those specialty contractors involve less than thirty thousand dollars (\$30,000).

(p) An awarding body that implements an approved labor compliance program in accordance with subdivision (b) of Section 1771.5 may, with the approval of the director, assist in the enforcement of this section under the terms and conditions prescribed by the director. *(Amended by Stats. 2018, Ch. 704, Sec. 17. (AB 235) Effective September 22, 2018.)*

1813. The contractor or subcontractor shall, as a penalty to the state or political subdivision on whose behalf the contract is made or awarded, forfeit twenty-five dollars (\$25) for each worker employed in the execution of the contract by the respective contractor or subcontractor for each calendar day during which the worker is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week in violation of the provisions of this article. In awarding any contract for public work, the awarding body shall cause to be inserted in the contract a stipulation to this effect. The awarding body shall take cognizance of all violations of this article committed in the course of the execution of the contract, and shall report them to the Division of Labor Standards Enforcement.

(Amended (as added by Stats. 1997, Ch. 757, Sec. 6) by Stats. 2002, Ch. 28, Sec. 3. Effective January 1, 2003.)

1815. Notwithstanding the provisions of Sections 1810 to 1814, inclusive, of this code, and notwithstanding any stipulation inserted in any contract pursuant to the requirements of said sections, work performed by employees of contractors in excess of 8 hours per day, and 40 hours during any one week, shall be permitted upon public work upon compensation for all hours worked in excess of 8 hours per day at not less than 1¹/₂ times the basic rate of pay.

(Amended by Stats. 1963, Ch. 964.)

EXCERPTS FROM THE PUBLIC CONTRACT CODE 9204

EXCERPTS FROM PUBLIC CONTRACT CODE 9204

EFFECTIVE DATE JANUARY 1, 2017

Please note section 9204 of the Public Contract Code, set forth in full below. Contractor must follow the contractual dispute resolution process specified in the Ventura County Standard Specifications, which is consistent with section 9204.

* * *

(a) The Legislature finds and declares that it is in the best interests of the state and its citizens to ensure that all construction business performed on a public works project in the state that is complete and not in dispute is paid in full and in a timely manner.

(b) Notwithstanding any other law, including, but not limited to, Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2, Chapter 10 (commencing with Section 19100) of Part 2, and Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, this section shall apply to any claim by a contractor in connection with a public works project.

(c) For purposes of this section:

(1) "Claim" means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:

(A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.

(B) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.

(C) Payment of an amount that is disputed by the public entity.

(2) "Contractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who has entered into a direct contract with a public entity for a public works project.

(3)(A) "Public entity" means, without limitation, except as provided in subparagraph (B), a state agency, department, office, division, bureau, board, or commission, the California State University, the University of California, a city, including a charter city, county, including a charter county, city and county, including a charter city and county, district, special district, public authority, political subdivision, public corporation, or nonprofit transit corporation wholly owned by a public agency and formed to carry out the purposes of the public agency.

(B) "Public entity" shall not include the following:

(i) The Department of Water Resources as to any project under the jurisdiction of that department.

(ii) The Department of Transportation as to any project under the jurisdiction of that department.

(iii) The Department of Parks and Recreation as to any project under the jurisdiction of that department.

(iv) The Department of Corrections and Rehabilitation with respect to any project under its jurisdiction pursuant to Chapter 11 (commencing with Section 7000) of Title 7 of Part 3 of the Penal Code.

(v) The Military Department as to any project under the jurisdiction of that department.

(vi) The Department of General Services as to all other projects.

(vii) The High-Speed Rail Authority.

(4) "Public works project" means the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind.

(5) "Subcontractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who either is in direct contract with a contractor or is a lower tier subcontractor.

(d)(1)(A) Upon receipt of a claim pursuant to this section, the public entity to which the claim applies shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the claimant a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, a public entity and a contractor may, by mutual agreement, extend the time period provided in this subdivision.

(B) The claimant shall furnish reasonable documentation to support the claim.

(C) If the public entity needs approval from its governing body to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the public entity shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide the claimant a written statement identifying the disputed portion and the undisputed portion.

(D) Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. If the public entity fails to issue a written statement, paragraph (3) shall apply.

(2)(A) If the claimant disputes the public entity's written response, or if the public entity fails to respond to a claim issued pursuant to this section within the time prescribed, the claimant may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the public entity shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(B) Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the public entity shall provide the claimant a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. Any disputed portion of the claim, as identified by the contractor in writing, shall be submitted to nonbinding mediation, with the public

entity and the claimant sharing the associated costs equally. The public entity and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

(C) For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

(D) Unless otherwise agreed to by the public entity and the contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

(E) This section does not preclude a public entity from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under this section does not resolve the parties' dispute.

(3) Failure by the public entity to respond to a claim from a contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the public entity's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.

(4) Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.

(5) If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a public entity because privity of contract does not exist, the contractor may present to the public entity a claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the contractor present a claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the contractor shall notify the subcontractor in writing as to whether the contractor presented the claim to the public entity and, if the original contractor did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

(e) The text of this section or a summary of it shall be set forth in the plans or specifications for any public works project that may give rise to a claim under this section.

(f) A waiver of the rights granted by this section is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) a

public entity may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the provisions of this section, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in this section.

(g) This section applies to contracts entered into on or after January 1, 2017.

(h) Nothing in this section shall impose liability upon a public entity that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.

(i) This section shall remain in effect only until January 1, 2027, and as of that date is repealed, unless a later enacted statute that is enacted before January 1, 2027, deletes or extends that date.

**Ventura County Standard
Specifications
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**Ventura County Standard
Specifications**

**COUNTY OF VENTURA
PUBLIC WORKS AGENCY
STANDARD SPECIFICATIONS
PART 1 - GENERAL PROVISIONS**

SECTION 0 - SSPWC ADOPTION AND MODIFICATIONS

0-1 STANDARD SPECIFICATIONS

Except as hereinafter provided or as modified by the Special Provisions, the provisions of Parts 2 through 5 of the 2015 edition of the Standard Specifications for Public Works Construction (referred to as SSPWC), published by BNi Building News, Los Angeles, are part of these Standard Specifications.

0-2 DELETIONS

The following portions of SSPWC are hereby deleted: Part 1 and Sections 200-1.6.2, and 301-1.4.

0-3 NUMBERING OF SECTIONS

The numbering in these modifications is compatible with the numbering in SSPWC. References to whole sections of SSPWC and these modifications are preceded by the word "Section", references to parts of sections show numbers only, such as "211-5", except at the beginning of a sentence, the word "Section" precedes the number. Standard Special Provisions, if included, are numbered as Sections 901 through 999. The Special Provisions are numbered starting with Section 1000 or higher.

Cross-references contained in SSPWC to sections deleted by 0-2 hereof shall be references to the sections of like number contained herein.

0-4 ADDITIONS

The sections that follow, either, replace sections of like number in SSPWC which were deleted in 0-2 above, modify sections of SSPWC, or add material not in SSPWC.

SECTION 1 - TERMS, DEFINITIONS, ABBREVIATIONS, UNITS OF MEASURE AND SYMBOLS

1-1 GENERAL Unless otherwise stated, the words directed, required, permitted, ordered, instructed, designated, considered necessary, prescribed, approved, acceptable, satisfactory, or words of like meaning, refer to actions, expressions, and prerogatives of the Engineer.

1-2 TERMS AND DEFINITIONS

Acceptance--The formal written acceptance by the Agency of the Work which has been completed in all respects in accordance with the Plans and Specifications and any Modifications thereof.

Addendum--Written or graphic instrument issued prior to the opening of Bids which clarifies, corrects or changes the bidding or Contract Documents. The term "Addendum" shall include bulletins and all other types of written notices issued to potential bidders prior to opening of Bids.

Agency--The legal entity for which the Work is being performed.

Agreement--See Contract.

Base--A layer of specified material of planned thickness placed immediately below the pavement or surfacing.

Bid--The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work.

Bidder--Any individual, firm, partnership, corporation, or combination thereof, submitting a Bid for the Work, acting directly or through a duly authorized representative.

Board--The officer or body constituting the awarding authority of the Agency.

Bond--Bid, performance and payment bond or other instrument of security.

Cash Contract--A contract financed by means other than special assessments.

Certificate of Compliance--A written document signed and submitted by a supplier or manufacturer that certifies that the material or assembled material supplied to the Work site conforms to the requirements of the Contract Documents.

Change Order--A written order to the Contractor signed by the Agency directing an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract time issued after the effective date of the Contract. A Change Order may or may not also be signed by the Contractor.

Code--The terms Government Code, Labor Code, etc. refer to codes of the State of California.

Consultant--A professional engineer, architect, landscape architect or other professional who designed the project or performed other services for the Agency on the project.

Contract--The written agreement between the Agency and the Contractor covering the Work.

Contract Documents--The Contract, Addenda, notice inviting bids, instruction to bidders; Bid (including documentation accompanying the Bid and any post-bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Contract, the Bonds, permits from jurisdictional regulatory agencies, Special Provisions, Plans, Standard Plans, Standard Specifications, Reference Specifications, Change Orders and Supplemental Agreements.

Contractor--The individual, partnership, corporation, joint venture, or other legal entity having a Contract with the Agency to perform the Work. In the case of work being done under permit issued by the Agency, the Permittee shall be construed to be the Contractor. The term "prime contractor" shall mean Contractor.

Contract Price--The total amount of money for which the Contract is awarded.

Contract Unit Price--The amount shown in the Bid for a single unit of an item of work.

County Sealer--The Sealer of Weights and Measures of the county in which the Contract is let.

Days--Days shall mean consecutive calendar days unless otherwise specified.

Daily Extra Work Reports--Reports on Agency furnished forms as required by 3-3.

Disputed Work--Work in which Agency and Contractor are in disagreement.

Due Notice--A written notification, given in due time, of a proposed action where such notification is required by the Contract to be given a specified interval of time (usually 48 hours or two Working Days) prior to the commencement of the contemplated action. Notification may be from Engineer to Contractor or from Contractor to Engineer.

Electrolier--Street light assembly complete, including foundation, standard, luminaire arm, luminaire, etc.

1-2 DEFINITIONS (Continued)

- Engineer--The Director of Public Works Agency acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties delegated to them.
- Field Directive--A written communication from the Engineer to the Contractor that does not make any Modification to the Contract Documents. It is used only to answer Contractor's questions and to provide decisions as specified in the Contract Documents.
- Geotextile--Synthetic fiber used in civil engineering applications, serving the primary function of separation and filtration.
- House Connection Sewer--A sewer, within a public street or right of way, proposed to connect any parcel, lot, or part of a lot with a main line sewer.
- House Sewer--A sewer, wholly within private property, proposed to connect any building to a house connection sewer.
- Luminaire--The lamp housing including the optical and socket assemblies (and ballast if so specified).
- Major Bid Item--A single Contract item constituting 10% or more of the original Contract Price.
- Mast Arm--The structural member or bracket, which, when mounted on a Standard, supports the luminaire.
- Modification--Includes Change Orders and Supplemental Agreements. A Modification may only be issued after the effective date of the Contract.
- Notice of Award--The written notice by the Agency to the successful Bidder stating that upon compliance by it with the required conditions, the Agency will execute the Contract.
- Notice to Proceed--A written notice given by the Agency to the Contractor fixing the date on which the Contract time will start.
- Owner--Same meaning as Agency.
- Person--Any individual, firm, association, partnership, corporation, trust, joint venture, or other legal entity.
- Plans--The drawings, profiles, cross sections, Standard Plans, working drawings, shop drawings, and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions, or details of the Work.
- Private Contract--Work subject to Agency inspection, control, and approval, involving private funds, not administered by the Agency.
- Prompt--The briefest interval of time required for a considered reply, including time required for approval by a governing body.
- Proposal--See Bid.
- Reference Specifications--Those bulletins, standards, rules, methods of analysis or testing, codes, and specifications of other agencies, engineering societies, or industrial associations referred to in the Contract Documents. These refer to the latest edition, including amendments in effect and published at the time of advertising the project or issuing the permit, unless specifically referred to by edition, volume, or date.
- Roadway--The portion of a street reserved for vehicular use.
- Service Connection--All or any portion of the conduit cable or duct including meter, between a utility distribution line and an individual consumer
- Service Lateral Connection--The interface of the House Connection Sewer with the host pipe.
- Sewer--Any conduit intended for the reception and transfer of sewage and fluid industrial waste.
- Shop Drawings--Drawings showing details of manufactured or assembled products proposed to be incorporated in the Work.
- Special Provisions--Any provisions which supplement or modify the Standard Specifications.
- Specifications--Standard Specifications, Reference Specifications, Standard Special Provisions, Special Provisions, and specifications in Change Orders or Supplemental Agreements between the Contractor and the Board.
- Standard--The shaft or pole used to support street lighting luminaire, traffic signal heads, mast arms, etc.
- Standard Plans--Details of standard structures, devices, or instructions referred to on the Plans or in the Specifications by title or number.
- Standard Special Provisions-- Special Provisions prepared in standardized form numbered in the series 401 through 499.

1-2 DEFINITIONS (Continued)

Standard Specifications--Parts 1 through 6 of this document. See Section 0. References to whole sections will be preceded by the word "Section", references to parts of sections will show numbers only, such as "3-2", except at the beginning of a sentence, the word "Section" precedes the number.

State--The State of California.

State Standard Plans--Standard Plans prepared by State of California, Business and Transportation Agency, Department of Transportation.

Stipulated Unit Price--Unit prices established by Agency in the Contract Documents.

Storm Drain--Any conduit and appurtenances intended for the reception and transfer of storm water.

Street--Any road, highway, parkway, freeway, alley, walk or way.

Subbase--A layer of specified material of planned thickness between a base and the subgrade.

Subcontractor--An individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work.

Subgrade--For roadways, that portion of the roadbed on which pavement, surfacing, base, subbase, or a layer of other material is placed. For structures, the soil prepared to support a structure.

Supervision--Supervision, where used to indicate supervision by the Engineer, shall mean the performance of obligations, and the exercise of rights, specifically imposed upon and granted to the Agency in becoming a party to the Contract. Except as specifically stated herein, supervision by the Agency shall not mean active and direct superintendence of details of the Work.

Supplemental Agreement--A written amendment of the Contract Documents signed by both parties.

Surety--See 2-4.

Utility--Tracks, overhead or underground wires, pipelines, conduits, ducts, or structures, sewers or storm drains owned, operated or maintained in or across a public right of way or private easement.

Work--That which is proposed to be constructed or done under the Contract or permit, including the furnishing of all labor, materials, equipment, and services.

Working Day--See 6-7.2 and 6.7.2.1.

Working Drawings--Drawings showing details not shown on the Plans which are required to designed by the Contractor

1-3 ABBREVIATIONS

1-3.1 General. The abbreviations herein, together with others in general use, are applicable to these Standard Specifications and to all other Contract Documents.

All abbreviations and symbols used on Plans for structural steel construction shall conform to those given by the "Manual of Steel Construction" published by the American Institute of Steel Construction, Inc.

1-3.2 Common Usage

<u>Abbreviation</u>	<u>Word or Words</u>	<u>Abbreviation</u>	<u>Word or Words</u>
Aban	Abandon	l	Liters
Aband	Abandoned	Lab	Laboratory
ABS	Acrylonitrile-butadiene-styrene	Lat	Lateral
AC	Asphalt Concrete	LD	Local depression
ACP	Asbestos cement pipe	LED	Light Emitting Diode
ADA	Americans with Disabilities Act of 1990 (Public Law 101-336, 104 Stat. 1990,42 USC 12101-12213 (as amended))	LH	Lamp hole
Alt	Alternate	LL	Live load
AmerStd	American Standard	LOL	Layout line
APC	Air Placed Concrete	Long	Longitudinal
ARAM	Asphalt Rubber Aggregate Membrane	LP	Lamp post
ARHM	Asphalt Rubber Hot Mix	LPS	Low pressure sodium (Light)
AWG	American Wire Gage (non-ferrous wire)	LS	Lump sum
B/W	Back of wall	LTS	Lime treated soil
BC	Beginning of curve	m	Meters
BCR	Beginning of curb return	Maint	Maintenance
Bdry	Boundary	Max	Maximum
BF	Bottom of footing	MC	Medium curing
BM	Bench mark	MCR	Middle of curb return
BMPs	Best Management Practices	Meas	Measure
BVC	Beginning of vertical curve	MH	Manhole, maintenance hole
C&G	Curb & Gutter	Mil Spec	Military specification
C&G	Curb and gutter	Min	Minimum
CAB	Crushed aggregate base	Misc	Miscellaneous

<u>Abbreviation</u>	<u>Word or Words</u>	<u>Abbreviation</u>	<u>Word or Words</u>
CALOSHA	California Occupational Safety and Health Administration	Mon	Monument
CALTRANS	California Department of Transportation	MSDS	Material Safety Data Sheet
CAP	Corrugated aluminum pipe	Mult	Multiple
CB	Catch Basin	MUTCD	Manual on Uniform Traffic Control Devices
Cb	Curb	MVL	Mercury vapor light
CBP	Catch Basin Connection Pipe	N/A	No applicable
CBR	California Bearing Ratio	NRCP	Nonreinforced concrete pipe
C-C	Center to center	Obs	Obsolete
CCFRPM	Centrifugally Cast Fiberglass Reinforced Plastic Mortar	oc	On center
CCR	California Code of Regulations	OD	Outside diameter
CCTV	Closed Circuit TV	OE	Outer edge
CF	Cubic foot	Opp	Opposite
CF	Curb face	Orig	Original
CFR	Code of Federal Regulations	PAV	Pressure Aging Vessel
CFS	Cubic feet per second	PB	Pull box
CHDPE	Corrugated High Density Polyethylene	PC	Point of curvature
CIP	Cast iron pipe	PCC	Point of compound curvature
CIPP	Cast-in-place pipe	PCC	Portland cement concrete
CIPPC	Cast-in-place Concrete Pipe	PCVC	Point of compound vertical curve
CL	Clearance, center line	PE	Polyethylene
CLF	Chain link fence	PG	Performance Graded
CLSM	Controlled Low Strength Material	PI	Point of intersection
CMB	Crushed miscellaneous base	PL	Property line
CMC	Cement mortar-coated	PLI	Pounds per linear inch
CML	Cement mortar-lined	PMB	Processed miscellaneous base
cms	Cubic meters per second	POC	Point on curve
CO	Cleanout (Sewer)	POT	Point on tangent
Col	Column	PP	Power pole
Conc	Concrete	PRC	Point of reverse curve
Conn	Connection	PRCB	Precast Reinforced Concrete Box
Const	Construct, Construction	PRVC	Point of reverse vertical curve
Coord	Coordinate	PSI	Pounds per square inch
CQS	Cationic Quick-Setting	PT	Point of tangency
CRM	Crumb Rubber Modifier	PVC	Polyvinyl chloride
CRS	Cationic Rapid-Setting	Pvmt	Pavement
CSEP	Confined Space Entry Plan	Pvt R/W	Private right of way
CSP	Corrugated steel pipe	Q	Rate of flow in cms (CFS)
CSPA	Corrugated steel pipe arch	Quad	Quadrangle, Quadrant
CSS	Cationic Slow-Setting	R	Radius or Resistance value
CT	California Test	R&O	Rock and Oil
CTB	Cement treated base	R/W	Right of way
CV	Check valve	RA	Reclaimed Asphalt or Recycling agent
CY	Cubic yard	RAC	Recycled asphalt concrete
D	Depth, Load of pipe	RAP	Reclaimed asphalt pavement
db	Decibels	RBAC	Rubberized asphalt concrete
Dbl	Double	RC	Reinforced concrete or Rapid Curing
DF	Douglas Fir	RCB	Reinforced concrete box
Dia	Diameter	RCE	Registered civil engineer
DIP	Ductile iron pipe	RCP	Reinforced concrete pipe
DL	Dead load	RCV	Remote control valve
DT	Drain tile	Ref	Reference
Dwg	Drawing	Reinf	Reinforced or reinforcement
Dwy Appr	Driveway approach	Res	Reservoir
Dwy	Driveway	RGE	Registered geotechnical engineer
Ea	Each	RPPCC	Reclaimed Plastic Portland Cement Concrete
EC	End of curve	RR	Railroad
ECR	End of curb return	RSE	Registered structural engineer
EF	Each face	RTE	Registered traffic engineer
EG	Edge of gutter	RTFO	Rolling Thin Film Oven
EGL	Energy grade line	RW	Reclaimed Water
EI	Elevation	S	Slope
ELC	Electrolier lighting conduit	S/W	Sidewalk
ELT	Extra long ton of slurry	SC	Slow curing
Eng	Engineer, Engineering	SCCP	Steel cylinder concrete pipe
EP	Edge of pavement	SCNs	Supplementary Cementitious Materials
Esmt	Easement	SD	Storm drain
ETB	Emulsion treated base	SDR	Standard dimension ratio

<u>Abbreviation</u>	<u>Word or Words</u>	<u>Abbreviation</u>	<u>Word or Words</u>
EVC	End of vertical curve	SE	Sand Equivalent
Exc	Excavation	Sec	Section
Exist or Ex	Existing	SF	Square foot
Exp Jt	Expansion joint	SG	Specific gravity
F & C	Frame and cover	SI	International System of Units (Metric)
F & I	Furnish and install	SLC	Service Lateral Connection
F/W	Face of wall	Spec	Specifications
Fab	Fabricate	SR	Standard ratio
FAS	Flashing arrow sign	SS	Sanitary sewer
FD	Floor drain	SSB	Select sub-base
Fdn	Foundation	SSP	Structural steel plate pipe
Fed Spec	Federal Specification	SSPA	Structural steel plate pipe arch
FG	Finished grade	St Hwy	State highway
FL	Flow line	Sta	Station
FS	Finished surface	Std	Standard
ft - lb	foot – pound	Str Gr	Straight grade
Ftg	footing	Str	Straight
FW	Face of wall	Struc	Structural/Structure
Ga	Gauge	SW	Sidewalk
Galv	Galvanized	SWD	Sidewalk drain
GG	Gap graded	SWPPP	Storm Water Pollution Prevention Plan
GIP	Galvanized iron pipe	SY	Square Yard
GL	Ground line or grade line	T/W	Top of wall
GM	Gas meter	Tan	Tangent
GP	Guy pole	TC	Top of curb
Gr	Grade	TCP	Traffic control plan
Grtg	Grating	Tel	Telephone
GSP	Galvanized steel pipe	TF	Top of footing
H	High or height	Topo	Topography
HB	Hose bib	Tr	Tract
HC	House connection	Trans	Transition
HDPE	High density Polyethylene	TRMAC	Tire rubber modified asphalt concrete
HDWL	Headwall	TS	Traffic signal or transition structure
HGL	Hydraulic grade line	TSC	Traffic signal conduit
Hor, Horiz	Horizontal	TSS	Traffic signal standard
Hp	Horsepower	TTC	Temporary traffic control
HPG	High pressure gas	TW	Top of wall
HPS	High pressure sodium (Light)	Typ	Typical
HRWRA	High Range Water Reducing Admixture	U.S.	United States
Hyd, Hydr	Hydraulic	U.S.C.	United States Code
ID	Inside diameter	USA	Underground Service Alert
Incl	Include, Including	Var	Varies, Variable
Insp	Inspection	VB	Valve box
Inv	Invert	VC	Vertical curve
IP	Iron pipe	VCP	Vitrified clay pipe
J	Joules	Vert	Vertical
JC	Junction chamber	Vol	Volume
Jct	Junction	VTCSH	Vehicle Traffic Controls Signal Heads
JS	Junction structure	W	Width or Wider
Jt	Joint	WATCH	Work Area Traffic Control Handbook
kg	Kilograms	WI	Wrought iron
kPa	KiloPascals	WM	Water meter
L	Length	WPJ	Weakened plane joint
		WTAT	Wet Track Abrasion Test
		X Conn	Cross connection
		x (as in 2x4)	by
		X-Sec	Cross section

1-3.3 Institutions.

<u>Abbreviation</u>	<u>Word or Words</u>
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGC	Associated General Contractors of America
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preserver's Association
AWS	American Welding Society
AWWA	American Water Works Association
CBSC	California Building Standards Commission
CRSI	Concrete Reinforcing Steel Institute
EIA	Electronic Industries Association
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratories
FCC	Federal Communications Commission
IAPMO	International Association of Plumbing and Mechanical Officials
ICC	International Code Council
IEEE	Institute of Electrical and Electronics Engineers
IMSA	International Municipal Signal Association
ITE	Institute of Traffic Engineers
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NOAA	National Oceanic and Atmospheric Administration (Department of Commerce)
RUS	Rural Utility Service
UL	Underwriters' Laboratories, Inc.
USGS	United State Geological Survey
WFCB	Western Fire Chiefs Association

1-3.4 Building Codes. The Ventura County Building Code (VCBC) and Ventura County Fire Code (VCFC) are applicable to the Work. VCBC and VCFC adopt by reference a number of uniform and national codes. Where such codes are referenced directly in the Specifications, such references shall be to the VCBC or VCFC which adopt and modify certain provisions in the referenced codes.

<u>Abbreviation</u>	<u>Code</u>	<u>Publisher</u>
CBC	California Building Code	CBSC
DBC	Uniform Code for Abatement of Dangerous Building	ICC
UBC	Uniform Building Code	ICC
UFC	Uniform Fire Code	ICC and WFCB
UHC	Uniform Housing Code	ICC
UMC	Uniform Mechanical Code	IAPMO
UPC	Uniform Plumbing Code	IAPMO
NEC	National Electrical Code	NFPA

1-3.5 Reference Documents.

<u>Abbreviation</u>	<u>Document</u>
HDM	Highway Design Manual, State of California, Department of Transportation, Latest Edition
MUTCD	Manual on Uniform Traffic Control Devices
SSP	Standard Plans, State of California, Department of Transportation, latest edition
SPPWC	Standard Plans for Public Works Construction, Latest edition, published by BNi Building News, Los Angeles,
SSPWC	Standard Specifications for Public Works Construction, (See Section 0-1)
SSS	Standard Specifications, State of California, Department of Transportation, latest edition
VCSS	Ventura County Standard Specifications (Division 1, Sections 0 through 10, of which this section is a part)

1-4 UNITS OF MEASURE

1-4.1 General.

The International System of Units, also referred to as SI or the metric system, is the principal measurement system in these Specifications and shall be used for construction, unless otherwise stated in the Contract Documents. U. S. Standard Measure, also called U. S. Customary System, are included in parenthesis. SI units and U. S. Standard Measure in parenthesis may or may not be exactly equivalent. If U. S. Standard Measures are specified for use in the Contract Documents, then all values used for construction shall be U. S. Standard Measures shown in parentheses. However, certain material Specifications and test requirements contained herein use SI units specifically and conversions to U. S. Measures have not been included in these circumstances. When U. S. Standard Measures are not included in parentheses, the SI units shall control.

Reference is also made to ASTM E 380 for definitions of various units of the SI system and a more extensive set of conversion factors.

1-4.1.1 Units for Work.

Where U. S. Standard Measure units are shown on the Plans or are specified, U. S. Standard Measure shall be used for the Work.

1-4.2 Units of Measure, Equivalents and Abbreviations

One U.S. Customary Unit	(abbreviation)	Is Equal To	#	SI Unit
mil (=0.001 in)		25.4	micrometers	(μm)
inch	(in)	25.4	millimeter	(mm)
inch	(in)	2.54	centimeter	(cm)
foot	(ft)	0.3048	meter	(m)
yard	(yd)	0.9144	meter	(m)
mile		1.6093	kilometer	(km)
square foot	(ft ²)	0.0929	square meter	(m ²)
square yard	(yd ²)	0.8361	square meter	(m ²)
cubic foot	(ft ³)	0.0283	cubic meter	(m ³)
cubic yard	(yd ³)	0.7646	cubic meter	(m ³)
acre (=43,560 ft ²)		0.4047	hectare (1ha=10,000m ²)	(ha)
gallon	(gal)	3.7854	Liter	(L)
fluid ounce	(fl. oz.)	29.5735	milliliter	(mL)
pound mass (avoirdupois)	(lbs)	0.4536	kilogram	(kg)
ounce mass	(oz)	0.02835	kilogram	(kg)
ounce mass	(oz)	28.35	grams	(g)
Ton (=2000 lb avoirdupois)		0.9072	Tonne (1 Tonne = 1000 kg)	
Poise		0.10	Pascal-second	(Pa-s)
centistoke	(cs)	1.00	square millimeter/sec.	(mm ² /s)
pound force	(lbf)	4.4482	Newton	(N)
pound per square inch	(psi)	6.8948	Kilopascal	(kPa)
pound force per foot	(lbf/ft)	14.594	Newton per meter	(N/M)
foot-pound force	(ft-lbf)	1.3558	Joules	(J)
foot-pound force per second	([ft-lbf]/s)	1.3558	Watt	(W)
part per million	(ppm)	1.00	milligram/liter	(mg/L)
Degree Fahrenheit	(°F)	0.5555	Degree Celsius	(°C)

Temperature: Celsius to Fahrenheit	Temperature: Fahrenheit to Celsius
Temperature °F = (1.8 x °C) + 32	Temperature °C = (°F - 32) / 1.8

SI Units Used in Both Systems		
Ampere (A)	second (s)	Candela (cd)
Volt (V)	decibel (db)	Lumen (lm)

Common Metric Prefixes			
kilo (k)	10 ³	milli (m)	10 ⁻³
centi (c)	10 ⁻²	micro (μ)	10 ⁻⁶
		nano (n)	10 ⁻⁹
		pico (p)	10 ⁻¹²

1-5 SYMBOLS

° Degree	ℙ Property line	% Percent
' Feet or minutes	ℚ Survey line or station line	# Number
" Inches or seconds	ℚ Center line	/ per or of (between words)
Δ Delta, the central angle or angle between tangents	∠ Angle	

SECTION 2 - SCOPE AND CONTROL OF WORK

2-1 AWARD AND EXECUTION OF CONTRACT

2-1.1 Award of Contract. The right is reserved to waive minor irregularities in the proposals and to reject any or all proposals. The award of the Contract, if it be awarded, will be to the lowest responsive, responsible Bidder, determined as provided on the Proposal Form, whose Proposal complies with all the requirements prescribed. Such award, if made, will be made within the number of Days stated in the Proposal form. If the lowest responsible Bidder refuses or fails to execute the Contract, the Agency may, within 45 additional Days, consider the next lowest Bidder to be the lowest responsive, responsible Bidder. The periods of time specified above within which the award of Contract may be made shall be subject to extension for such further period as may be agreed upon in writing by the Bidder concerned. If the Bidder's bid guarantee was in the form of a bid bond, the Bidder shall also submit a statement from the Surety that the bond has been extended for the same period.

Proposals not accompanied by a properly executed Noncollusion Affidavit required by Public Contract Code Section 7106 will be considered nonresponsive and will not be considered for award.

All bids will be compared on the basis of the quantities, amounts and unit prices, or lump sums, as shown on the Bid Proposal.

Before award, the Bidder may be required to furnish acceptable evidence of adequate capability, equipment and financial resources to adequately perform the Work. Bidders found not to be so qualified may have their bids rejected. If reasonable cause exists to believe collusion exists among Bidders, or that prices Bid are unbalanced between Bid items, any or all proposals may be rejected.

Award will not be made to a Bidder who is listed by the State Labor Commissioner as ineligible to bid, work on, or be awarded public works projects.

2-1.2 Notice of Award. Within one Day after award of Contract by the Board, the Bidder to whom Contract is awarded will be notified of award by email and telephone, or if no contact is made by telephone, then by mail. Within three business days after award of Contract, a Notice of Award will be sent, transmitting the Contract Documents to such Bidder for execution. If telephone contact is made, the Bidder may request that the Contract Documents be held in Agency's office to be picked up.

2-1.3 Execution of Contract Documents. On receipt of the Contract Documents, the Bidder shall promptly obtain the required insurance coverage, certificates of insurance, power-of-attorney and Contract bonds, execute the Contract, and transmit all required documents to the Agency.

2-1.4 Failure to Execute Documents. Should the Bidder fail to furnish Agency all required documents, properly executed, prior to the starting day of the Contract time computed as provided in 6-7.4 and stated in the Notice of Award, Agency may thereafter declare the Bidder to be in default and its Proposal guarantee forfeited.

2-1.5 Return of Proposal Guarantees. Within 10 Days after the award of the Contract, Agency will return the Proposal guarantees, other than Bidder's bonds, accompanying such of the proposals as are not to be further considered in making the award. The low and second Bidder's Proposal guarantee will be held until the Contract has been executed, after which all Proposal guarantees, except Bidders' bonds and any guarantees which have been forfeited, will be returned to the respective Bidders whose proposals they accompany.

2-2 ASSIGNMENT. No Contract or portion thereof may be assigned without consent of the Board except that the Contractor may assign money due or which will accrue to it under the Contract. If given written notice, such assignment will be recognized by the Board to the extent permitted by law, but any assignment of money shall be subject to all proper withholdings in favor of the Agency and to all deductions provided for in the Contract. All money withheld, whether assigned or not, shall be subject to being used by the Agency for completion of the Work, should the Contractor be in default.

2-3 SUBCONTRACTS.

2-3.1 General. Each Bidder shall comply with the Chapter of the Public Contract Code including Sections 4100 through 4113. The following excerpts or summaries of some of the requirements of that Chapter are included below for information.

The Bidder shall set forth in the Bid, as provided in 4104:

"(a) (1) The name, the location of the place of business, and the California contractor license number of each subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State of California who, under subcontract to the prime contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of 1 percent of the prime contractor's total bid or, in the case of bids or offers for the construction of streets or highways, including bridges, in excess of one-half of 1 percent of the prime contractor's total bid or ten thousand dollars (\$10,000), whichever is greater.

(2) An inadvertent error in listing the California contractor license number provided pursuant to paragraph (1) shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive if the corrected contractor's license number is submitted to the public entity by the prime contractor within 24 hours after the bid opening and provided the corrected contractor's license number corresponds to the submitted name and location for that subcontractor."

If the Contractor fails to specify a Subcontractor, or specifies more than one Subcontractor for the same portion of the Work to be performed under the Contract (in excess of one-half of 1 percent of the Contractor's total bid), the Contractor shall be qualified to perform that portion itself, and shall perform that portion itself except as otherwise provided in the Code.

Except as provided in Section 4107, no prime contractor, whose Bid is accepted, shall substitute any person or Subcontractor in place of the Subcontractor listed in the original bid other than for causes and by procedures established in Section 4107.5 which provides procedures to correct a clerical error in the listing of a Subcontractor.

Section 4110 provides that a Contractor violating any of the provisions of the Chapter violates the Contract and the Board may exercise the option either to cancel the Contract or assess the Contractor a penalty in an amount of not more than 10 percent of the subcontract involved, after a public hearing.

2-3.1.1 Use of Debarred Subcontractors Prohibited. The Contractor is prohibited from performing work using a Subcontractor who is listed by the State Labor Commissioner as ineligible to work on public works projects.

2-3.2 Additional Responsibilities. The Contractor shall give personal attention to the fulfillment of the Contract and shall keep the Work under its control.

Except where the required Contractor's License Class is "B", the Contractor shall perform, with its own organization, Contract work amounting to at least 50 percent of the Contract Price except that any designated "Specialty Items" may be performed by subcontract and the amount of any such "Specialty Items" so performed may be deducted from the Contract Price before computing the amount required to be performed by the Contractor with its own organization. "Specialty Items" will be identified by the Agency in the Bid or Proposal with an "[S]". Where an entire item is subcontracted, the value of work subcontracted will be based on the Contract Unit Price. This will be determined from information submitted by the Contractor, and subject to approval by the Engineer.

Before the work of any Subcontractor is started, the Contractor shall submit to the Engineer for approval a written statement showing the work to be subcontracted giving the name, contractor license number, registration with the Department of Industrial Relations, and business of each Subcontractor and description and value of each portion of work to be subcontracted.

2-3.3 Status of Subcontractors. Subcontractors shall be considered employees of the Contractor, and the Contractor shall be responsible for their work.

2-3.3.1 Subcontracts. The Contractor shall incorporate into all subcontracts, and the Subcontractor shall incorporate into all lower tier subcontracts, all of the Plans and Specifications which are part of the Contract between the Contractor and the Agency.

2-3.3.2 Contractor Responsible. The Contractor is responsible for properly performing and completing all Work required by the Contract whether or not it employs subcontractors for certain portions of the Work. It shall coordinate the sequence and timing of its efforts and that of its subcontractors to insure the proper and timely completion of the Work.

2-3.3.3 Specialty Contractors. Where a specialty Contractor's license is required by law or by the Specifications in order to perform certain portions of the Work, the Contractor may perform such portion with its own forces if it holds the proper license. Otherwise, it shall employ a properly licensed subcontractor to perform that portion of the Work. Such requirement to employ a subcontractor does not modify the other requirements of 2-3.

2-4 CONTRACT BONDS. Before execution of the Contract by the Agency, the Bidder shall file surety bonds with the Agency to be approved by the Board in the amounts and for the purposes noted below. Bonds issued by a Surety who is listed in the latest version of U.S. Department of Treasury Circular 570, who is authorized to issue bonds in California, and whose bonding limitation shown in said circular is sufficient to provide bonds in the amount required by the Contract shall be deemed to be approved unless specifically rejected by the Agency. Bonds from all other sureties shall be accompanied by all of the documents enumerated in Code of Civil Procedure 995.660(a). The Bidder shall pay all bond premiums, costs, and incidentals.

Each bond shall incorporate, by reference, the Contract and be signed by both the Bidder and Surety and the signature of the authorized agent of the Surety shall be notarized.

The Bidder shall provide two good and sufficient surety bonds. The "Payment Bond" (Material and Labor Bond) shall be for not less than 100 percent of the Contract Price, to satisfy claims of material suppliers and mechanics and laborers employed by it on the Work. The bond shall be maintained by the Contractor in full force and effect until the Work is accepted by the Agency, and until all claims for materials and labor are paid, and shall otherwise comply with the Civil Code.

The "Performance Bond" shall be for 100 percent of the Contract Price to guaranty faithful performance of all Work, within the time prescribed, in a manner satisfactory to the Agency, and that all materials and workmanship will be free from original or developed defects. The bond must remain in effect until the end of the warranty period set forth in 6.8-2.

Should any bond become insufficient, the Contractor shall renew the bond within 10 Days after receiving notice from the Agency.

Should any Surety at any time be unsatisfactory to the Board, notice will be given the Contractor to that effect. No further payments shall be deemed due or will be made under the Contract until a new Surety shall qualify and be accepted by the Board.

Changes in the Work, or extensions of time, made pursuant to the Contract, shall in no way release the Contractor or Surety from its obligations. Notice of such changes or extensions shall be waived by the Surety.

2-4.1 Bond Forms. Bonds shall be on forms furnished by Agency.

2-5 PLANS AND SPECIFICATIONS

2-5.1 General. The Contractor shall keep at the work site a copy of the Plans and Specifications, to which the Engineer shall have access at all times.

The Plans, Specifications, and other Contract Documents shall govern the Work. The Contract Documents are intended to be complementary and cooperative. Anything specified in the Specifications and not shown on the Plans, or shown on the Plans and not specified in the Specifications, shall be as though shown or specified in both.

The Plans shall be supplemented by such working drawings and shop drawings as are necessary to adequately control the Work.

The Contractor shall ascertain the existence of any conditions affecting the cost of the Work through reasonable examination of the work site prior to submitting the Bid..

Existing improvements visible at the work site, for which no specific disposition is made on the Plans, but which interfere with the completion of the Work, shall be removed and disposed of by the Contractor.

The Contractor shall, upon discovering any error or omission in the Plans or Specifications, immediately call it to the attention of the Engineer.

2-5.1.1 Specifications Captions. Captions accompanying specification parts, sections and paragraphs are for convenience of reference only and do not limit the content of such part, section or paragraph.

The division of the Plans into parts and the division of the Specifications into divisions and sections are for the ease of reference only and does not imply the division of work between trades or subcontractors.

2-5.2 Precedence of Contract Documents. If there is a conflict between any of the Contract Documents, the document highest in precedence shall control. The precedence shall be as follows:

- 1) Permits issued by jurisdictional regulatory agencies.
- 2) Change Orders and Supplemental Agreements; whichever occurs last.
- 3) Contract/Agreement.
- 4) Addenda.
- 5) Bid/Proposal.
- 6) Special Provisions.
- 7) Plans.
- 8) Standard Plans.
- 9) Standard Specifications.
- 10) Reference Specifications.

Detail drawings shall take precedence over general drawings.

2-5.3 Shop Drawings, Working Drawings, and Submittals.

2-5.3.1 General. Submittals shall be provided, at the Contractor's expense, as required in 2-5.3.2, 2-5.3.3 and 2-5.3.4, when required by the Plans or Special Provisions, or when requested by the Engineer.

Materials shall neither be furnished nor fabricated, nor shall any work for which submittals are required be performed, before the required submittals have been reviewed and accepted by the Engineer. Neither review nor acceptance of submittals by the Engineer shall relieve the Contractor from responsibility for errors, omissions, or deviations from the Contract Documents, unless such deviations were specifically called to the attention of the Engineer in the letter of transmittal. The Contractor shall be responsible for the correctness of the submittals.

The Contractor shall allow a minimum of 20 working days for review of submittals unless otherwise specified in the Special Provisions. Each submittal shall be accompanied by a letter of transmittal.

2-5.3.2 Working Drawings. Working drawings shall be of a size and scale to clearly show all necessary details.

Six copies and one reproducible shall be submitted. If no revisions are required, 3 of the copies will be returned to the Contractor. If revisions are required, the Engineer will return one copy along with the reproducible for resubmission. Upon acceptance, the Engineer will return 2 of the copies to the Contractor and retain the remaining copies and the reproducible.

Working drawings are required in the following subsections:

TABLE 2-5.3.2 (A)

Item	Section Number	Title	Subject
1	7-8.5.2	Sanitary Sewers	Sewage Bypass and Pumping
2	7.8.6.3	Water Pollution Control	Storm Water Pollution Prevention Plan
3	7-8.6.6	Water Pollution Control	Dewatering Plan
4	7-10.2.2	Work Area Traffic Control	Traffic Control Plan
5	7-10.4..2.2	Safety	Trench Shoring
6	207-8.4	Joints	Vitrified Clay Pipe
7	207-10.2.1	General	Fabricated Steel Pipe
8	300-3.2	Cofferdams	Structure Excavation & Backfill
9	303-1.6.1	General	Falsework
10	303-1.7.1	General	Placing Reinforcement
11	303-3.1	General	Prestressed Concrete Construction
12	304-1.1.1	Shop Drawings	Structural Steel
13	304-1.1.2	Falsework Plans	Structural Steel
14	304-2.1	General	Metal Hand Railings
15	306-2.1	General	Jacking Operations
16	306-3.1	General	Tunneling Operations
17	306-3.4	Tunnel Supports	Tunneling Operations
18	306-6	Remodeling Existing Sewer Facilities	Polyethylene Liner Installation
19	306-8	Microtunneling	Microtunneling Operations

Working drawings listed above as Items 4, 5, 8, 9, 11, 12, 13, 15 and 18 shall be prepared by a Civil or Structural Engineer registered by the State of California.

2-5.3.3 Shop Drawings. Shop drawings are drawings showing details of manufactured or assembled products proposed to be incorporated into the Work. Shop drawings required shall be as specified in the Special Provisions.

2-5.3.4 Supporting Information. Supporting information is information required by the Specifications for the purposes of administration of the Contract, analysis for verification of conformance with the Specifications, the operation and maintenance of a manufactured product or system to be constructed as part of the Work, and other information as may be required by the Engineer. Six copies of the supporting information shall be submitted to the Engineer prior to the start of the Work unless otherwise specified in the Special Provisions or directed by the Engineer. Supporting information for systems shall be bound together and include all manufactured items for the system. If resubmittal is not required, three copies will be returned to the Contractor. Supporting information shall consist of the following and is required unless otherwise specified in the Special Provisions:

- 1) List of Subcontractors per 2-3.2.
- 2) List of Materials per 4-1.4.
- 3) Certificates of Compliance per 4-1.5.
- 4) Construction Schedule per 6-1.
- 5) Spill Prevention and Emergency Response Plan per 7-8.5.3
- 6) Confined Space Entry Program per 7-10.4.5.1
- 7) Lean concrete base mix designs per 200-4
- 8) Concrete mix designs per 201-1.1.
- 9) Asphalt concrete mix designs per 203-6.1.
- 10) Pipeline layout diagrams per 207-2.1
- 11) Equipment and materials list per 307-1
- 12) Controller cabinet wiring diagrams per 307-17.2.2
- 13) Data, including, but not limited to, catalog sheets, manufacturer's brochures, technical bulletins, specifications, diagrams, product samples, and other information necessary to describe a system, product or item. This information is required for irrigation systems, street lighting systems, and traffic signals, and may also be required for any product, manufactured item, or system.

2-5.4 Record Drawings. The Contractor shall prepare and maintain a set of prints in the Engineer's Field Office on which the locations and description of all plumbing, mechanical, and electrical facilities, which were not detailed fully on the Plans, are marked in colored pencil. Such prints shall also indicate any authorized changes from the original Plans. Such prints shall be furnished to the Engineer before final Acceptance of the Work.

2-6 WORK TO BE DONE. The Contractor shall perform all work necessary to complete the Contract in a satisfactory manner. Unless otherwise provided, it shall furnish all materials, equipment, tools, labor and incidentals necessary to complete the Work.

All work under the Contract shall be performed in accordance with the highest standards prevailing in the trades unless otherwise specified on the Plans or in the Special Provisions. Unless otherwise specified, it is the intent that the Contractor will construct a complete facility ready for use.

2-6.1 Manufacturer's Recommendations. Where the manufacturer of any materials or equipment provides written recommendations or instructions for its use or method of installation (including labels, tags, manuals, or trade literature), such recommendations or instructions shall be complied with except where the Contract Documents specifically require deviations.

2-6.2 Testing of Installed Components. Where the specifications provide that any component of the Work is to be tested, calibrated or adjusted during or after installation, such testing shall be performed by a qualified firm, approved by the Engineer. The firm performing the testing or calibration shall be employed by and paid for by the Contractor.

2-6.3 Training of Agency Personnel. Where the specifications provide for training of Agency personnel in the use or maintenance of any component of the Work, the Contractor shall arrange for and pay for competent personnel to perform the training. Contractor shall schedule the training with the Engineer.

2-7 SUBSURFACE DATA. All soil and test hole data, groundwater elevations, and soil analyses shown on the Plans or included in the Specifications apply only at the location of the test holes and to the depths shown. Soil test reports for test holes which have been drilled are available for inspection at the office of the Engineer. Additional subsurface exploration may be performed by Bidders or the Contractor at their own expense. The indicated groundwater elevation is that existing at the date specified in the data. It is the Contractor's responsibility to determine and allow for the groundwater elevation on the date the Work is performed. A difference in groundwater elevation between what is shown in soil boring logs and what is actually encountered during construction will not be considered as a basis for Extra Work per 3-3.

Opinions, recommendations or conclusions contained in any soils report, soil boring logs, subsurface materials investigation, geological report or other similar studies, tests or reports, prepared for the Agency, are not a part of the Contract. Contractor shall be responsible for forming its own opinions and conclusions from the facts set forth in such reports.

2-8 RIGHTS-OF-WAY. Rights-of-way, easements or rights-of-entry for the Work will be provided by the Agency. Unless otherwise provided, the Contractor shall make arrangements, pay for, and assume all responsibility for acquiring, using, and disposing of additional work areas and facilities temporarily required. The Contractor shall indemnify and hold the Agency harmless from all claims for damages caused by such actions.

2-9 SURVEYING

2-9.1 Permanent Survey Markers. The Contractor shall notify the Engineer at least 7 Days before starting work to allow for the preservation of survey monuments, lot stakes (tagged), and bench marks. The Engineer, or the owner at its cost, shall file a Corner Record Form referencing survey monuments subject to disturbance in the Office of the County Surveyor prior to the start of construction and also prior to the completion of construction for the replacement of survey monuments. The Contractor shall not disturb survey monuments, lot stakes (tagged), or bench marks without the consent of the Engineer or the owner on Private Contracts. The Contractor shall bear the expense of replacing any that may be disturbed without permission. Replacement shall be done only under the direction of the Engineer by a Licensed Land Surveyor or a Registered Civil Engineer authorized to practice land surveying within the state.

When a change is made in the finished elevation of the pavement of any roadway in which a permanent survey monument is located, the Contractor shall adjust the monument cover to the new grade within 7 Days of finished paving unless otherwise specified.

2-9.2 Survey Service. The Engineer will set only the horizontal and vertical control survey points shown on the Plans. These will be set prior to the commencement of construction. The Contractor shall preserve these points as well as any other surveys established by the Engineer for use by the Contractor for the duration of their usefulness. If any survey points established by Engineer are lost or disturbed and need to be replaced, such replacement shall be by the Engineer at the expense of the Contractor. The Contractor shall employ engineers or surveyors to perform adequate surveys and staking necessary to construct the Work to the lines, elevations and grades shown on the Plans and for the Engineer's use in checking such work. Copies of the field notes or diagrams used in setting stakes shall be promptly furnished to the Engineer.

2-9.2.1 Open Areas. Where dimensions are not given on the Plans for parking lots, landscaped areas or graded areas, distances shall be scaled. Unless otherwise indicated, straight grades and smooth vertical curves shall be set between indicated elevations. Finished surfaces shall be sloped to drain in order to eliminate ponding of water.

2-9.2.2 Utilities. Section 5-5.1 requires the Contractor's cooperation during the relocation of utilities, which may require the setting of lines and grades when needed by utility owners performing relocations.

2-9.3 Contractor's Surveys. Surveying by private engineers and surveyors on the Work shall conform to the quality and practice required by the Engineer.

2-9.3.1 Errors in Surveys. The Contractor is responsible for the accuracy of all surveys except those performed by the Engineer. To assure that a survey point set by the Engineer has not been disturbed since it was set and that it was accurately set, all surveys by the Contractor shall be based on at least two survey points set by the Engineer or by other governmental surveys, in accordance with good survey practice. Should discrepancies be found between such points, the Engineer shall be notified and construction shall not proceed until the discrepancy has been resolved.

2-9.4 Line and Grade. All Work upon completion shall conform to the lines, elevations, and grades shown on the Plans.

2-9.5 Quantity Surveys. The Engineer will perform all quantity surveys for payment purposes, however, in performing such quantity surveys, it may make use of surveys performed by the Contractor.

2-9.6 Payment for Surveys. Payment for performing all of the surveying and staking as required by the Specifications and such additional surveying and staking as required by the Contractor will be made at the lump sum price set forth in the Proposal and shall be full compensation for furnishing all labor, equipment, instruments and materials necessary to perform the Work. If no bid item for surveying is included in the Proposal, the cost of surveying shall be included in the prices bid for other applicable items of work.

2-10 AUTHORITY OF BOARD AND ENGINEER. The Board has the final authority in all matters affecting the Work. Within the scope of the Contract, the Engineer has the authority to enforce compliance with the Plans and Specifications. The Contractor shall promptly comply with instructions from the Engineer or its authorized representative.

On all questions relating to quantities, the acceptability of material, equipment, or work, the execution, progress or sequence of work, and the interpretation of Specifications or drawings, the decision of the Engineer is final and binding, and shall be precedent to any payment under the Contract, unless otherwise ordered by the Board.

2-10.1 Decisions in Writing. Any and all decisions of the Engineer interpreting Specifications or drawings shall be in writing. Any purported "interpretation" which is not in writing shall not be binding upon the Agency and should not be relied upon by the Contractor.

2-11 INSPECTION

The Work is subject to inspection and approval of the Engineer. The Contractor shall notify the Engineer before noon of the working day before inspection is required. Work shall be done only in the presence of the Engineer, unless otherwise authorized. Any work done without proper inspection will be subject to rejection. The Engineer and any authorized representatives shall at all times have access to the Work during its construction at shops and yards as well as the Work site. The Contractor shall provide every reasonable facility for ascertaining that the materials and workmanship are in accordance with these specifications. Inspection of the Work shall not relieve the Contractor of the obligation to fulfill all conditions of the Contract.

2-11.1 Permit Inspections. The Contractor shall arrange for code compliance inspections by all agencies issuing permits for the Work. The Work shall not continue beyond mandatory inspection points without clearance from the controlling agency. Each agency involved shall be notified in accordance with the code they enforce or in accordance with their standard operating procedures. No extensions of time will be granted for delays occasioned by such inspections except where, through no fault of the Contractor, the inspection is delayed more than one Day beyond normal response time after proper notification has been given. It shall be the Contractor's responsibility to see that any required inspection record card is signed off before proceeding with the next phase of the Work and completely signed off on completion of the Work.

2-11.2 Structural Observation. When the plans indicate that "Structural Observation" of specific work is required prior to Permit Inspection, Contractor shall notify Engineer, in writing, at least five working days prior to the date Contractor plans to have the work ready for structural observation. If the work is not ready for structural observation on the date indicated, Contractor shall reimburse Agency the cost of structural observer's visit to the Work site. If the work to be observed is substantially complete but is found to need correction before approval by the structural observer, Contractor shall give notice of a new date, as required above.

2-12 SPECIAL NOTICES. When specified in the Specifications or as directed by the Engineer, any notice required to be given in accordance with this subsection shall be in writing, dated, and signed by the Contractor or the Engineer. Such notices shall be served by any of the following methods:

- a) Personal delivery with proof of delivery which may be made by declaration under penalty of perjury by any person over the age of 18 years. The proof of delivery shall show that delivery was performed in accordance with these provisions. Service shall be effective on the date of delivery. Notices given to the Contractor by personal delivery may be made to the Contractor's authorized representative at the Work site; or
- b) Certified mail addressed to the mailing address of the recipient postage prepaid; return receipt requested. Service shall be effective on the date of the receipt of the mailing.

Simultaneously, the Agency may send the same notice by regular mail. If a notice that is sent by certified mail is returned unsigned, then delivery shall be effective pursuant to regular mail, provided the notice that was sent by regular mail is not returned.

2-13 AGENCY PERSONNEL AND AUTHORITY

2-13.1 General. The Board has complete authority for the project within the limits prescribed by law. Pursuant to resolutions duly adopted by the Board, the authority to perform certain functions has been delegated to the Director of Public Works. Agency staff personnel and Consultants delegated thereto by the Director are authorized to perform functions limited as set forth in the following list of personnel and designated duties.

2-13.2 Engineer. The Director of the Public Works Agency of the County of Ventura is the Engineer and has general authority to administer the Contract. The Engineer has the following specific authority:

(a) To issue Contract Change Orders (CCO) and to settle claims subsequent to Acceptance as follows:

<u>Original Contract Amount</u>	<u>Maximum Amount of any Change Order or Claim Settlement</u>
\$50,000 or less.....	\$5,000
greater than \$50,000 and not over \$250,000	10% of the original Contract amount
greater than \$250,000 and not over \$3,950,000	\$25,000 plus 5% of the original Contract cost in excess of \$250,000.
greater than \$3,950,000	\$210,000

CCOs and claim settlements exceeding the amounts set forth above require Board approval.

- (b) To make final adjustments of quantities (FAQ) on unit price items.
- (c) To accept the Work when the Contractor has completed all obligations of the Contract, in accordance with the Plans, Specifications and other Contract Documents. The Engineer also has authority to make and record the Notice of Completion.
- (d) To approve progress and final payments under the Contract, including the provisions for withholding funds.
- (e) To determine whether performance on the Work is satisfactory. Satisfactory performance includes compliance with all contract requirements.
- (f) To approve the substitution of a Subcontractor, where allowed by law, if the listed Subcontractor does not object when notified.
- (g) To suspend the Work for the benefit of the Agency.
- (h) In the absence of the Agency Director, a Public Works Agency Department Director, as Deputy Director of Public Works, may exercise the Engineer's authority. Such action will be indicated by "Acting" with the Department Director's signature.

2-13.3 Department Director (Public Works Agency). The Department Director responsible for the project is designated in the Notice to Proceed. The Department Director has the following authority:

(a) To issue Contract Change Orders (CCO) as follows:

<u>Original Contract Amount</u>	<u>Maximum Amount of any Change Order</u>
Less than \$500,000.....	\$5,000
\$500,000 to \$1,000,000	1% of Bid Price
Greater than \$1,000,000	\$10,000

- (b) To issue extensions of Contract time in accordance with the Contract Documents.
- (c) To make final adjustment of quantities where the total does not exceed the amounts listed in (a) above.
- (d) To approve the substitution of subcontractors, where allowed by law, if the listed Subcontractor does not object when notified.
- (e) To determine when the Work has been completed and acknowledge in writing the completion of the Work.

2-13.4 Project manager. The Project manager responsible for the project is designated in the Notice to Proceed. This person may also be referred to as Project Engineer. The Project manager has the following authority:

- (a) To interpret the Plans and Specifications.
- (b) To make minor changes in the location or features of the Work where no change in cost is involved. Such changes in cost may not be the net of multiple changes.
- (c) To approve substitutes for material and equipment specified by proprietary names when such material and equipment meet the Contract requirements.
- (d) To approve shop drawings and submittals.
- (e) To issue stop work orders when necessary to enforce the provisions of the Contract.
- (f) To make determinations of each Working Day to be charged against the Contract time in accordance with 6-7.3.
- (g) To take over a portion of the Work for Agency's use in accordance with 6-10.
- (h) To receive all correspondence and other documents from the Contractor.
- (i) To inspect the Work and perform Final Inspection subject to review by the Department Director and the Engineer.

2-13.5 Inspector. One or more inspectors will be assigned to the project by the Project manager. Substitutes may be used during absence of the assigned inspector. The Inspector has the following authority subject to review by the Project manager, Department Director and the Engineer:

- (a) To view and inspect the Work, sample and test components (at the Work site and at offsite manufacturing locations), and to discuss the Work with the Contractor's field representative.
- (b) To determine compliance with the Plans, Specifications and other Contract Documents and to issue warnings of noncompliance.
- (c) To issue stop work notices in the following two instances only:
 - 1) Where a safety hazard exists that has an immediate potential for serious injury or death.
 - 2) Where the operation in progress, if continued for even a short period of time, could be adverse to the Agency's interests.

2-13.6 Other Agency Personnel and Consultants.

2-13.6.1 Materials Engineer. The Materials Engineer is designated in the Notice to Proceed. The Materials Engineer may assign one or more Materials Inspectors to the project.

Materials Inspectors have authority to sample and test material at the Work site and at offsite manufacturing or storage locations. They may furnish available written test results to the Contractor's field representative. At batch plants, they may issue warnings of noncompliance, but stop notices require the signature of the Materials Engineer or Project manager.

2-13.6.2 Surveyors & Technicians. Surveyors and technicians shall have free access to the site to perform their duties but have no authority related to Contract administration.

2-13.6.3 Other Persons. Other Agency personnel who are not involved in construction administration and the general public may be present at the site because it is their present place of work, as client/customers, as visitors, as future users of the facility, or as persons who will maintain the completed facility. Where the facility is to continue in use during construction, work access for Agency workers and client/customers shall be maintained as provided in the Special Provisions. Where the facility (or portion where construction is being performed) is not in use during construction, admittance to the Work site by Agency personnel not involved in construction administration and visitors may be allowed by the Contractor or by the inspector, subject to compliance with safety regulations. Such persons have no authority under the Contract and the Agency is not responsible for their comments, suggestions or directions.

2-13.6.4 Consultants. Consultants hired by the Agency shall have free access to the site to perform their duties but have no authority related to Contract administration, unless such duties are specifically identified in writing to the Contractor. When so identified, Consultant may perform the duties of certain Agency personnel described above.

SECTION 3 - CHANGES IN WORK

3-1 CHANGES REQUESTED BY THE CONTRACTOR

3-1.1 General. Changes in specified methods of construction may be made at the Contractor's request when approved in writing by the Engineer. Changes in the Plans and Specifications, requested in writing by the Contractor, which do not materially affect the Work and which are not detrimental to the Work or to the interests of the Agency, may be granted by the Board to facilitate the Work, when approved in writing by the Engineer. Nothing herein shall be construed as granting a right to the Contractor to demand acceptance of such changes.

3-1.2 Payment for Changes Requested by the Contractor. If such changes are granted, they shall be made at a reduction in cost or at no additional cost to the Agency. All costs to the Agency in reviewing the proposed change, or testing materials involved therein, shall be paid for by the Contractor, whether or not the change is approved.

3-2 CHANGES INITIATED BY THE AGENCY

3-2.1 General. The Agency may change the Plans, Specifications, character of the Work, or quantity of work, provided the total arithmetic dollar value of all such changes, both additive and deductive, does not exceed 25 percent of the Contract Price. Should it become necessary to exceed this limitation, the change shall be by written Supplemental Agreement between the Contractor and Agency, unless both parties agree to proceed with the change by Change Order.

Change orders shall be in writing and state the dollar value of the change or establish method of payment, any adjustment in Contract time, and, when negotiated prices are involved, shall provide for the Contractor's signature indicating its acceptance.

3-2.2 Payment for Changes Initiated by the Agency.

3-2.2.1 Contract Unit Prices. If a change is ordered in an item of work covered by a Contract unit price, and such change does not involve a substantial change in the character of the Work from that shown on the Plans or included in the Specifications, an adjustment in payment will be made based upon the increase or decrease in quantity and the Contract unit price. In the case of such an increase or decrease in a Major Bid Item, the use of this basis for the adjustment of payment will be limited to that portion of the change which, together with all previous changes to that item, is not in excess of 25% of the total cost of such item based on the original quantity and Contract unit price.

If a change is ordered in an item of work covered by a Contract unit price, and such change does involve a substantial change in the character of the Work from that shown on the Plans or included in the Specifications, an adjustment in payment will be made in accordance with 3-2.2.3.

Should any Contract item be deleted in its entirety, payment will be made only for actual costs incurred prior to notification of such deletion.

3-2.2.2 Stipulated Unit Prices. Stipulated unit prices are those established by the Agency in the Contract Documents, as distinguished from Contract unit prices submitted by the Contractor. Stipulated unit prices may be used for the adjustment of Contract changes.

3-2.2.3 Pricing. Adjustments in payments for changes other than those set forth in 3-2.2.1 and 3-2.2.2 will be determined by agreement between Contractor and Agency. If unable to reach agreement, the Agency may direct the Contractor to proceed on the basis of Extra Work in accordance with 3-3 or as set forth in 3-2.2.4.

3-2.2.4 Non-Agreed Prices. Agency may issue a change order directing the Contractor to proceed at a price set by the Agency or on the basis of Extra Work. If the Agency sets a price for the work covered by the change order, Contractor is entitled to payment for such work in accordance with 3-3 to the extent payment in accordance with 3-3 exceeds the price set by the Agency.

3-3 EXTRA WORK

3-3.1 General. New or unforeseen work will be classed as "Extra Work" when the Engineer determines that it is not covered by Contract Unit Prices or Stipulated Unit Prices.

3-3.2 Payment.

3-3.2.1 General. When the price for the Extra Work cannot be agreed upon, the Agency will pay for the Extra Work based on the accumulation of costs as provided herein.

3-3.2.2 Basis for Establishing Costs

(a) Labor. The cost of labor will be the current cost for wages prevailing for each craft or type of workers performing the Extra Work at the time the Extra Work is done, plus payment of health and welfare, pension, vacation, apprenticeship funds, and other direct costs included in the prevailing rates applicable to the project, as well as assessments or benefits required by lawful collective bargaining agreements. To the total of these labor costs, the labor surcharge set forth in the current CALTRANS Labor Surcharge and Equipment Rental Rates publication shall be applied.

The use of a labor classification which would increase the Extra Work cost will not be permitted unless the Contractor establishes the necessity for such additional costs.

Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for the equipment rental. The labor cost for foremen shall be proportioned to all of their assigned work and only that applicable to Extra Work shall be paid. A foreman is defined as a lead working journeyman.

Nondirect labor costs including superintendence, payroll taxes, all types of insurance, and all other labor costs, not specifically provided for, shall be considered to be paid for as part of the markup of 3-3.2.3(a)(1).

(b) Materials. The cost of materials reported shall be at invoice or lowest current price at which such materials are locally available and delivered to the Work site in the quantities involved, plus sales tax, freight and delivery.

The Agency reserves the right to approve materials and sources of supply, or to supply materials to the Contractor if necessary for the progress of the Work. No markup shall be applied to any material provided by the Agency.

(c) Tool and Equipment Rental. No payment will be made for the use of tools which have a replacement value of \$200 or less.

Regardless of ownership, the rates to be used for determining equipment rental costs shall not exceed the following:

- (1) For equipment that is listed in the current CALTRANS Labor Surcharge and Equipment Rental Rates publication, the rates shown therein. The right of way delay and overtime/multiple shift factors contained therein shall be used as applicable.
- (2) For equipment not listed in said CALTRANS publication, the listed rates prevailing locally at equipment rental agencies, or distributors, at the time the work is performed.
- (3) For equipment rental that includes operators and helpers, the applicable cost from (1) or (2) above, plus the applicable labor costs as determined in accordance with (a) above.

The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals.

Necessary loading and transportation costs for equipment used on the Extra Work shall be added to the other costs.

If equipment is used intermittently and, when not in use, could be returned to its rental source at less expense to the Agency than holding it at the work site, it shall be returned, unless the Contractor elects to keep it at the work site at no expense to the Agency.

All equipment shall be acceptable to the Engineer, in good working condition, and suitable for the purpose for which it is to be used. Manufacturer's ratings and manufacturer's approved modifications shall be used to classify equipment and it shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

The reported rental rates for equipment already at the work site shall be for the duration of its use on the Extra Work, commencing at the time it is first put into actual operation on the Extra Work, plus the time required to move it from its previous site, and move it back to its previous site or to a closer site of next use.

3-3.2.2 Basis for Establishing Costs (Continued)

(d) Other Items. The Agency may authorize other items which may be required on the Extra Work. Such items include labor, service, material and equipment which are different in their nature from those required for the Work specified in the Contract and which are of a type not ordinarily available from the Contractor or any of its subcontractors.

Invoices covering all such items in detail shall be submitted with the request for payment.

(e) Invoices. Vendors' invoices for material, equipment rental, and other expenditures, shall be submitted with the request for payment. If the request for payment is not substantiated by invoices or other documentation, the Agency may establish the cost of the item involved at the lowest price which was current at the time of the report.

3-3.2.3 Markup

(a) Work by Contractor. The following percentage shall be added to the Contractor's costs and shall constitute the markup for all overhead and profits, and all other cost not specifically provided for:

- (1) Labor 33%
- (2) Materials 15%
- (3) Equipment Rental 15%
- (4) Other Items and Expenditures ... 15%

To the sum of the cost and markups provided for in this section, 1 percent shall be added as compensation for bonding.

(b) Work by Subcontractor. When all or any part of the Extra Work is performed by a Subcontractor, the markup established in 3-3.2.3(a) shall be applied to the Subcontractor's actual cost of such work. A markup of 10% on the first \$5,000 of the subcontracted portion of the Extra Work and a markup of 5% on work in excess of \$5,000 of the subcontracted portion of the Extra Work may be added by the Contractor.

3-3.3 Daily Extra Work Reports by Contractor. When the price for the Extra Work cannot be agreed upon, the Contractor shall submit a Daily Extra Work Report to the Engineer on forms furnished by the Agency, together with applicable delivery tickets, listing all labor, materials, and equipment involved for that day, and for other services and expenditures when authorized. Failure to submit the Daily Extra Work Report, showing the labor and equipment hours and the quantity of materials used, by the close of the next Working Day may waive any rights for that day. Failure to submit fully completed Daily Extra Work Reports, with the required supporting documentation, within ten calendar days after the Engineer makes a written request for the such reports shall waive all rights for the work covered by the requested reports. An attempt shall be made to reconcile the Daily Extra Work Report daily, and it shall be signed by the Engineer and the Contractor. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved immediately. Each party shall retain a signed copy of the Daily Extra Work Report. Daily Extra Work Reports by Subcontractors or others shall be submitted through the Contractor.

The Daily Extra Work Report shall:

- 1) Show names of workers, classifications, and hours worked.
- 2) Describe and list quantities of materials used.
- 3) Show type of equipment, size, identification number, and hours of operation, including loading and transportation, if applicable.
- 4) Describe other services and expenditures in such detail as the Agency may require.

In addition to the Daily Extra Work Reports, the Contractor shall furnish Certified Payroll Records for the labor included in the reports before payment will be made.

3-4 CHANGED CONDITIONS. The Contractor shall notify the Engineer in writing of the following work site conditions, hereinafter called changed conditions, promptly upon their discovery and before they are disturbed:

- 1) Subsurface or latent physical conditions differing materially from those represented in the Contract;
- 2) Unknown physical conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character being performed; and
- 3) Material differing from that represented in the Contract which the Contractor believes may be hazardous waste, as defined in Section 25117 of the Health and Safety Code that is required to be removed to a Class I, Class II or Class III disposal site in accordance with provisions of existing law.

The Engineer will promptly investigate conditions which appear to be changed conditions. If the Engineer determines that the conditions are changed conditions and that they will materially increase or decrease the costs of any portion of the Work, a Change Order will be issued adjusting the compensation for such portion of the Work in accordance with 3-2.2. If the Engineer determines that conditions are changed conditions and that they will materially affect the performance time, the Contractor, upon submitting a written request, will be granted an extension of time subject to the provisions of 6-6.

If the Engineer determines that the conditions of which it has been notified by the Contractor do not justify an adjustment in compensation, the Contractor will be so notified in writing. This notice will also advise the Contractor of its obligation to notify the Engineer, in writing, if the Contractor disagrees.

Should the Contractor disagree with such determination, it may submit a written notice of potential claim to the Engineer before commencing the disputed work. In the event of such a disagreement, the Contractor shall not be excused on account of that disagreement from any scheduled completion date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. However, the Contractor shall retain any and all rights provided either by Contract or by law which pertain to the resolution of disputes and protests between the contracting parties. The Contractor shall proceed as provided in 3-5.

The Contractor's failure to give notice of changed conditions promptly upon their discovery and before they are disturbed shall constitute a waiver of all claims in connection therewith.

3-5 DISPUTED WORK. If the Contractor and the Agency are unable to reach agreement on disputed work, the Agency may direct the Contractor to proceed with the Work. Payment shall be as later determined by mediation or arbitration, if the Agency and the Contractor agree thereto, or as fixed in a court of law.

Although not to be construed as proceeding under Extra Work provisions, the Contractor shall keep and furnish records of disputed work in accordance with 3-3.

SECTION 4 - CONTROL OF MATERIALS

4-1 MATERIALS AND WORKMANSHIP

4-1.1 General. All materials, parts, and equipment furnished by the Contractor in the Work shall be new, high grade, and free from defects. Quality of work shall be in accordance with the generally accepted standards. Material and work quality shall be subject to the Engineer's approval.

Materials and work quality not conforming to the requirements of the Specifications shall be considered defective and will be subject to rejection. Defective work or material, whether in place or not, shall be removed immediately from the site by the Contractor, at its expense, when so directed by the Engineer.

If the Contractor fails to replace any defective or damaged work or material after reasonable notice, the Engineer may cause such work or materials to be replaced. The replacement expense will be deducted from the amount to be paid to the Contractor.

Used or secondhand materials, parts, and equipment may be used only if permitted by the Specifications.

4-1.1.1 Materials Furnished by Agency. Materials furnished by the Agency will be available at locations designated in the Special Provisions or if not designated in the Special Provisions, they will be delivered to a single location of Agency's choice within the project area. They shall be hauled to the site of installation by the Contractor at its expense, including any necessary loading and unloading that may be involved. The cost of handling and placing materials furnished by the Agency shall be considered as included in the price paid for the Contract item involving such furnished materials.

The Contractor will be held responsible for all materials furnished to it, and it shall pay all demurrage and storage charges. Furnished materials, after delivery to Contractor, lost or damaged from any cause whatsoever shall be replaced by the Contractor. The Contractor will be liable to the Agency for the cost of replacing lost or damaged furnished material and such costs may be deducted from any monies due or to become due the Contractor.

4-1.2 Protection of Work and Materials. The Contractor shall provide and maintain storage facilities and employ such measures as will preserve the specified quality and fitness of materials to be used in the Work. Stored materials shall be reasonably accessible for inspection. The Contractor shall also adequately protect new and existing work and all items of equipment for the duration of the Contract.

The Contractor shall not, without the Agency's consent, assign, sell, mortgage, hypothecate, or remove equipment or materials which have been installed or delivered and which may be necessary for the completion of the Contract.

4-1.3 Inspection Requirements

4-1.3.1 General. Unless otherwise specified, inspection is required at the source for asphalt concrete pavement mixtures, structural concrete, metal fabrication, metal casting, welding, concrete pipe manufacture, protective coating application, and similar shop or plant operations. Steel pipe in sizes less than 450 mm (18 inches), vitrified clay and cast iron pipe in all sizes are acceptable upon certification as to compliance with the Specifications, subject to sampling and testing by the Agency. Standard items of equipment such as electric motors, conveyors, elevators, plumbing fixtures, etc., are subject to inspection at the Work site only. Special items of equipment such as designed electrical panel boards, large pumps, sewage plant equipment, etc., are subject to inspection at the source, normally only for performance testing. The Specifications may require inspection at the source for other items not typical of those listed in this section.

4-1.3.2 Inspection of Materials Not Locally Produced. When the Contractor intends to purchase materials, fabricated products, or equipment from sources located more than 80 km (50 miles) outside the geographical limits of the Agency, an inspector or accredited testing laboratory (approved by the Engineer), shall be engaged by the Contractor at its expense, to inspect the materials, equipment or process. This approval shall be obtained before producing any material or equipment. The inspector or representative of the testing laboratory shall evaluate the materials for conformance with the Plans and Specifications. The Contractor shall forward reports required by the Engineer. No materials or equipment shall be shipped nor shall any processing, fabrication or treatment of such materials be done without proper inspection by the approved agent. Approval by said agent shall not relieve the Contractor of responsibility for complying with the Contract requirements.

4-1.3.3 Inspection by the Agency. The Agency will provide all inspection and testing laboratory services within 80 km (50 miles) of the geographical limits of the Agency.

4-1.3.4 Certificates of Compliance. The Engineer may require certificates of compliance with the Specifications for materials or manufactured items produced outside of the Work site. Such certificates will not relieve the Contractor from the requirements of providing material and manufactured items complying with the Specifications even though they have been incorporated into the Work.

4-1.4 Tests of Materials. Before incorporation in the Work, the Contractor shall submit samples of materials, as the Engineer may require, at no cost to the Agency. The Contractor, at its own expense, shall deliver the materials for testing to the place and at the time designated by the Engineer. Unless otherwise provided, all initial testing and a reasonable amount of retesting shall be performed under the direction of the Engineer, and at no expense to the Contractor. If the Contractor is to provide and pay for testing, the Specifications will so state.

The Contractor shall notify the Engineer in writing, at least 15 Days in advance, of its intention to use materials for which tests are specified, to allow sufficient time to perform the tests. The notice shall name the proposed supplier and source of material.

If the notice of intent to use is sent before the materials are available for testing or inspection, or is sent so far in advance that the materials on hand at the time will not last but will be replaced by a new lot prior to use on the Work, it will be the Contractor's responsibility to re-notify the Engineer when samples which are representative may be obtained.

4-1.5 Certification. The Engineer may waive materials testing requirements of the Specifications and accept the manufacturer's written certification that the materials to be supplied meet those requirements. Materials test data may be required as part of the certification.

4-1.6 Trade Names or Equals. The Contractor may supply any of the materials specified or offer an equivalent. The Engineer shall determine whether the material offered is equivalent to that specified. Adequate time shall be allowed for the Engineer to make this determination.

Whenever any particular material, process, or equipment is indicated by patent, proprietary or brand name, or by name of manufacturer, such wording is used for the purpose of facilitating its description and shall be deemed to be followed by the words **or equal**. A listing of materials is not intended to be comprehensive, or in order of preference. The Contractor may offer any material, process, or equipment considered to be equivalent to that indicated. The substantiation of offers shall be submitted as provided in the Contract Documents.

The Contractor shall, at its expense, furnish data concerning items offered by it as equivalent to those specified. The Contractor shall have the material tested as required by the Engineer to determine that the quality, strength, physical, chemical, or other characteristics, including durability, finish, efficiency, dimensions, service, and suitability are such that the item will fulfill its intended function.

Test methods shall be subject to the approval of the Engineer. Test results shall be reported promptly to the Engineer, who will evaluate the results and determine if the substitute item is equivalent. The Engineer's findings shall be final. Installation and use of a substitute item shall not be made until approved by the Engineer.

If a substitute offered by the Contractor is not found to be equal to the specified material, the Contractor shall furnish and install the specified material.

The specified Contract completion time shall not be affected by any circumstance developing from the provisions of this section.

4-1.6.1 Compatibility with Design. Where the size, configuration, weight, fastening locations, fastening strength, utility rough-in locations, and utility capacities of equipment or devices offered by the Contractor as equivalents do not conform to those provided for in the Contract Documents or those which are necessary for equipment or devices indicated by brand names, the Contractor shall bear all costs of redesign and changes in construction necessary to adapt the offered equipment or device to the Work.

Equipment or devices will not be considered "equal" where the life cycle cost of operation, utilities and maintenance of the offered alternate is greater than those listed by brand names. Life cycle costs shall mean utility charges (demand and usage charges), maintenance, operating personnel and replacement (equipment, installation and down time expenses) all reduced to an average annual rate using the current interest rate earned on funds invested by the County Treasurer.

4-1.6.2 Trade Names Listed. Where the Agency has listed products by brand or trade name on the Plans or in the Specifications, or both, this shall not be construed as meaning every product may be used without furnishing shop drawings, without redesign of the facility or without a change in utility rough-in requirements.

Where use of products listed on the Plans or in the Specifications, or both, or where use of a substitute proposed as an "equal" product requires shop drawings, redesign of the facility, or revisions in the size and location of rough-in utility connections, or in connecting work, the Contractor shall provide any necessary shop drawings, or shall cause the preparation of any necessary redesign or revisions to the Plans at its own expense and shall bear the full cost of any necessary additional construction or reconstruction work. No work described in shop drawings, a redesign, or a revision to the Plans shall be undertaken until such shop drawings, redesign, or revisions have been approved by the Engineer. Any proposed redesign or revision to the Plans shall be accompanied by complete computations and details prepared by an appropriate licensed design professional.

4-1.7 Weighing Equipment. All scales used for proportioning materials shall be inspected for accuracy and certified within the past 12 months by the State of California Bureau of Weights and Measures, by the County Director or Sealer of Weights and Measures, or by a scale mechanic registered with or licensed by the County.

The accuracy of the work of a scale service agency, except as stated herein, shall meet the standards of the California Business and Professions Code and the California Code of Regulations pertaining to weighing devices. A certificate of compliance shall be presented, prior to operation, to the Engineer for approval and shall be renewed whenever required by the Engineer at no cost to the Agency.

All scales shall be arranged so they may be read easily from the operator's platform or area. They shall indicate the true net weight without the application of any factor. The figures of the scales shall be clearly legible. Scales shall be accurate to within 1 percent when tested with the plant shut down. Weighing equipment shall be so insulated against vibration or moving of other operating equipment in the plant area that the error in weighing with the entire plant running will not exceed 2 percent for any setting nor 1.5 percent for any batch.

4-1.8 Calibration of Testing Equipment. Testing equipment, such as, but not limited to, pressure gages, metering devices, hydraulic systems, force (load) measuring instruments, and strain-measuring devices shall be calibrated by a testing agency acceptable to the Engineer at intervals not to exceed 12 months and following repairs, modification, or relocation of the equipment. Calibration certificates shall be provided when requested by the Engineer.

SECTION 5 - UTILITIES

5-1 LOCATION. The Permittee (in the case of Private Contracts) and the Agency (in the case of Cash or Assessment Act Contracts), will search known substructure records and furnish the Contractor with copies of documents which describe the location of utility substructures, or will indicate on the Plans for the project those substructures (except for service connections) which may affect the Work. Information regarding removal, relocation, abandonment, or installation of new utilities will be furnished to prospective bidders.

Where underground main distribution conduits such as water, gas, sewer, electric power, telephone, or cable television are shown on the Plans, the Contractor shall assume that every property parcel will be served by a service connection for each type of utility.

As provided in Section 4216 of the California Government Code, at least 2 working days prior to commencing any excavation, the Contractor shall contact the regional notification center (Underground Service Alert of Southern California) and obtain an inquiry identification number.

The California Department of Transportation is not required by Section 4216 to become a member of the regional notification center. The Contractor shall contact it for location of its subsurface installations.

The Contractor shall determine the location and depth of all utilities, including service connections, which have been marked by the respective owners and which may affect or be affected by its operations. If no pay item is provided in the Contract for this work, full compensation for such work shall be considered as included in the prices bid for other items of work.

5-2 PROTECTION. The Contractor shall not interrupt the service function or disturb the support of any utility without authority from the owner or order from the Agency. All valves, switches, vaults, and meters shall be maintained readily accessible for emergency shutoff.

Where protection is required to ensure support of utilities located as shown on the Plans or in accordance with 5-1, the Contractor shall, unless otherwise provided, furnish and place the necessary protection at its expense.

Upon learning of the existence and location of any utility omitted from or shown incorrectly on the Plans, the Contractor shall immediately notify the Engineer in writing. When authorized by the Engineer, support or protection of the utility will be paid for as provided in 3-2.2.3 or 3-3.

The Contractor shall immediately notify the Engineer and the utility owner if any utility is disturbed or damaged. The Contractor shall bear the costs of repair or replacement of any utility damaged if located as noted in 5-1.

When placing concrete around or contiguous to any non-metallic utility installation, the Contractor shall at its expense:

1. Furnish and install a 50 mm (2 inch) cushion of expansion joint material or other similar resilient material; or
2. Provide a sleeve or other opening which will result in a 50 mm (2 inch) minimum-clear annular space between the concrete and the utility; or
3. Provide other acceptable means to prevent embedment in or bonding to the concrete.

Where concrete is used for backfill or for structures which would result in embedment, or partial embedment, of a metallic utility installation; or where the coating, bedding or other cathodic protection system is exposed or damaged by the Contractor's operations, the Contractor shall notify the Engineer and arrange to secure the advice of the affected utility owner regarding the procedures required to maintain or restore the integrity of the system.

5-3 REMOVAL. Unless otherwise specified, the Contractor shall remove all interfering portions of utilities shown on the Plans or indicated in the Bid documents as "abandoned" or "to be abandoned in place". Before starting removal operations, the Contractor shall ascertain from the Agency whether the abandonment is complete, and the costs involved in the removal and disposal shall be included in the Bid for the items of work necessitating such removals.

5-4 RELOCATION. When feasible, the owners responsible for utilities within the area affected by the Work will complete their necessary installations, relocations, repairs, or replacements before commencement of work by the Contractor. When the Plans or Specifications indicate that a utility installation is to be relocated, altered, or constructed by others, the Agency will conduct all negotiations with the owners and work will be done at no cost to the Contractor, except as provided in 301-1.6. Utilities which are relocated in order to avoid interference shall be protected in their position and the cost of such protection shall be included in the Bid for the items of work necessitating such relocation.

After award of the Contract, portions of utilities which are found to interfere with the Work will be relocated, altered or reconstructed by the owners, or the Engineer may order changes in the Work to avoid interference. Such changes will be paid for in accordance with 3-2.

When the Plans or Specifications provide for the Contractor to alter, relocate, or reconstruct a utility, all costs for such work shall be included in the Bid for the items of work necessitating such work. Temporary or permanent relocation or alteration of utilities requested by the Contractor for its convenience shall be its responsibility and it shall make all arrangements and bear all costs.

The utility owner will relocate service connections as necessary within the limits of the Work or within temporary construction or slope easements. When directed by the Engineer, the Contractor shall arrange for the relocation of service connections as necessary between the meter and property line, or between a meter and the limits of temporary construction or slope easements. The relocation of such service connections will be paid for in accordance with provisions of 3-3. Payment will include the restoration of all existing improvements which may be affected thereby. The Contractor may agree with the owner of any utility to disconnect and reconnect interfering service connections. The Agency will not be involved in any such agreement.

5-5 DELAYS. The Contractor shall notify the Engineer of its construction schedule insofar as it affects the protection, removal, or relocation of utilities. Said notification shall be included as a part of the construction schedule required in 6-1. The Contractor shall notify the Engineer in writing of any subsequent changes in the construction schedule which will affect the time available for protection, removal, or relocation of utilities.

The Contractor will not be entitled to damages or additional payment for delays attributable to utility relocations or alterations if correctly located, noted, and completed in accordance with 5-1.

The Contractor may be given an extension of time for unforeseen delays attributable to unreasonably protracted interference by utilities in performing work correctly shown on the Plans.

The Agency will assume responsibility for the timely removal, relocation, or protection of existing main or trunkline utility facilities within the area affected by the Work if such utilities are not identified in the Contract Documents. The Contractor will not be assessed liquidated damages for any delay caused by failure of Agency to provide for the timely removal, relocation, or protection of such existing facilities.

If the Contractor sustains loss due to delays attributable to interferences, relocations, or alterations not covered by 5-1, which could not have been avoided by the judicious handling of forces, equipment, or plant, there shall be paid to the Contractor such amount as the Engineer may find to be fair and reasonable compensation for such part of the Contractor's actual loss as was unavoidable and the Contractor may be granted an extension of time.

5-5.1 Cooperation During Utility Relocation. When utilities are to be relocated during construction, the Contractor shall cooperate and coordinate with the respective utility owners so they may relocate their facilities to clear the Work. Delays in relocation of utilities which result from failure to cooperate and coordinate will not be a cause for an extension of time or Non-Working Days.

5-6 COOPERATION. When necessary, the Contractor shall so conduct its operations as to permit access to the Work site and provide time for utility work to be accomplished during the progress of the Work.

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

6-1 CONSTRUCTION SCHEDULE AND COMMENCEMENT OF WORK.

The requirements of this section concerning submission of construction schedules shall not apply to projects where the time allowed to complete the Work is less than 25 Working Days or the total Contract Price bid is less than \$75,000 unless required by the special provisions.

The Contractor shall submit a construction schedule concurrently with the submittal of signed Contract, Contract bonds, and certificate of insurance. The Notice to Proceed will be delayed until the schedule is received. See 6-7.4, Starting of Contract Time.

When required by the Special Provisions, a revised schedule shall be submitted monthly prior to each progress payment closure date. Processing of the progress payment will be delayed until such revised schedule complying with this section is received.

The construction schedule shall be in the form of a Construction Element vs. Time Chart as shown in Appendix B-1 and a Work Complete vs. Time Chart as shown in Appendix B-2.

The B-1 Chart shall be in sufficient detail to show the chronological relationship of all activities of the project including, but not limited to, estimated starting and completion dates of various activities, submittal of shop drawings to the Engineer for approval, procurement of materials, and scheduling of equipment. The B-1 Chart shall recognize the requirements of 5-5. The B-1 Chart shall reflect obtaining all materials and completing all Work under the Contract within the specified time and in accordance with these Specifications. If the Contractor intends to complete the Work prior to the time for completion, the intended date of completion shall be set forth in the B-1 Chart and the Contractor shall execute a Contract Change Order that changes the number of Working Days allowed for completion to conform with such intended completion date. The Change Order shall not change the Contract Price.

The Contractor may submit a computer generated schedule in lieu of the form in Appendix B-1 and B-2, provided all of the elements shown on that form or specified herein are included.

An updated construction schedule shall be submitted prior to the next progress payment closure date whenever the actual percent Work complete versus percent time elapsed curve falls below and to the right of the dotted line shown on Appendix B-2.

If the Contractor desires to make a major change in its method of operations after commencing construction, or if its schedule fails to reflect the actual progress, it shall submit to the Agency a revised construction schedule in advance of beginning revised operations.

Revised and updated schedules shall show actual completion to the date of the revision in the lower segmented bar for each item.

The construction schedule shall be prepared as follows (see examples in Appendices C-1 and C-2):

1. On the B-1 Chart:
 - a. Enter the project name and Specification No. as shown on the notice inviting bids and the Contractors name.
 - b. List the items of Work either individually or combined where items are part of the same element of the Work.
 - c. Assign a value for each horizontal space plotting interval in Working Days as follows: 1 working day for total Contract time of less than 100 working days, 2 for 100 to 200 working days and 5 for longer projects. Enter the value used in the space provided in the lower part of the form.
 - d. At the end of performance time and draw a vertical line and label it "End Performance Time". Enter numbers at 10 times the plotting interval at the top of intermediate vertical lines.
 - e. Shade in a bar in the upper segmented section for each work item to indicate the period during which Work will be performed. Move-in time and delivery time for materials shall be shown if significant to the schedule.

6-1 CONSTRUCTION SCHEDULE AND COMMENCEMENT OF WORK. (Continued)

2. On the B-2 Chart:

- a. Enter the project name and Specification No. as shown on the notice inviting bids.
- b. At time intervals of 10 or 20 working days:
 - (1) Compute the cumulative dollar value of Work which is expected to be completed for each item of Work, including the value of the completed portion of lump-sum items.
 - (2) Divide the values computed in "b(1)" by the Total Contract Price to determine the percentage of the entire Contract planned for completion at the end of each time interval.
 - (3) Divide the days of performance time at the end of each time interval by the total Contract performance time to obtain the percentage of elapsed performance time.
- c. Plot each percentage of completion value figure computed in "b(2)" against the corresponding percentage of completion time computed in "b(3)" using scales on the bottom and left side of chart.
- d. Connect points plotted in "c" with a line which will show the planned progress for the entire job.

If the proposed percent Work complete versus percent time elapsed line falls below and to the right of the dotted line drawn on the B-2 Chart, the Contractor shall provide sufficient information and backup to show that the Work can be completed on time.

6-1.1 Beginning of Work. The issuance of Notice to Proceed by Agency shall constitute the Contractor's authority to enter upon the site of the Work and to begin operations provided it has also notified Engineer at least 24 hours in advance. Entry upon the site without authority will be treated as trespassing.

6-1.2 Starting Work. The Contractor may start work at any time after the Notice to Proceed is issued but work shall begin within 15 Days after the starting date for the Contract, or at such other time as may be indicated in the Special Provisions. The actual date on which the Contractor starts work will not affect the required time for completion as provided for in 6-7 and 6-7.1.

6-1.3 Work Sequence. If required by the Special Provisions, the Contractor shall start construction operations on that part of the Work designated by the Engineer.

6-1.4 Resources Required. The Work shall be conducted in such a manner and with sufficient materials, equipment, and labor to insure its completion in accordance with the Plans and Specifications within the time set forth in the Contract.

6-2 PROSECUTION OF WORK. To minimize public inconvenience and possible hazard and to restore streets and other Work areas to their original condition and former state of usefulness as soon as practicable, the Contractor shall diligently prosecute the Work to completion. If, in the Engineer's opinion, the Contractor fails to prosecute the Work to the extent that the above purposes are not being accomplished, the Contractor shall, upon orders from the Engineer, immediately take the steps necessary to fully accomplish said purposes. All costs of prosecuting the Work as described herein shall be absorbed in the Contractor's bid. Should the Contractor fail to take the necessary steps to fully accomplish said purposes, after orders of the Engineer to do so, the Engineer may suspend the Work in whole or in part, until the Contractor takes said steps.

As soon as possible under the provisions of these Specifications, the Contractor shall backfill all excavations and restore to usefulness all improvements existing prior to the start of the Work.

If Work is suspended through no fault of the Agency, all expenses and losses incurred by the Contractor during such suspensions shall be borne by the Contractor. If the Contractor fails to properly provide for public safety, traffic, and protection of the Work during periods of suspension, the Agency may elect to do so, and deduct the cost thereof from monies due the Contractor. Such action will not relieve the Contractor from liability.

6-3 SUSPENSION OF WORK

6-3.1 General. The Work may be suspended in whole or in part when determined by the Engineer that the suspension is necessary in the interest of the Agency. The Contractor shall comply immediately with any written order of the Engineer. Such suspension shall be without liability to the Contractor on the part of the Agency except as otherwise specified in 6-6.3.

6-3.2 Archaeological and Paleontological Discoveries. If discovery is made of items of archaeological or paleontological interest, the Contractor shall immediately cease excavation in the area of discovery and shall not continue until ordered by the Engineer. When resumed, excavation operations within the area of discovery shall be as directed by the Engineer.

Discoveries which may be encountered may include, but not be limited to, dwelling sites, stone implements or other artifacts, animal bones, human bones and fossils.

The Contractor shall be entitled to an extension of time and compensation in accordance with the provisions of 6-6.

6-3.3 Temporary Suspension of Work. Should suspension of Work be ordered by reason of the failure of the Contractor to carry out orders or to perform any provisions of the Contract; or by reason of weather conditions being unsuitable for performing any item or items of Work; the Contractor, at its expense, shall do all the work necessary to provide a safe, smooth, and unobstructed passageway through construction for use by public traffic during the period of such suspension. In the event that the Contractor fails to perform the work above specified, the Agency may perform such work and the cost thereof will be deducted from monies due or to become due the Contractor.

If the Engineer orders a suspension of all of the Work, or a portion of the Work which is the current controlling operation or operations, due to unsuitable weather or to such other conditions as are considered unfavorable to the suitable prosecution of the Work, the days on which the suspension is in effect shall not be considered Working Days.

If a portion of Work at the time of such suspension is not a current controlling operation or operations, but subsequently does become the current controlling operation or operations, the determination of Working Days will be made on the basis of the then current controlling operation or operations.

If a suspension of Work is ordered by the Engineer due to the failure on the part of the Contractor to carry out orders given or to perform any provision of the Contract, the Days on which the suspension order is in effect shall be considered Working Days if such days are Working Days as defined.

6-4 TERMINATION OF THE CONTRACT FOR DEFAULT..

6.4.1 General. If, prior to the acceptance of the Work, the Contractor:

- a) becomes insolvent, assigns its assets for the benefit of its creditors, is unable to pay its debts as they become due, or is otherwise financially unable to complete the Work,
- b) abandons the Work by failing to report to the Work site and diligently prosecute the Work to completion,
- c) disregards written instructions from the Agency or materially violates provisions of the Contract Documents,
- d) fails to prosecute the Work according to the schedule approved by the Engineer,
- e) disregards laws or regulations of any public body having jurisdiction, or
- f) commits continuous or repeated violations of regulatory or statutory safety requirements, then the Agency will consider the Contractor in default of the Contract.

Notices, and other written communications regarding default between the Contractor, the Agency, and the Surety shall be transmitted in accordance with 2-12.

6-4.2 Notice to Cure. The Agency will issue a written notice to cure the default to the Contractor and its Surety. The Contractor shall commence satisfactory corrective actions within 5 Working Days after receipt.

6-4.3 Notice of Termination for Default. If the Contractor fails to commence satisfactory corrective action within 5 Working Days after receipt of the notice to cure, or to diligently continue satisfactory and timely correction of the default thereafter, then the Agency will consider the Contractor in default of the Contract and:

- a) will terminate the Contractor's right to perform under the Contract by issuing a written notice of termination for default to the Contractor and its Surety,
- b) may use any materials, equipment, tools or other facilities furnished by the Contractor to secure and maintain the Work site, and
- c) may furnish labor, equipment, and materials the Agency deems necessary to secure and maintain the Work site. The provisions of this subsection shall be in addition to all other legal rights and remedies available to the Agency.

6-4.4 Responsibilities of the Surety. Upon receipt of the written notice of termination for default, the Surety shall immediately assume all rights, obligations and liabilities of the Contractor under the Contract. If the Surety fails to protect and maintain the Work site, the Agency may do so, and may recover all costs incurred. The Surety shall notify the Agency that it is assuming all rights, obligations and liabilities of the Contractor under the Contract and all money that is due, or would become due, to the Contractor shall be payable to the Surety as the Work progresses, subject to the terms of the Contract.

Within 15 Working Days of receipt of the written notice of termination for default, the Surety shall submit to the Agency a written plan detailing the course of action it intends to take to remedy the default. The Agency will review the plan and notify the Surety if the plan is satisfactory. If the Surety fails to submit a satisfactory plan, or if the Surety fails to maintain progress according to the plan accepted by the Agency, the Agency may, upon 48 hours written notice, exclude the Surety from the premises, take possession of all material and equipment, and complete the Work in any way the Agency deems to be expedient. The cost of completing the Work by the Agency shall be charged against the Surety and may be deducted from any monies due, or which would become due, the Surety. If the amounts due under the Contract are insufficient for completion, the Surety shall pay to the Agency, within 30 days after the Agency submits an invoice, all costs in excess of the remaining Contract Price.

6-4.5 Payment. The Surety will be paid for completion of the Work in accordance with 9-3 less the value of damages caused to the Agency by acts of the Contractor.

6-5 TERMINATION OF CONTRACT. The Board may terminate the Contract at its own discretion or when conditions encountered during the Work make it impossible or impracticable to proceed, or when the Agency is prevented from proceeding with the Contract by act of God, by law, or by official action of a public authority.

The Agency will issue a written notice of termination for convenience in accordance with 2-12. Upon receipt, the Contractor shall immediately cease work, except work the Contractor is directed to complete by the Engineer or required to complete for public safety and convenience. The Contractor shall immediately notify Subcontractors and suppliers to immediately cease their work.

The Contractor will be paid without duplication for:

- a) work completed in accordance with the Contract Documents prior to the effective date of termination for convenience;
- b) reasonable costs incurred in settlement of terminated contracts with Subcontractors, suppliers and others; and
- c) reasonable expenses directly attributable to termination.

The Contractor shall submit a final termination settlement proposal to the Agency no later than 90 days from the effective date of termination, unless extended, in writing, by the Agency upon written request by the Contractor.

If the Contractor fails to submit a proposal, the Agency may determine the amount, if any, due the Contractor as a result of the termination. The Agency will pay the Contractor the amount it determines to be reasonable. If the Contractor disagrees with the amount determined by the Agency as being reasonable, the Contractor shall provide notice to the Agency within 30 days of receipt of payment. Any amount due shall be as later determined by arbitration, if the Agency and the Contractor agree thereto, or as fixed in a court of law.

6-6 DELAYS AND EXTENSIONS OF TIME

6-6.1 General. If delays are caused by unforeseen events beyond the control of the Contractor, such delays will entitle the Contractor to an extension of time as provided herein, but the Contractor will not be entitled to damages or additional payment due to such delays, except as provided in 6-6.3. Such unforeseen events may include war, government regulations, labor disputes, strikes, fires, floods, adverse weather necessitating cessation of work, other similar action of the elements, inability to obtain materials, equipment or labor, required Extra Work, or other specific events as may be further described in the Specifications.

No extension of time will be granted for a delay caused by the Contractor's inability to obtain materials unless the Contractor furnishes to the Engineer documentary proof of the inability to obtain such materials in a timely manner in accordance with the sequence of the Contractor's operations and the approved construction schedule.

If delays beyond the Contractor's control are caused by events other than those mentioned above, but substantially equal in gravity to those enumerated, and an extension of time is deemed by the Engineer to be in the best interests of the Agency, an extension of time may be granted, but the Contractor will not be entitled to damages or additional payment due to such delays, except as provided in 6-6.3.

If delays beyond the Contractor's control are caused solely by action or inaction by the Agency, such delays will entitle the Contractor to an extension of time as provided in 6-6.2.

6-6.2 Extensions of Time. Extensions of time, when granted, will be based upon the effect of delays to the Work as a whole and will not be granted for noncontrolling delays to minor included portions of Work unless it can be shown that such delays did, in fact, delay the progress of the Work as a whole.

6-6.3 Payment for Delays to Contractor. The Contractor will be compensated for damages incurred due to delays for which the Agency is responsible if such delays are unreasonable in the circumstances involved and were not within the contemplation of the parties when the Contract was awarded to the Contractor and delay the Work as a whole. Such actual costs will be determined by the Engineer. The Agency will not be liable for, and in making this determination the Engineer will exclude, all damages which the Engineer determines the Contractor could have avoided by any reasonable means including, without limitation, the judicious handling of forces, equipment, or plant.

6-6.4 Written Notice and Report. If the Contractor desires payment for a delay as specified in 6-6.3 or an extension of time, it shall, within 30 Days after the beginning of the delay, file with the Agency a written request and report as to the cause and extent of the delay. The request for payment or extension must be made at least 15 Days before the specified completion date. Failure by the Contractor to file these items within the time specified will be considered grounds for refusal by the Agency to consider such request.

6-6.4.1 Documentation of Delays. When the Contractor requests an extension of time for delay due to inability to obtain materials or equipment, the documentary proof required by 6-6.1 shall include the following:

1. Date Engineer was notified of delay.
2. Date the delay began.
3. Exact description of material or equipment causing delay.
4. Documentation showing when and from whom ordered.
5. Documentation of promise to deliver.
6. Documentation of actual delivery date.
7. Description of how late delivery caused delay (include construction schedule).
8. Documentation of measures taken to get prompt delivery.
9. Documentation of attempts to get delivery from other sources.
10. Description of steps taken in project scheduling to minimize effects of late delivery.
11. Description of steps taken to get project back on schedule after actual delivery.
12. Statement of actual time lost as a result of late delivery.

6-7 TIME OF COMPLETION

6-7.1 General. The Contractor shall complete the Work within the time set forth in the Contract. The Contractor shall complete each portion of the Work within such time as set forth in the Contract for such portion. Unless otherwise specified, the time of completion of the Contract shall be expressed in Working Day

6-7.2 Working Day. A Working Day is any day within the period between the start of the Contract time as defined in 6-1 and the date provided in the Contract for completion or upon field acceptance by the Engineer of all Work provided for in the Contract, whichever occurs first, other than:

- (1) Saturday,
- (2) Sunday,
- (3) any day designated as a holiday by the Agency,
- (4) any other day designated as a holiday in a Master Labor Agreement entered into by the Contractor or on behalf of the Contractor as an eligible member of a Contractor Association,
- (5) any day the Contractor is prevented from working at the beginning of the workday for cause as defined in 6-6.1,
- (6) any day the Contractor is prevented from working during the first 5 hours of the workday with at least 60 percent of the normal work force for cause as defined in 6-6.1.

6-7.2.1 Holidays. Solely for the purposes of paragraph (3) of 6-7.2, the following days are designated as holidays by the Agency.

	A	B
<u>MONTH</u>	<u>AGENCY EMPLOYEE HOLIDAYS</u>	<u>OTHER DESIGNATED HOLIDAYS</u>
January	1st day; 3rd Monday	None
February.....	3rd Monday	12th day
March.....	None.....	31st day
March-April	None.....	One Friday between March 21 and April 23 designated as Good Friday
May	Last Monday.....	None
June	None.....	None
July.....	4th day.....	None
August.....	None.....	None
September	1st Monday.....	9th day
October	None.....	2nd Monday
November	11 th day; 4th Thursday.....	the Friday following the 4th Thursday
December	25th	23rd day, only if Thursday or Friday; 24th day; 31st day

If any day listed above falls on Saturday, the preceding Friday is the holiday. If any day listed above falls on Sunday, the succeeding Monday is the holiday.

No extra holiday shall result when such Friday or Monday is already designated as a holiday.

A copy of a Working Day calendar incorporating the above-listed holidays and used by the Agency for Contract time accounting purpose will be furnished to the Contractor upon request.

The term "holiday" as used in this section shall not be construed as being the same as "holiday" within the meaning of 7-2.2.

The Contractor may perform work on the holidays designated in Column A above provided it has obtained prior written approval of the Engineer at least two Days in advance of performing the work. The Contractor may perform work on the holidays designated in Column B above provided the Contractor notifies the Engineer two Days in advance of the holiday.

6-7.2.2 Landscape Maintenance Period. Where a landscape maintenance period is specified, the portion of the time in such period that follows the completion of all other Work required by the Contract shall not be Working Days for Contract time accounting.

6-7.3 Contract Time Accounting. The Engineer will make a daily determination of each Working Day to be charged against the Contract time. These determinations will be discussed and the Contractor will be furnished a periodic statement showing the allowable number of Working Days of Contract time, as adjusted, at the beginning of the reporting period. The statement will also indicate the number of Working Days charged during the reporting period and the number of Working Days of Contract time remaining. If the Contractor does not agree with the statement, the Contractor must file a written protest within 15 Days after receipt, setting forth the facts of the protest. Otherwise, the statement will be deemed to have been accepted.

6-7.4 Starting Date for Contract Time and Notice to Proceed. The starting date for Contract time accounting will be determined by adding the number of Days indicated on the Proposal form to the date the Contract is awarded, however the Agency may, at its option, delay the starting date by not more than 60 calendar Days if necessary to obtain permits, rights-of-way, or approval of federal or State authorities, or when prevented from starting the project due to causes beyond its control. Notice to Proceed will be issued within 7 calendar Days after the Contract, bonds, certificates of insurance and other documents have been returned, properly completed by the Contractor, unless the starting date is delayed as herein provided. If the Agency delays the Contract starting date, Notice to Proceed will be issued at least 7 calendar Days prior to the new starting date. Any delay caused by failure of the Contractor to properly complete or timely return the Contract Documents shall not change the Contract starting date and shall not be a cause for extending the Contract time. The Notice of Award will indicate a probable Contract starting date. The Notice to Proceed will indicate the actual Contract starting date, computed as herein described.

6-8 COMPLETION, ACCEPTANCE AND WARRANTY.

6-8.1 Completion and Acceptance. Acknowledgment of completion of the Work will occur prior to Acceptance by the Agency. Acceptance will only occur after all Contract requirements have been fulfilled, such as training, submission of warranties, maintenance manuals, record drawings, Release on Contract and the like. Acceptance by the Agency will occur when the Engineer signs the Notice of Completion. The Work will be inspected by the Engineer promptly upon receipt of the Contractor's written assertion that the Work has been completed. If, in the Engineer's judgment, the Work has been completed in accordance with the Plans and Specifications, the Engineer will acknowledge completion of the Work. Completion of the Work, as used above, shall include the Contractor showing evidence of having received an occupancy clearance from Building and Safety, or other permit issuing agency, when a building, plumbing electrical, grading, or other permit is required for the Work. The Engineer will, in acknowledging completion of the Work, set forth in writing the date when the Work was completed. This will be the date when the Contractor is relieved from responsibility to protect the Work. This will also be the date to which liquidated damages will be computed.

6-8.2 Warranty and Correction

6-8.2.1 Warranty The Contractor warrants to the Agency that materials and equipment furnished under the Contract will be new, unless otherwise specified in the Contract Documents, and of good quality, that the Work will be free from defects in materials and workmanship and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective by the Agency. This warranty excludes damage or defect caused by abuse (other than by the Contractor or those under the control of the Contractor), modifications not executed by the Contractor, or improper or insufficient maintenance. This warranty excludes normal wear and tear. Nothing in this warranty is intended to limit any manufacturer's warranty which provides the Agency with greater warranty rights.

6-8.2.2 Correction Period For a period of one (1) year from the date of acceptance of the Work by the Agency, the Contractor shall repair or replace any defective workmanship or materials or Work not in conformance with the Contract Documents after notice to do so from the Engineer, and within the time specified in the notice. If the Contractor fails to make such repair or replacement within the time specified in the notice, the Agency may perform the repair or replacement and the Contractor and the Contractor's sureties shall be liable for the cost thereof. The one (1) year period referenced in this section 6-8.2.2 applies only to the Contractor's obligation to repair or replace defective workmanship or materials or Work not in conformance with the Contract Documents and is not intended to constitute a period of limitations for any other rights or remedies the Agency may have regarding the Contractor's other obligations under the Contract Documents.

6-8.3 No Waiver of Legal Rights. The Agency shall not be precluded or estopped by any measurement, estimate, or certificate made either before or after the completion and Acceptance of the Work and payment therefor from showing the true amount and character of the Work performed and materials furnished by the Contractor, nor from showing that any such measurement, estimate, or certificate is untrue or is incorrectly made, nor that the Work or materials do not in fact conform to the Contract.

The Agency shall not be precluded or estopped, notwithstanding any such measurement, estimate, or certificate and payment in accordance therewith, from recovering from the Contractor or its sureties, or both, such damages as it may sustain by reason of the Contractor's failure to comply with the terms of the Contract.

Neither the Acceptance by the Engineer or by its representative, nor any payment for or Acceptance of the whole or any part of the Work, nor any extension of time, nor any possession taken by the Engineer shall operate as a waiver of any portion of the Contract or of any power herein reserved, or of any right to damages.

A waiver of any breach of the Contract shall not be held to be a waiver of any other or subsequent breach.

6-8.4 Landscape Maintenance Period. Final Acceptance of the Contract shall follow the satisfactory completion of all Contract Work, including the landscape maintenance period if one is specified.

6-8.5 Non-complying Work. Neither the final certificate of payment nor any provision in the Contract Documents, nor partial or entire occupancy of the premises by the Agency, shall constitute an Acceptance of Work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

6-8.6 Written Warranties. The Contractor shall obtain and deliver to the Engineer all written warranties required to be furnished by the Specifications. Each of such warranty shall be underwritten by the Contractor for the full period prescribed therein, and shall bear its endorsement to such effect.

6-9 LIQUIDATED DAMAGES. Failure of the Contractor to complete the Work within the time allowed will result in damages being sustained by the Agency. Such damages are, and will continue to be, impracticable and extremely difficult to determine. For each consecutive calendar day in excess of the time specified, as adjusted in accordance with 6-6, for completion of the Work the Contractor shall pay to the Agency, or have withheld from monies due it, the sum of \$250, unless otherwise provided in the Contract Documents.

Execution of the Contract under these Specifications shall constitute agreement by the Agency and Contractor that \$250 per day is the minimum value of the costs and actual damage caused by failure of the Contractor to complete the Work within the allotted time, that such sum is liquidated damages and shall not be construed as a penalty, and that such sum may be deducted from payments due the Contractor if such delay occurs.

6-10 USE OF IMPROVEMENT DURING CONSTRUCTION. The Agency reserves the right to take over and utilize all or part of any completed facility or appurtenance. The Contractor will be notified in writing in advance of such action. Such action by the Agency will relieve the Contractor of responsibility for injury or damage to said completed portions of the improvement resulting from use by public traffic or from the action of the elements or from any other cause, except injury or damage resulting from the Contractor's operations or negligence. The Contractor will not be required to reclean such portions of the improvement before field completion, except for cleanup made necessary by its operations. Nothing in this section shall be construed as relieving the Contractor from full responsibility for correcting defective work or materials.

In the event the Agency exercises its right to place into service and utilize all or part of any completed facility or appurtenance, the Agency shall assume the responsibility and liability for injury to persons or property arising out of or resulting from the utilization of the facility or appurtenance so placed into service, except for any willful or negligent act or omission by the Contractor, Subcontractor, their officers, employees or agents.

6-10.1 Use of Improvements - Exceptions. The provisions of 6-10 shall not apply to projects for the repair, modification, enlargement or improvement of existing facilities that are to remain in use during construction except where a portion of the project which is completely independent from the rest of the Work can be completed and put into use by the Agency.

On projects on public roads, after satisfactory completion of an isolated section of the Work involving roadway improvements or repairs, when all temporary signs and other temporary Contractor facilities have been removed, the section is not being used as a detour, the section is no longer under the Contractor's control, and the section is opened to public traffic through the end of the Contract period, that section of the Work shall be taken over by the Agency as provided in 6-10. The Contractor shall indicate to the Engineer in writing when the conditions of this paragraph have been complied with and shall specify the limits of the section involved. Any taking over of the Work by the Agency shall be effective only when formal written notification is issued by the Agency.

6-11 NOTICE OF POTENTIAL CLAIM FOR ADDITIONAL COMPENSATION. Procedures for notice of claims in specific situations and circumstances are provided in the following sections:

- 3-4 Changed Conditions
- 6-6.4 Delay and Extensions of Time
- 6-7.3 Contract Time Accounting

Compliance with this section is not prerequisite to assertion of a claim involving those sections or based on differences in measurements or errors of computation as to Contract quantities.

Compliance with the provisions of this section is required in all other situations and circumstances.

It is the intention of this section that differences arising between the parties under and by virtue of the Contract be brought to the attention of the Engineer at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action taken to resolve such differences.

The Contractor shall give the Engineer written notice of a potential claim, setting forth: (1) the reasons for which the Contractor believes additional compensation will or may be due; (2) the nature of the costs involved; and (3) insofar as possible, the amount of the potential claim.

If the claim is based upon an act or failure to act by the Engineer, the said notice must be given to the Engineer prior to the date when the work giving rise to the potential claim is commenced; in all other cases the said notice must be given to the Engineer within 15 Days after the happening of the event, thing or occurrence giving rise to the potential claim.

The Contractor shall not be entitled to the payment of any additional compensation where the written notice of potential claim has not been given to the Engineer in the manner required by and within the time limitations of this section.

6-12 DISPUTES AND CLAIMS; PROCEDURE.

6-12.1 GENERAL. Any and all decisions made on appeal pursuant to this section shall be in writing. Any "decision" purportedly made pursuant to this section which is not in writing shall not be binding upon the Agency and should not be relied upon by the Contractor.

Filing or giving the notices required under 3-4, 6-6.4, 6-7.3 and 6-11 is prerequisite to recovery under a Contractor's claim for additional compensation; nothing in this section shall excuse the Contractor from its duty to file or give the required notices, or from performing other duties required by the Contract Documents.

6-12.2 ADMINISTRATIVE REVIEW. Prior to proceeding under 6-12.3 or filing a Complaint in Arbitration, the Contractor shall exhaust its administrative remedies by submitting its claim for review and decision by the following Agency staff in the following sequence:

Project Manager, responsible for the project
Department Director (Public Works Agency), responsible for the project.
Director of the Public Works Agency (the Engineer)

If the Contractor disputes the Project Manager's decision on its claim, the Contractor shall submit the claim to the Department Director. If the Contractor disputes the Department Director's decision on its claim, the Contractor shall submit the claim to the Engineer. Agency staff decisions shall state the portion of the claim that is undisputed if any.

The Project Manager may elect to forward a claim submitted by the Contractor directly to the Department Director. The Project Manager must give the Contractor notice of that election and the Contractor may supplement its claim within 7 Days of such notice (unless the parties agree in writing to a different time) and its claim will be deemed submitted on the earlier of the day it supplements its claim, the day it states in writing that it will not supplement its claim or the day time to supplement expires. The Department Director may forward a claim timely submitted by the Contractor directly to the Engineer instead of making a decision on the claim, in which case no notice or opportunity to supplement the claim is required, and the claim shall be deemed timely submitted to the Engineer.

The Engineer's decision on the claim shall be the Agency's final decision.

Claims submitted to the Department Director and the Engineer shall be submitted in writing and shall include:

- a. A copy of the disputed decision.
- b. A statement as to why the Contractor believes the decision is in error.
- c. All information, argument, documents and evidence (collectively, materials) that the Contractor wishes to have considered in the review. Where the request for review is made to the Engineer, in lieu of resubmitting materials which have already been submitted to the Department Director, the Contractor may include with the request a list of the materials the Contractor wants the Engineer to consider. Any additional materials and evidence not previously submitted to the Department Director shall be included with the request to the Engineer, if the Contractor wishes them to be considered. If relevant evidence is not available at the time the request is made to the Department Director or the Engineer, the Contractor shall identify such evidence and include a statement as to when such evidence will be submitted.

The Project Manager shall issue a decision on a claim within 10 Days of receipt; if the Project Manager does not do so, then the Project manager will be deemed to have decided to reject the claim in its entirety as of the conclusion of the 10th Day after receipt. The Contractor shall submit a claim to the Department Director for review and decision within 7 Days of receipt of the Project Manager's decision or of the time the Project Manager is deemed to have decided to reject the claim, whichever is applicable. The Department Director shall issue a decision on a claim within 10 Days of the timely submission of the claim; if the Department Director does not do so, then the Department Director will be deemed to have decided to reject the claim in its entirety as of the conclusion of the 10th Day after timely submission. The Contractor shall submit a claim to the Engineer for review and decision within 7 Days of receipt of the Department Director's decision or of the time the Department Director is deemed to have decided to reject the claim, whichever is applicable. If a claim is timely submitted to the Engineer and the Engineer fails to issue a decision on that claim within the time limits prescribed for issuing a written statement under Public Contract Code, section 9204, subdivision (d)(1), the Engineer shall be deemed to have decided to reject the claim in its entirety. At any time after the Project Manager receives a claim, the Agency and Contractor may agree in writing to different time limits than those set forth in this paragraph.

6-12.3 MEET AND CONFER; MEDIATION If the Contractor disputes the Agency's final decision, the Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the Agency shall schedule a meet and confer conference within 30 Days for settlement of the dispute.

Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the Agency shall provide the Contractor a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 Days after the Agency issues its written statement. Any disputed portion of the claim, as identified by the Contractor in writing, shall be submitted to nonbinding mediation, with the Agency and the Contractor sharing the associated costs equally. The Agency

and Contractor shall agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the Agency and Contractor cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

Failure by the Agency to meet the time requirements of this section shall result in the portion of the claim that remains in dispute being deemed rejected in its entirety.

The parties may agree to waive, in writing, mediation under this section.

6-12.4 ARBITRATION. Claims and disputes arising under or related to the performance of the Contract, for which mediation under 6-12.3 was waived or unsuccessful except for claims which have been released by execution of the "Release on Contract" as provided in 9-4, shall be resolved by arbitration unless the Agency and the Contractor agree in writing, after the claim or dispute has arisen, to waive arbitration and to have the claim or dispute litigated in a court of competent jurisdiction. Arbitration shall be pursuant to Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2 of the Public Contract Code and the regulations promulgated thereto, Chapter 4 (commencing with Section 1300) of Division 2 of Title 1 of the California Code of Regulations. The arbitration decision shall be decided under and in accordance with California law, supported by substantial evidence and, in writing, contain the basis for the decision, findings of fact, and conclusions of law.

Arbitration shall be initiated by a Complaint in Arbitration made in compliance with the requirements of said Chapter 4. A Complaint in Arbitration by the Contractor shall be filed not later than 90 calendar Days after receipt of the final written decision of the Agency on the claim or dispute or within 300 Days after Acceptance of the Work by the Agency if no written decision has been issued. For the purposes of this section, "Acceptance of the Work by the Agency" shall be defined as the date the Notice of Completion is filed.

Where an election is made by either party to use the Simplified Claims Procedure provided under Sections 1340-1346 of said Chapter 4, the parties may mutually agree to waive representation by counsel.

All contracts valued at more than \$25,000 between the Contractor and its subcontractors and suppliers shall include a provision that the subcontractors and suppliers shall be bound to the Contractor to the same extent that the Contractor is bound to the Agency by all terms and provisions of the Contract, including this arbitration provision.

6-13 CONTRACTOR'S WORK HOURS

6-13.1 Working Hours Limitations. Except as otherwise specified, no work shall be performed by the Contractor at the Work site between the hours of 7:00 p.m. and 7:00 a.m. the following day, nor shall work be performed on Saturdays, Sundays or holidays listed in 6-7.2.1.

6-13.2 Regular Work Schedule. The Contractor shall furnish a work schedule with the Construction Schedule required by 6-1 and inform the Engineer at least two Days in advance of changing the schedule. The schedule shall include the times for starting and ending work on each day. Such starting and ending times shall not be more than 10 1/2 hours apart.

6-13.3 Exceptions. The limitations on working hours and days shall not apply to emergency work made necessary by unusual conditions where such work is necessary to protect the Work, to protect the property of others, to protect life, or to ensure the orderly flow of traffic.

The limitations of this section shall not apply where work at times other than allowed by 6-13.1 and 6-13.2 is necessary in order to make utility connections or is required by other provisions contained in these Specifications in order to perform the work in the manner specified. In these cases, the Contractor shall obtain prior written approval of the Engineer at least two Days in advance of performing the work.

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

7-1 THE CONTRACTOR'S EQUIPMENT AND FACILITIES.

7-1.1 General. The Contractor shall furnish and maintain in good condition all equipment and facilities as required for the proper execution and inspection of the Work.

The Contractor shall provide and maintain enclosed toilets for the use of employees engaged in the Work. These accommodations shall be maintained in a neat and sanitary condition, and regularly pumped out.

7-1.2 Temporary Utility Services. The Contractor shall, at its own expense, make all arrangements necessary for the provision of temporary utility services necessary for its own use during performance of the Work.

The Contractor shall not draw water from any fire hydrant (except to extinguish a fire), without obtaining permission from the water utility owner.

7-1.3 Crushing and Screening Operations. Unless otherwise specified in the Special Provisions, the establishment and operation of portable screens and crushers will not be allowed on or adjacent to the Work site.

7-2 LABOR

7-2.1 General. The Contractor, its agents, and employees shall be bound by and comply with applicable provisions of the Labor Code and Federal, State, and local laws related to labor.

Any worker found by the Engineer to be incompetent, intemperate, troublesome, disorderly, or otherwise objectionable, or who fails to perform the Work properly and acceptably, shall be immediately removed from the Work site by the Contractor and shall not be reemployed in the performance on the Work.

7-2.1.1 Special Qualifications. Where the Engineer determines certain portions of the Work require experience, training, certification or other special qualifications that may not be possessed by the average journeyman, such portions of the Work will be specifically identified in the Special Provisions and the special qualifications identified.

When work requiring special qualifications is being performed, a person with such qualifications must be in immediate charge of the work. The person may be a lead journeyman, foreman or trade superintendent. The general superintendent or a foreman who is not specifically assigned to the area where the identified work is being performed will not be considered to be in immediate charge of the work.

Written certification of the required qualifications shall be furnished to the Engineer at least one week prior to the time work is commenced on the work requiring such qualifications. Such certification is subject to review and acceptance by the Engineer. If, during performance of work requiring special qualifications, the qualified person becomes temporarily or permanently unavailable to the Contractor, work shall not proceed until a qualified replacement has been accepted by the Engineer. The Engineer will promptly consider the certification of the replacement.

If identified work is performed without a person having the special qualifications in charge, the Engineer may, at its sole discretion, order such work removed and replaced at the Contractor's expense.

If, after certification is accepted, the Engineer finds that the certification was inaccurate, or work on the project indicates a lack of the knowledge and experience to supervise the work, the Engineer may order the work stopped until an acceptable replacement has been certified, accepted and is in charge.

7-2.2 Prevailing Wages. Pursuant to Section 1773.2 of the Labor Code, the current prevailing rate of per diem wages at the time of the Bid as determined by the Director of the Department of Industrial Relations (DIR) are on file at the office of the Engineer. The Contractor shall post a copy of these rates at the Work site. Pursuant to Section 1774 of the Labor Code, the Contractor and any Subcontractors shall pay not less than the specified prevailing rates of wages to workers employed on the Contract. If the Contract is Federally-funded, the Contractor and any Subcontractors shall not pay less than the higher of these rates or the rates determined by the United States Department of Labor. Pursuant to Section 1775 of the Labor Code, the Contractor and any Subcontractors, shall, as a penalty to the Agency, forfeit the prescribed amounts per calendar day, or portion thereof, for each worker paid less than the prevailing wage rates. The project is subject to the compliance monitoring and enforcement by the California Department of Industrial Relations (DIR). The contractor is responsible for posting job site notices as prescribed by regulation pursuant to Labor Code section 1771.4, subdivision (a)(2). The Contractor and each Subcontractor, if any, must be registered with the DIR pursuant to Labor Code section 1725.5 and section 1771.1. The Contractor and each Subcontractor, if any, must submit certified payrolls to the Labor Commissioner pursuant to Labor Code 1771.4.

7-2.2.1 Apprentices. Apprentices shall be employed on the Work in accordance with Labor Code Section 1777.5. The Contractor is responsible for compliance with Labor Code Section 1777.5 for all apprenticeable occupations whether employed directly or through subcontractors.

7-2.2.2 Contractors' Duties Concerning Labor Code Compliance. As required by Labor Code 1775(b)(1), Labor Code Sections 1771, 1775, 1776, 1777.5, 1813 and 1815 are required to be included in the contract between the Contractor and subcontractors. The Contractor agrees to comply with these sections and all remaining provisions of the Labor Code.

7-2.3 Payroll Records. Pursuant to Section 1776 of the Labor Code the Contractor and each Subcontractor, if any, shall keep, make available, and submit to the Engineer within ten (10) days of receipt of a written request,

certified payroll records. Pursuant to Labor Code section 1776, subsection (h), the Contractor and each Subcontractor, if any, shall, as a penalty to the Agency, forfeit the prescribed amount for each calendar day, or portion thereof, for each worker, the Contractor and each Subcontractor, if any, fails to comply with that subsection until strict compliance is effectuated. The Contractor and each Subcontractor, if any, waives any right to any notice or hearing on the forfeiture of such penalties pursuant to Labor Code sections 1726 or 1771.6. The contractor shall include the in its subcontracts as required to make this paragraph effective as to each Subcontractor. Upon written request, the Contractor shall withhold penalties forfeited by a Subcontractor pursuant to Labor Code section 1776, subsection (h), and this paragraph from payment due to such Subcontractor and remit such penalties withheld to the Agency.

7-2.4 Hours of Labor. Pursuant to Section 1810 of the Labor Code, 8 hours of labor shall constitute a legal day's work. Pursuant to Section 1813 of the Labor Code, the Contractor and any Subcontractors, shall, as a penalty to the Agency, forfeit the prescribed amount per calendar day for each worker required or permitted to work more than 8 hours in any 1 calendar day and 40 hours in any 1 calendar week without being compensated in accordance with Section 1815.

Pursuant to Section 1810 of the Labor Code, 8 hours of labor shall constitute a legal day's work. Pursuant to Section 1813 of the Labor Code, the Contractor and each Subcontractor, if any, shall, as a penalty to the Agency, forfeit the prescribed amount per calendar day for each worker required or permitted to work more than 8 hours in any 1 calendar day and 40 hours in any 1 calendar week without being compensated in accordance with Section 1815. Contractor and each Subcontractor, if any, waives any right to any notice or hearing on the forfeiture of such penalties pursuant to Labor Code sections 1726 and 1771.6. Contractor shall include terms in its subcontracts as required to make this paragraph effective as to each Subcontractor. Upon written request, Contractor shall withhold penalties forfeited by a Subcontractor pursuant to Labor Code section 1813 and this paragraph from payments due to such Subcontractor and remit such penalties withheld to the Agency

7-3 INDEPENDENCE OF CONTRACTOR, INDEMNIFICATION AND POLLUTION

7-3.1 Independence of Contractor. It is understood and agreed that Contractor is at all times an independent contractor and that no relationship of employer-employee exists between the parties hereto. Contractor will not be entitled to any benefits payable to employees of County, including but not limited to overtime, retirement benefits, workers' compensation benefits, injury leave or other leave benefits. County is not required to make any tax or benefit deductions from the compensation payable to Contractor under the provisions of this Agreement. As an independent contractor, Contractor hereby holds County harmless from any and all claims that may be made against County based upon any contention by any third party that an employer-employee relationship exists by reason of the Agreement.

If, in the performance of this Agreement, any third persons are employed by Contractor, such persons will be entirely and exclusively under the direction, supervision and control of Contractor. All terms of employment, including hours, wages, working conditions, discipline, hiring and discharging or any other terms of employment or requirements of law, will be determined by Contractor. County will have no right or authority over such persons or the terms of such employment, except as provided in this Agreement.

7-3.2 Indemnification and Hold Harmless Clause. All activities arising out of or relating to the performance of the Work covered by this Contract shall be at the risk of Contractor. To the fullest extent permitted by law, Contractor shall defend (at Agency's request), indemnify and hold harmless Agency, and the County of Ventura if the County of Ventura is not the entity defined as Agency under this Contract, including all of their boards, agencies, departments, officers, employees, agents and volunteers (collectively, "Indemnatee"), against any and all claims, suits, actions, legal or administrative proceedings, judgments, debts, demands, damages, including injury or death to any person or persons, and damage to any property including loss of use resulting therefrom, incidental and consequential damages, liabilities, interest, costs, attorneys' fees and expenses of whatsoever kind of nature, whether arising before, during or after commencement or completion of this Contract, whether against Contractor and Indemnatee or which are in any manner, directly, indirectly, in whole or in part, arising from any act, omission, fault or negligence, whether active or passive, of Contractor, a Subcontractor or anyone directly or indirectly employed by them or anyone for whose acts they may be liable in connection with or incident to the Contract, even though the same may have resulted from the joint, concurring or contributory negligence, or from the passive negligence, of Indemnatee or any other person or persons, unless the same be caused by the sole negligence of Indemnatee, or except to the extent caused by the active negligence or willful misconduct of Indemnatee.

The Agency will notify the Contractor of the receipt of any third party claims.

7-3.3 Contamination and Pollution. Contractor, solely at its own cost and expense, will provide clean up of any premises, property or natural resources contaminated or polluted due to Contractor activities. Any fines, penalties, punitive or exemplary damages assigned due to contaminating or polluting activities of the Contractor will be borne entirely by the Contractor.

7-4 INSURANCE REQUIREMENTS

Contractor, at its sole cost and expense, shall obtain and maintain in full force during the term of this Contract the following types of insurance:

7-4.1 Workers' Compensation Insurance.

7-4.1.1 Coverage. Workers' Compensation coverage, in full compliance with Labor Code 3700, for all employees of Contractor and Employer's Liability in the minimum amount of \$1,000,000. The Agency, the County of Ventura, its officers, employees or Consultants, will not be responsible for any claims in law or equity occasioned by failure of Contractor to comply with this paragraph.

7-4.1.2 Certification. Before execution of the Contract by Agency, Contractor shall file with the Engineer the following signed certification:

"I am aware of the provisions of Section 3700 of the 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 that code, and I will comply with such provisions before commencing the performance of the Work of this Contract."

7-4.2 Commercial General Liability Insurance

7-4.2.1 Minimum Limits and Scope; Insurance Classes. "Occurrence" coverage in the minimum amount of:

<u>Coverage Class</u>	<u>Coverage</u>
L-A	\$ 1,000,000 combined single limit (CSL) bodily injury and property damage each occurrence and \$1,000,000 aggregate
L-B	\$ 1,000,000 CSL bodily injury and property damage each occurrence and \$2,000,000 aggregate
L-C	\$ 5,000,000 CSL bodily injury and property damage each occurrence and \$5,000,000 aggregate
L-D	\$ 10,000,000 CSL bodily injury and property damage each occurrence and \$10,000,000 aggregate

If no coverage class is specified in "Proposal", coverage class L-B shall apply.

If Contractor maintains higher limits than the minimums shown above, the Agency requires and shall be entitled to coverage for the higher limits maintained by the Contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the Agency.

Coverages shall include premises/operations; products/completed operations; independent contractors; underground, explosion and collapse hazards; personal and advertising injury; broad form property damage; and broad form blanket contractual.

7-4.2.2 Coverage Exceptions. On projects where no explosives will be used and no demolition is involved, the coverage for explosion may be omitted. On projects where no excavation is involved, the coverage for underground hazard may be omitted. The omission of said coverages is at Agency's option, and shall not abrogate Contractor's responsibilities for indemnification as set forth in these Specifications.

7-4.2.3 Excess Liability Policies. All Excess Liability policies, if used, shall be on an "umbrella" or following form of the primary layer of coverage.

7-4.3 Commercial Automobile Liability Insurance

Coverage in the minimum amount of \$1,000,000 CSL bodily injury and property damage, including automobile liability, any auto.

7-4.4 Property Insurance

Contractor shall arrange for its own "Course of Construction" insurance on the project to protect its interests, as Agency does not have this coverage.

Contractor is responsible for delivering to Agency Work completed in accordance with the Contract except as provided in 7-18 (Acts of God). Should the Work being constructed be damaged by fire or other causes during construction, it shall be replaced by Contractor in accordance with the requirements of the Plans and Specifications without additional expense to Agency.

7-4.5 Other Insurance Provisions.

7-4.5.1 Insurance Company Qualifications. All insurance required shall be issued by (a) an admitted company or admitted companies authorized to transact business in the State of California which have a BEST rating of B+ or higher and a Financial Size Category (FSC) of VII or larger or (b) a California approved Surplus Line carrier or carriers which have a BEST rating of A or higher and a Financial Size Category (FSC) of VII or larger.

Workers compensation insurance not meeting the above requirements but meeting all other requirements of the specifications, will be accepted.

7-4.5.2 Primary Coverage. All insurance required shall be primary coverage as respects Agency and any insurance or self-insurance maintained by Agency or the County of Ventura shall be in excess of Contractor's insurance coverage and shall not contribute to it.

7-4.5.3 Aggregate Limits Exceeded. Agency shall not be notified immediately if any aggregate insurance limit is exceeded. Contractor shall purchase additional coverage to meet requirements.

7-4.5.4 Liability in Excess of Limits. Insurance coverage in the minimum amounts set forth herein shall not be construed to relieve Contractor for liability in excess of such coverage, nor shall it preclude Agency or the County of Ventura from taking such other actions as is available to it under any other provisions of this Contract or otherwise in law.

7-4.5.5 Additional Insured Endorsements. The Agency, the County of Ventura (if not defined as Agency) and all special Districts governed by the County of Ventura Board of Supervisors, and their officials, employees, and volunteers shall be named as Additional Insured as respects Work done by or on behalf of Contractor under the Contract on all policies required (except workers' compensation). With respect to Contractor's commercial general Liability insurance, Additional Insured coverage shall include both ongoing and completed operations.

7-4.5.6 Waiver of Subrogation Rights. Contractor agrees to waive all rights of subrogation against the Agency, the County of Ventura, including its boards, and all special Districts governed by the Board of Supervisors, for losses arising directly or indirectly from the activities or Work performed by Contractor under the Contract (applies only to Workers' Compensation and Commercial General Liability).

7-4.5.7 Cancellation Notice Required. In the case of policy cancellation, Agency shall be notified by the insurance company or companies as provided for in the policy. Contractor shall notify Agency of any and all policy cancellations within three working days of the cancellation.

7-4.5.8 Documentation Required. Prior to execution of the Contract by Agency, Contractor shall provide Agency with Certificates of Insurance for all required coverages (see Appendix A for example), all required endorsement(s) and a copy of its course of insurance policy.

It is the responsibility of Contractor to confirm that all terms and conditions of Section 7-4 Insurance Requirements are complied with by any and all subcontractors that Contractor may use in the completion of the Contract.

7-5 PERMITS. The Agency will obtain, at no cost to the Contractor, all encroachment and building permits necessary to perform Contract Work in streets, highways, railways or other rights of way, unless the necessity for such permit(s) is created by a method of operation chosen by the Contractor. The Contractor shall obtain and pay for all costs incurred for permits necessitated by its operations such as, but not limited to, those permits required for night Work, overload, blasting and demolition.

The Contractor shall pay all business taxes or license fees that are required for the Work.

7-5.1 Highway and Railroad Permits. The Engineer will obtain the basic State highway and railroad encroachment permits which will include checking of plans. However, the Contractor must also obtain permits from these agencies. Inspection fees charged by these agencies must be paid by the Contractor.

7-5.2 Grading Ordinance

7-5.2.1 General. All excavation, filling and grading operations in Ventura County are governed by the Ventura County Grading Ordinance or City Ordinances, except within the project right of way shown on the Plans.

7-5.2.2 Permits Required. Work outside the project right of way which involves excavation or filling of soils is subject to all requirements of the applicable grading ordinance. The requirements may include, but are not limited to, submitting of a grading plan prepared by a Civil Engineer, obtaining a grading permit, paying the permit fee, posting a grading bond, hiring professionals for engineering and testing services, compacting fills, constructing drainage facilities and providing erosion protection.

7-5.2.3 Imported and Exported Material. To insure that neither the Agency nor the Contractor is a party to aiding or abetting any property owner (who is ultimately responsible) to violate the applicable grading ordinance, no material shall be imported from or exported or wasted outside the project right of way until the Contractor has furnished the Engineer a copy of the grading permit covering such operation on land where material is to be deposited or excavated, unless exempt.

7-5.2.4 Exemptions from Permit. No grading permit is required of the Contractor for Work performed within the project right of way shown on the Plans or on borrow or disposal areas shown on the Plans or described in the Special Provisions and which are specifically designated as being exempt from such permit requirements.

7-5.3 Building Permit.

7-5.3.1 Agency Furnished Permits. Except as provided in **7-5.3.2**, Agency will submit the plans for the Work to Department of Building and Safety, and other building related permit issuing agencies, for plan check and make the corrections necessary for the issuance of building and related permits. Agency will Pay plan check and permit fees for the Work. The Contractor may be required to furnish information to the permit issuing agencies, as required for the issuance of permits, and sign the permit.

7-5.3.2 Contractor Furnished Permits. Components or systems, required by the Contract, may require the preparation of plans and calculations to obtain approvals or permits from state or local building, fire prevention, public health, safety, environmental protection and other agencies in addition to the basic permits arranged for by the Agency as provided in **7-5.3.1**. Contractor shall take all actions in a timely manner to obtain such approvals or permits so as not to delay completion of the Work beyond the time provided in **6-7**. Contractor shall include all costs and consider the time required to obtain approvals or permits in the Contract price bid.

7-5.4 Coastal Zone Permits

7-5.4.1 Agency Furnished Permits. Permits required for Work on the project within rights of way furnished by the Agency within the Coastal Zone will be obtained by the Agency.

7-5.4.2 Contractor Furnished Permits. Permits required for the Contractor's operations outside of rights of way furnished by the Agency must be obtained by the Contractor. Such permits are required for brush removal, grading, dredging, disposal of material and many other operations within the Coastal Zone.

7-6 THE CONTRACTOR'S REPRESENTATIVE. Before starting work, the Contractor shall designate in writing a representative who shall have complete authority to act for it. An alternative representative may be designated as well. The representative or alternate shall be present at the Work site whenever work is in progress or whenever actions of the elements necessitate its presence to take measures necessary to protect the Work, persons, or property. Any order or communication given to this representative shall be deemed delivered to the Contractor. A joint venture shall designate only one representative and alternate. In the absence of the Contractor or its representative, instructions or directions may be given by the Engineer to the superintendent or person in charge of the specific work to which the order applies. Such order shall be complied with promptly and referred to the Contractor or its representative.

In order to communicate with the Agency, the Contractor's representative, superintendent, or person in charge of specific work shall be able to speak, read, and write the English language.

7-7 COOPERATION AND COLLATERAL WORK. The Contractor shall be responsible for ascertaining the nature and extent of any simultaneous, collateral, and essential work by others. The Agency, its workers and contractors and others, shall have the right to operate within or adjacent to the Work site during the performance of such work.

The Agency, the Contractor, and each of such workers, contractors and others, shall coordinate their operations and cooperate to minimize interference.

The Contractor shall include in its Bid all costs involved as a result of coordinating its work with others. The Contractor will not be entitled to additional compensation from the Agency for damages resulting from such simultaneous, collateral, and essential work. If necessary to avoid or minimize such damage or delay, the Contractor shall redeploy its work force to other parts of the Work.

Should the Contractor be delayed by the Agency, and such delay could not have been reasonably foreseen or prevented by the Contractor, the Engineer will determine the extent of the delay, the effect on the Work, and any extension of time.

7-8 WORK SITE MAINTENANCE

7-8.1 General Throughout all phases of construction, including suspension of the Work, and until acceptance per 6-8, the Contractor shall keep the Work site clean and free from rubbish and debris. Rubbish and debris collected on the Work site shall only be stored in roll-off, enclosed containers prior to disposal. Stockpiles of such will not be allowed.

When required by the Special Provisions, the Contractor shall provide a self-loading motorized street sweeper equipped with a functional water spray system. The sweeper shall clean all paved areas within the Work site and all paved haul routes at least once each working day.

The Contractor shall ensure there is no spillage along haul routes. Any such spillage shall be removed immediately and the area cleaned.

Should the Contractor fail to keep the Work site free from rubbish and debris, the Engineer may suspend the Work per 6-3 until the condition is corrected.

7-8.2 Air Pollution Control The Contractor shall not discharge smoke, dust, equipment exhaust, or any other air contaminants into the atmosphere in such quantity as will violate any Federal, State, or local regulations.

The Contractor shall also abate dust nuisance by cleaning, sweeping and spraying with water, or other means as necessary. The use of water shall conform to 7-8.6.

7-8.3 Noise Control. Noise generated from the Contractor's operations shall be controlled as specified in the Special Provisions.

7-8.4 Storage of Equipment and Materials.

7-8.4.1 General Materials and equipment shall be removed from the Work site as soon as they are no longer necessary. Before inspection by the Engineer for acceptance, the Work site shall be cleared of equipment, unused materials, and rubbish so as to present a satisfactory clean and neat appearance.

Excess excavated material shall be removed from the Work site immediately unless otherwise specified in the Special Provisions.

Forms and form lumber shall be removed from the Work site as soon as practicable after stripping.

7-8.4.2 Storage in Public Streets. Construction materials and equipment shall not be stored in streets, roads, or highways for more than 5 days after unloading unless otherwise specified in the Special Provisions or approved by the Engineer. All materials or equipment not installed or used in construction within 5 days after unloading shall be stored at a location approved by the Engineer.

Excavated material, except that which is to be used as backfill in the adjacent trench, shall not be stored in public streets unless otherwise specified in the Special Provisions or approved by the Engineer. Immediately after placing backfill, all excess material shall be removed from the Work site.

7-8.5 Sanitary Sewers.

7-8.5.1 General. The flow of sewage shall not be interrupted. Should the Contractor disrupt the operation of existing sanitary sewer facilities, or should disruption be necessary for performance of the Work, the Contractor shall bypass the sewage flow around the Work. Sewage shall be conveyed in closed conduits and disposed of in a sanitary sewer system. Sewage shall not be permitted to flow in trenches nor be covered by backfill.

Whenever sewage bypass and pumping is required by the Plans or Specifications, or the Contractor so elects to perform, the Contractor shall submit per 2-5.3 a working drawing conforming to 7-8.5.2 detailing its proposed plan of sewage bypass and pumping.

7-8.5.2 Sewage Bypass and Pumping Plan. The plan shall indicate the locations and capacities of all pumps, sumps, suction and discharge lines. Equipment and piping shall be sized to handle the peak flow of the section of sewer line to be bypassed and pumped. Equipment and piping shall conform to 7-10, the Plans, and the Special Provisions. Bypass piping, when crossing areas subject to traffic loads, shall be constructed in trenches with adequate cover and otherwise protected from damage due to traffic. Lay-flat hose or aluminum piping with an adequate casing and/or traffic plates may be allowed if so approved by the Engineer. Bypass pump suction and

discharge lines that extend into manholes shall be rigid hose or hard pipe. Lay flat hose will not be allowed to extend into manholes. The Contractor shall provide a backup bypass pumping system in case of malfunction. The backup bypass system shall provide 100 percent standby capability, and be in place and ready for immediate use.

Each standby pump shall be a complete unit with its own suction and discharge piping. In addition to the backup system, the Contractor shall furnish and operate vacuum trucks when required by the Plans or Special Provisions.

7-8.5.3 Spill Prevention and Emergency Response Plan. The Contractor shall prepare and submit per 2-5.3 a spill prevention and emergency response plan. The plan shall address implementation of measures to prevent sewage spills, procedures for spill control and containment, notifications, emergency response, cleanup, and spill and damage reporting.

The plan shall account for all storm drain systems and water courses within the vicinity of the Work which could be affected by a sewage spill. Catch basins that could receive spilled sewage shall be identified Unless otherwise specified in the Special Provisions, these catch basins shall be sealed prior to operating the bypass and pumping system. The Contractor shall remove all material used to seal the catch basins when the bypass and pumping system operations are complete.

The Contractor shall be fully responsible for containing any sewage spillage, preventing any sewage from reaching a watercourse, recovery and legal disposal of any spilled sewage, any fines or penalties associated with the sewage spill imposed upon by the Agency and/or the Contractor by jurisdictional regulatory agencies, and any other expenses or liabilities related to the sewage spill.

7-8.6 Water Pollution Control The Contractor shall prevent, control, and abate discharges of pollutants from the construction site in order to protect the storm drain system, which includes pipes, channels, streams, waterways, and other bodies of water, by the construction, installation or performance of water pollution control measures as shown on the Stormwater Pollution Control Plan (SWPCP) or Stormwater Pollution Prevention Plan (SWPPP) depending on the land area affected by the construction activity. The Contractor shall ensure compliance with the current State NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activity (General Construction Permit), NPDES No. CAS000002 and current Ventura County NPDES Municipal Separate Storm Sewer System (MS4) Permit No. CAS004002.

7-8.6.1 Compliance with NPDES General Construction Permit

7-8.6.1.1 Construction Sites

If the Work involves construction activity that results in soil disturbance of one acre or more of total land area, or results in soil disturbances of less than one acre but is a part of a work area larger than one acre, the Contractor shall comply with the requirements of the General Construction Permit NPDES No. CAS000002. Construction activity includes clearing, grading, excavation, stockpiling, and reconstruction of existing facilities involving removal and replacement. Construction activity does not include routine maintenance such as, maintenance of original line and grade, hydraulic capacity, or original purpose of the facility.

The Contractor shall comply with requirements of the General Construction Permit (NPDES No. CAS000002), obtained by the Agency, including a site-specific Storm Water Pollution Prevention Plan (SWPPP) for the Work to be developed by Qualified SWPPP Developer (QSD) and implemented by the Qualified SWPPP Practitioner (QSP). After July 1, 2010, the Agency will electronically file all required Permit Registration Documents (PRDs) through the State Water Board's Stormwater Multi-Application and Report Tracking System (SMARTS) website, as required prior to the commencement of construction activity. PRDs consist of the Notice of Intent (NOI), Risk Assessment, Post-Construction Calculations, a Site Map, the SWPPP, a signed certification statement by the Legally Responsible Party (LRP), and the first annual fee. For the Permit application, the Contractor shall submit to Project Manager the following:

- The completed site-specific Risk Assessment
- Post-construction calculations if applicable for the project, and
- Site-specific SWPPP developed in accordance with applicable Permits.

7-8.6.1.2 Linear Utility Projects; Contractor shall comply with the requirements of the General Construction Permit NPDES No. CAS000002 for Linear Underground/Overhead projects (LUPs) one acre or greater.

7-8.6.2 Compliance with NPDES MS4 Permit

7-8.6.2.1 Construction Sites Less Than One Acre The Contractor shall ensure implementation of an effective combination of erosion and sediment control Best Management Practices (BMPs) listed in **Table 6** of the Ventura County NPDES MS4 Permit. The Contractor shall develop and implement a Storm Water Pollution Control Plan (SWPCP).

7-8.6.2.2 Construction Sites One Acre but Less Than 5 Acres The Contractor shall ensure implementation of an effective combination of appropriate erosion and sediment control BMPs from **Table 7** (BMPs at Construction sites 1 acre or greater but less than 5 acres) of the Ventura County NPDES MS4 Permit in addition to the ones identified in **Table 6** (BMPs at Construction sites less than 1 acre) to prevent erosion and sediment loss, and the discharge of construction wastes. For all construction sites one acre or greater, the Contractor shall submit the SWPPP to the Agency for review and certification as the Local SWPPP.

7-8.6.2.3 Construction Sites 5 Acres and Greater The Contractor shall ensure implementation of an effective combination of the following BMPs in **Tables 8** (BMPs at Construction sites 5 acres or greater) in addition to the ones identified in **Table 6** (BMPs at Construction sites less than 1 acre) and **Table 7** (BMPs at Construction sites 1 acre or greater but less than 5 acres) at all construction sites 5 acres and greater to prevent erosion and sediment loss, and the discharge of construction wastes. For all construction sites one acre or greater, the Contractor shall submit the SWPPP to the Agency for review and certification as the Local SWPPP.

7-8.6.2.4 Enhanced Construction BMP Implementation

Construction sites located on hillsides, adjacent or directly discharging to CWA 303(d) listed waters for siltation or sediment, and directly adjacent to Environmentally Sensitive Areas are termed "high risk sites." Contractor shall implement enhanced practices that preclude impacts to water quality posed by the high risk sites.

Contractor shall ensure that high risk sites are inspected by the Qualified SWPPP Developer, Qualified SWPPP Practitioner, or Certified Professionals in Erosion and Sediment Control (CPESC) at the time of BMP installation, at least weekly during the wet season, and at least once each 24 hour period during a storm event that generates runoff from the site, to identify BMPs that need maintenance to operate effectively, that have failed or could fail to operate as intended.

During the wet season, the area of disturbance shall be limited to the area that can be controlled with an effective combination of erosion and sediment control BMPs. Enhanced sediment controls should be used in combination with erosion controls and should target portions of the site that cannot be effectively controlled by standard erosion controls described above. Effective sediment and erosion control BMPs proposed by the Contractor shall include the BMPs listed in Table 9 (Enhanced Construction BMP Implementation) of the NPDES MS4 Permit. The Contractor shall implement the BMPs listed in Table 9 unless shown unnecessary. Also, the Contractor shall retain records of the inspection and a determination and rationale of the BMPs selected to control runoff.

7-8.6.3 Plan.

7-8.6.3.1 The SWPCP, required for construction projects less than one acre, shall be prepared in accordance with the requirements of current Ventura County NPDES MS4 Permit No. CAS004002 and County Ordinance No. 4142.

7-8.6.3.2 The SWPPP, required for construction projects one acre or greater, shall be prepared in accordance with the requirements of the state's General Construction Permit NPDES Permit CAS000002, Ventura Countywide Stormwater Quality Management Program, NPDES MS4 Permit No. CAS004002, and County Ordinance No. 4142.

7-8.6.3.3 The SWPCP/SWPPP shall identify potential pollutant sources on the construction site that may affect the quality of discharges, whether non-stormwater or stormwater, from the site and design the use and placement of water pollution control measures, BMPs, to effectively prohibit the entry of pollutants from the site into the storm drain system during construction. At a minimum, and depending on the size of the project area, the SWPCP/SWPPP will include all appropriate minimum BMPs as required by the Ventura Countywide Stormwater Quality Management Program, NPDES MS4 Permit No. CAS004002 (Tables 6 through 9). The SWPCP/SWPPP must utilize the measures recommended in the California Stormwater Quality Association (CASQA) Stormwater BMPs Handbook for Construction (January 2003 version until July 1, 2010 and 2009 version after July 1, 2010). Starting July 1, 2010 SWPPP shall be prepared by QSD as defined in the NPDES Permit CAS000002. The Contractor shall complete, sign and submit the SWPCP/SWPPP for review and final approval by the Project Engineer, prior to issuance of the Notice to Proceed as provided in 6-7.4.

7-8.6.3.4 For all construction projects one acre and greater, the Contractor shall submit the SWPPP to the Agency for review and certification as Local SWPPP in accordance with NPDES MS4 Permit No. CAS004002 prior to the Notice to Proceed as provided in 6-7.4.

7-8.6.4 Measures. All water pollution control measures shall conform to the requirements of the submitted SWPCP/SWPPP. If circumstances during the course of construction require changes to the original SWPCP/SWPPP, a revised SWPCP/SWPPP shall be promptly submitted to the Project Manager in each instance. The SWPPP shall be amended or revised by QSD. A copy of the current SWPCP/SWPPP including revisions and amendments shall be kept at the site to ensure that field personnel has access to the current document at all times. If measures being taken are inadequate to control water pollution effectively, the Project Manager may direct the Contractor to revise the operations and no further work shall be performed until adequate water pollution control measures are implemented. Effective September 2, 2011, implementation of the SWPPP shall be overseen by the Contractor's QSP as defined in the General Construction Permit NPDES No. CAS000002. All work installed by the Contractor in connection with the SWPCP/SWPPP but not specified to become a permanent part of the Work shall be removed and the site restored in so far as practical to its original condition prior to completion of the Work.

7-8.6.4.1 Post-Construction Standards; Contractor shall ensure that applicable post-construction standards are implemented to meet applicable project requirements of the Ventura County NPDES MS4 Permit and General Construction Permit NPDES No. CAS000002 (effective September 2, 2012).

7-8.6.4.2 Active Treatment Systems; Contractor shall comply with requirements of the General Construction Permit NPDES No. CAS000002 for active treatment systems as applicable.

7-8.6.5 Monitoring and Reporting

7-8.6.5.1 Monitoring; In accordance with the General Construction Permit NPDES No. CAS000002, the Contractor shall develop and implement monitoring program for Risk Level 2 and 3 sites. In addition at Risk Level 3 sites, contractor shall perform receiving water monitoring to meet Permit requirements.

7-8.6.5.2 Reporting; the Contractor shall ensure that all submittals and reports are prepared and submitted to the RWQCB in accordance with the applicable Permits. At minimum the reports will include Annual Report (for applicable projects due September 1st), Rain Event Action Plan (due 48 hrs prior to the rain event for the applicable projects), Numeric Action Levels (NAL) Exceedance Report (as required), Numeric Effluent Limitations (NELs) Violation Report (within 24 hours after NEL exceedance is identified). Contractor shall submit required reports to the Project Manager for review and approval prior to submittal to the RWQCB.

7-8.6.6 Dewatering Activities. All dewatering activities shall be performed in accordance with applicable regulatory requirements issued by the Los Angeles Regional Water Quality Control Board, including specific requirements contained in the Waste Discharge Requirements (WDR) when issued for the Work.

7-8.6.7 Payment. The Contract lump sum price for water pollution control shall include full compensation for furnishing all labor, materials, tools, equipment, services and incidentals and for doing all work involved in water pollution control as specified herein. Payment for water pollution control will be made as the Work proceeds, and is in compliance with the approved Water Pollution Control Plan, on the following basis.

Partial payment estimate (excluding mobilization & water pollution control payments) as a percentage of the original Contract price (excluding the mobilization & water pollution control Bid items).		Cumulative amount of water pollution control pay item earned is the lesser of the amounts as computed by these two columns.	
Equal to or greater than	Less than	Percentage of water pollution control pay item	Percentage of the original Contract total.
5	10	10	1
10	20	20	2
20	50	50	3
50	Completion of Work	75	5
Completion of Work		100	

Where no Bid item is provided for water pollution control, payment for water pollution control shall be considered to be included in the other Bid items.

7-8.7 Drainage Control. The Contractor shall maintain drainage within and through the Work areas. Earth dams will not be permitted in paved areas. Temporary dams of sandbags, asphaltic concrete or other acceptable material will be permitted when necessary to protect the Work, provided their use does not create a hazard or nuisance to the public. Such dams shall be removed from the site as soon as their use is no longer necessary.

7-8.8 Final Cleaning. At the completion of the Work, the Contractor shall remove all waste materials and rubbish from and about the project, as well as all tools, construction equipment, temporary facilities, machinery, and surplus materials.

At completion of construction and just prior to final inspection, the Contractor shall thoroughly clean the interior and exterior of the buildings, including hardware, floors, roofs, sills, ledges, glass, or other surfaces where debris, plaster, paint, spots, and dirt or dust may have collected. All glass shall be washed clean and polished. Remove all grease, stains, labels, fingerprints, and other foreign materials from interior and exterior surfaces. Repair, patch, and touch up marred surfaces to match adjacent finishes.

The Contractor shall use only experienced workmen or professional cleaners for final cleaning. It shall use only cleaning materials recommended by the manufacturer of the surface to be cleaned, and use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

It shall broom-clean all paved surfaces and rake-clean other surfaces of grounds.

The Contractor shall replace air conditioning filters if units were operated during construction, and clean all ducts, blowers, and coils if air conditioning units were operated without filters during construction.

After cleaning, the Contractor shall maintain the building in a clean condition until it is accepted by the Agency.

7-9 PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS. The Contractor shall be responsible for the protection of public and private property adjacent to the Work and shall exercise due caution to avoid damage to such property.

The Contractor shall repair or replace all existing improvements within the right-of-way which are not designated for removal (e.g., curbs, sidewalks, driveways, fences, walls, signs, utility installations, pavement, structures, etc.) which are damaged or removed as a result of its operations. When a portion of a sprinkler system within the right-of-way must be removed, the remaining lines shall be capped. Repairs and replacements shall be at least equal to existing improvements and shall match them in finish and dimension.

Maintenance of street and traffic signal systems that are damaged, temporarily removed or relocated shall be done in conformance with 307-1.5.

Trees, lawns, and shrubbery that are not designated to be removed shall be protected from damage or injury. If damaged or removed because of the Contractor's operations, they shall be restored or replaced in as nearly the original condition and location as is reasonably possible. Lawns shall be reseeded and covered with suitable mulch.

The Contractor shall give reasonable notice to occupants or owners of adjacent property to permit them to salvage or relocate plants, trees, fences, sprinklers and other improvements which are designated for removal and would be destroyed because of the Work.

All costs to the Contractor for protecting, removing, and restoring existing improvements shall be absorbed in its bid.

In existing buildings, all surfaces, equipment, furniture and other property shall be protected from loss or damage by or as result of the Contractor's operations. The Contractor shall replace damaged property or shall repair and restore it to its previous condition. Patching, painting, replacement of wall, ceiling and floor covering and similar Work shall be done in such a manner that the repaired Work will not be readily noticeable.

7-10 PUBLIC CONVENIENCE AND SAFETY

7-10.1 Access.

7-10.1.1 General. The Contractor's operations shall cause no unnecessary inconvenience to the public or businesses in the vicinity of the Work. The Contractor shall have no greater length or quantity of Work under construction than can be properly prosecuted with a minimum of inconvenience to the public and other contractors engaged in adjacent or related work.

The Contractor shall provide continuous and unobstructed access to the adjacent properties unless otherwise specified in the Special Provisions or approved by Engineer. Work requiring traffic lane closures shall only be performed between the hours specified in the Special Provisions or shown on the TCP. Traffic shall be permitted to pass through the Work site, unless otherwise specified in the Special Provisions or shown on the TCP.

7-10.1.1.1 Vehicular Access. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access. If backfill has been completed to the extent that safe access may be provided and the street is opened to local traffic, the Contractor shall immediately clear the street and driveways and provide and maintain access.

7-10.1.1.2 Pedestrian Access. Safe, adequate, and ADA compliant pedestrian access shall be maintained unless otherwise approved by the Engineer. 7-10.2 Work Area Traffic Control.

7-10.2 Traffic Control

7-10.2.1 General. Work area traffic control shall conform to the California MUTCD, WATCH, or as specified in the Special Provisions. The total length of the traffic control zone shall include a buffer space, advance signing, striping transitions in advance of the Work site, existing striping, signing, and raised medians.

7-10.2.2 Traffic Control Plan.

7-10.2.2.1 General. If so specified in the Special Provisions or on the permit, the Contractor shall submit a TCP in accordance with 2-5.3. The sheets of the TCP shall display the title, phase identification, name of the firm preparing the TCP, name and stamp of the Registered Traffic or Civil Engineer, approval block for each jurisdictional agency, north arrow, sheet number, and number of sheets comprising the TCP. General notes and symbol definitions shall be included when required. Adequate dimensioning shall be provided to allow for proper field installation. The TCP shall be drawn to a 1 inch = 40 feet scale on common size sheets, either 8-1/2 inches x 11 inches, 8-112 inches x 14 inches, 11 inches x 17 inches, or 2-foot x 3-foot plan sheets as dictated by the length of the Work.

The requirements in the Special Provisions shall govern the design of the proposed TCP.

7-10.2.2.2 Payment. Payment for preparation of the TCP shall be included in the appropriate lump sum Bid items. If no Bid items have been provided, payment shall be included in the various Bid items unless otherwise specified in the Special Provisions.

7-10.3 Haul Routes. Unless otherwise specified in the Special Provisions, the haul route(s) shall be determined by the Contractor.

7-10.4 Safety.

7-10.4.1 Work Site Safety.

7-10.4.1.1 General. The Contractor shall provide safety measures as necessary to protect the public and workers within, or in the vicinity of, the Work site. The Contractor shall ensure that its operations will not create safety hazards. The Contractor shall provide safety equipment, material, and assistance to Agency personnel so that they may properly inspect all phases of the Work. When asbestos is being removed, the requirements of the CCR Title 8, Div. 1, Chapter 4, Subchapter 4 and Subchapter 7 shall be implemented.

7-10.4.1.2 Work Site Safety Official. The Contractor shall designate in writing a "Project Safety Official" who shall be at the Work site at all times, and who shall be thoroughly familiar with the Contractor's Injury and Illness Prevention Program (IIPP) and Code of Safe Practices (CSP). The Project Safety Official shall be available at all times to abate any potential safety hazards and shall have the authority and responsibility to shut down an unsafe operation, if necessary.

7-10.4.2 Safety Orders.

7-10.4.2.1 General. The Contractor shall have at the Work site, copies or suitable extracts of Construction Safety Orders, Tunnel Safety Orders, and General Industry Safety Orders issued by the State Division of Industrial Safety. Prior to beginning any excavation 5 feet in depth or greater, the Contractor shall submit to the Engineer, the name of the "Competent Person" as defined in CCR, Title 8, Section 1504, in accordance with 2-5.3. The "Competent Person" shall be present at the Work site as required by Cal-OSHA.

7-10.4.2.2 Shoring Plan. Before excavating any trench 5 feet (105m) or more in depth, the Contractor shall submit in accordance with 2-5.3 a detailed working drawing (shoring plan) showing the design of the shoring, bracing, sloping, or other provisions used for the workers' protection. If the shoring plan varies from the shoring system standards, the shoring plan shall be prepared by a registered Structural or Civil Engineer. The shoring plan shall accommodate existing underground utilities. No excavation shall start until the Engineer has accepted the shoring plan and the Contractor has obtained a permit from the State Division of Industrial Safety. A copy of the permit shall be submitted to the Engineer in accordance with 2-5.3. If the Contractor fails to submit a shoring plan or fails to comply with an accepted shoring plan, the Contractor shall suspend work at the affected location(s) when directed to do so by the Engineer. Such a directive shall not be the basis of a claim for Extra Work and the Contractor shall not receive additional compensation or Contract time due to the suspension.

7-10.4.2.3 Payment. Payment for shoring shall be included in the Bid item provided therefor. Payment for compliance with the provisions of the safety orders and all other laws, ordinances, and regulations shall be included in the various Bid items.

7-10.4.3 Use of Explosives. Explosives may be used only when authorized in writing by the Engineer, or as otherwise specified in the Special Provisions.

Explosives shall be handled, used, and stored in accordance with all applicable regulations.

Prior to blasting, the Contractor shall comply with the following requirements:

- a) The jurisdictional law enforcement agency shall be notified 24 hours in advance of blasting.
- b) The jurisdictional fire department shall be notified 24 hours in advance of blasting.
- c) Blasting activities and schedule milestones shall be included in the Contractor's construction schedule per 6-1.

For a Private Contract, specific permission shall be obtained from the Agency in writing, prior to any blasting operations in addition to the above requirements.

The Engineer's approval of the use of explosives shall not relieve the Contractor from liability for claims caused by blasting operations.

7-10.4.4 Hazardous Substances. An MSDS as described in CCR, Title 8, Section 5194, shall be maintained at the Work site for all hazardous material used by the Contractor. Material usage shall be accomplished with strict adherence to California Division of Industrial Safety requirements and all manufacturer warnings and application instructions listed on the MSDS and on the product container label. The Contractor shall notify the Engineer if a specified product cannot be used under safe conditions. **7-10.4.5 Confined Spaces.** **7-10.4.5.1 Confined Space Entry Program (CSEP).** The Contractor shall be responsible for implementing, administering and maintaining a CSEP in accordance with CCR, Title 8, Sections 5156, 5157 and 5158.

Prior to the start of the Work, the Contractor shall prepare and submit a CSEP in accordance with 2-5.3. The CSEP shall address all potential physical and environmental hazards and contain procedures for safe entry into confined spaces such as the following:

- a) Training of personnel
- b) Purging and cleaning the space of materials and residue
- c) Potential isolation and control of energy and material inflow
- d) Controlled access to the space
- e) Atmospheric testing of the space
- f) Ventilation of the space
- g) Special hazards consideration
- h) Personal protective equipment
- i) Rescue plan provisions

The submittal shall include the names of the Contractor's personnel, including each Subcontractor's personnel, assigned to the Work that will have CSEP responsibilities, their CSEP training, and their specific assignment and responsibility in carrying out the CSEP.

7-10.4.5 Confined Spaces.

7-10.4.5.1 Confined Space Entry Program (CSEP). The Contractor shall be responsible for implementing, administering and maintaining a CSEP in accordance with CCR, Title 8, Sections 5156, 5157 and 5158.

Prior to the start of the Work, the Contractor shall prepare and submit a CSEP in accordance with 2-5.3. The CSEP shall address all potential physical and environmental hazards and contain procedures for safe entry into confined spaces such as the following:

- a) Training of personnel.
- b) Purging and cleaning the space of materials and residue.
- c) Potential isolation and control of energy and material inflow.
- d) Controlled access to the space.
- e) Atmospheric testing of the space.
- f) Ventilation of the space.
- g) Special hazards consideration.
- h) Personal protective equipment.
- i) Rescue plan provisions.

The submittal shall include the names of the Contractor's personnel, including each Subcontractor's personnel, assigned to the Work that will have CSEP responsibilities, their CSEP training, and their specific assignment and responsibility in carrying out the CSEP.

7-10.4.5.2 Permit-Required Confined Spaces. Entry into permit-required confined spaces as defined in CCR, Title 8, Section 5157 may be required as a part of the Work. Manholes, tanks, vaults, pipelines, excavations, or other enclosed or partially enclosed spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. The Contractor shall implement a permit-required CSEP prior to performing any work in a permit-required confined space. A copy of the permit shall be available at all times for review by the Contractor and the Engineer at the Work site.

7-10.4.5.3 Payment. Payment for the CSEP shall be included in the Bid items for which the CSEP is required.

7-10.5 Security and Protective Devices.

7-10.5.1 General. Security and protective devices shall consist of fencing, steel plates, or other devices as specified in the Special Provisions to protect open excavations

7-10.5.2 Security Fencing. The Contractor shall completely fence open excavations. Security fencing shall conform to 304-3.5. Security fencing shall remain in place unless workers are present and construction operations are in progress during which time the Contractor shall provide equivalent security..

7-10.5.3 Steel Plate Covers. The Contractor shall provide steel plate covers as necessary to protect from accidental entry into openings, trenches, and excavations.

7-11 PATENT FEES OR ROYALTIES. The Contractor shall absorb in its Bid, the patent fees or royalties on any patented article or process which may be furnished or used in the Work. The Contractor shall indemnify and hold the Agency harmless from any legal action that may be brought for infringement of patents.

7-12 ADVERTISING. The names of contractors, subcontractors, architects, or engineers, with their addresses and the designation of their particular specialties, may be displayed on removable signs. The size and location of such signs shall be subject to the Engineer's approval.

Commercial advertising matter shall not be attached or painted on the surfaces of buildings, fences, canopies, or barricades.

7-13 LAWS TO BE OBSERVED. The Contractor shall keep fully informed of State and National laws and County and Municipal ordinances and regulations which in any manner affect those employed in the Work or the materials used in the Work or in any way affect the conduct of the Work. It shall at all times observe and comply with all such laws, ordinances and regulations.

7-13.1 Mined Materials. Mined material from California surface mines, used on the Work, shall be from a mine identified in the list published by the California Department of Conservation (referred to as 3098 List), as required by Public Contract Code 20676. This list is available on the Internet at www.conservation.ca.gov/OMR/ab_3098_list/index.htm.

7-14 ANTITRUST CLAIMS. Section 7103.5 of the Public Contract Code provides:

"In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 [commencing with Section 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the contractor, without further acknowledgement by the parties."

7-15 RECYCLABLE CONSTRUCTION & DEMOLITION WASTES. Ventura County Ordinance Code Section, 4421 et seq, requires that if any recyclable solid wastes or marketable reusable materials will be generated on the site of the Work within the unincorporated areas of Ventura County, the Contractor shall prepare a Construction & Demolition Debris Waste Diversion Plan and submit it to the Ventura County Public Works Agency, Water & Sanitation Department - Integrated Waste Management Division (IWMD). The Contractor shall prepare and file Construction & Demolition Debris Waste Diversion Reporting Forms as required by the IWMD.

For projects within the unincorporated areas of Ventura County, the Contractor shall submit an IWMD Form B-Recycling Plan approved by IWMD prior to issuance of the Notice to Proceed as provided in 6-7.4.

For projects within the unincorporated areas of Ventura County, the Contractor shall submit an IWMD Form C-Reporting Form approved by IWMD prior to the Engineer preparing the final estimate as provided in 9-3.2.

If the site of the Work is within an incorporated city, the Contractor shall comply with all the recycling, solid waste diversion, and hauling requirements of that incorporated city.

7-16 BLANK

7-17 LOSS OR DAMAGE TO THE WORK. The Contractor is responsible for delivering to the Agency Work completed in accordance with the Contract except as provided in 7-18. Should the Work being constructed be damaged by fire or other causes before Acceptance by the Agency, it shall be replaced in accordance with the requirements of the Plans and Specifications without additional expense to the Agency. The Agency does not carry "Course of Construction" insurance on the Work. Contractor should arrange for its own insurance to protect its interests.

7-18 ACTS OF GOD. As provided in Section 7105 of the California Public Contract Code, the Contractor shall not be responsible for the cost of repairing or restoring damaged portions of the Work determined to have been proximately caused by an act of God in excess of 5 percent of the contracted amount, provided that the Work damaged was built in accordance with accepted and applicable building standards and the Specifications and Drawings. The Contractor shall obtain insurance to indemnify the Agency for any damage to the Work caused by an act of God if the premium of said insurance coverage is called for as a separate bid item in the bidding schedule for the Work. For purposes of this section, the term "acts of God" shall include only the following occurrences or conditions and effects: earthquakes in excess of a magnitude of 3.5 on the Richter Scale, and tidal waves.

SECTION 8 - FACILITIES FOR AGENCY PERSONNEL

8-1 GENERAL. A field office shall be provided when required by the Plans or Special Provisions. The field office shall be at a suitable location approved by the Engineer.

A field office shall be a weather-tight building of suitable proportions with 16 m² (120 sq. ft.) of floor area, at least one door, and a window area of 2 m² (22 Sq. Ft.). A field office may be a building or a separate room in a building the Contractor may be required to provide or that it may desire to provide for its own use. In either case, the room shall have a separate exterior door. All doors shall be provided with hasps for padlocks.

The office shall be convenient to the Work. It shall be adequately heated, ventilated, electrically lighted, and provided with telephone service, all at the expense of the Contractor or plant owner. Offices are for the exclusive use of Agency personnel, unless otherwise provided herein.

Field offices at the worksite shall be removed upon completion of the Work.

All costs incurred in furnishing, maintaining, servicing, and removing a field office required at the Work site shall be included in the price bid for such item. If such item is required by the Plans or Specifications and no bid item is provided in the Proposal, the costs shall be absorbed in the other items for which bids are entered. Buildings and equipment furnished by the Contractor at the Work site under the provisions of this section are the property of the Contractor.

The first progress payment will not be approved until all facilities are in place and fully comply with the Specifications.

8-2 EQUIPMENT FOR FIELD OFFICES. Unless otherwise specified, a field office shall be equipped with:

- Plan table, 0.75 m x 1.5 m (2 1/2 ft. x 5 ft.) or larger
- Plan rack, capacity to hold two sets of project Plans plus all shop drawings
- Desk and chair
- Two lockers with hasps for padlocks

SECTION 9 - MEASUREMENT AND PAYMENT

9-1 MEASUREMENT OF QUANTITIES FOR UNIT PRICE WORK

9-1.1 General. Unless otherwise specified, quantities of work shall be determined from measurements or dimensions in horizontal planes. However, linear quantities of pipe, piling, fencing, and timber shall be considered as being the true length measured along longitudinal axis.

Unless otherwise provided in Specifications, volumetric quantities shall be the product of the mean area of vertical or horizontal sections and the intervening horizontal or vertical dimension. The planimeter shall be considered an instrument of precision adapted to measurement of all areas.

9-1.2 Methods of Measurement. Materials and items of Work which are to be paid for on the basis of measurement shall be measured in accordance with the methods stipulated in the particular sections involved.

9-1.3 Certified Weights. When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales or, when approved by the Engineer, on a completely automated weighing and recording system. The Contractor shall furnish the Engineer with duplicate licensed weighmaster's certificates showing actual net weights. The Agency will accept the certificate as evidence of weights delivered.

9-1.4 Units of Measurement. Measurements shall be in accordance with 1-4.1 and 1-4.2. A metric ton or "tonne" is equal to 1000 kilograms and the unit of liquid measure is a Liter (in U.S. Standard Measures, a pound is an avoirdupois pound; a ton is 2000 pounds avoirdupois; and the unit of liquid measure is a gallon).

9-2 LUMP SUM BID ITEMS. Items for which quantities are indicated as "Lump Sum", "L.S." or "Job" shall be paid for at the price indicated in the Proposal. Such payment shall be full compensation for the items of Work and all Work appurtenant thereto.

When required by the Specifications or requested by the Engineer, the Contractor shall submit to the Engineer within 15 Days after award of Contract, a detailed schedule in triplicate, to be used only as a basis for determining progress payments on a lump sum contract or any designated lump sum bid item. This schedule should equal in total the lump sum bid and shall be in such form and sufficiently detailed as to satisfy the Engineer that it correctly represents a reasonable apportionment of the lump sum. If Mobilization or Water Pollution Control are included in the detailed schedule, those items will be paid for as provided in 9-3.4.2 and 7-8.6.4, receptively.

9-3 PAYMENT

9-3.1 General. The quantities listed in the Bid schedule will not govern final payment unless identified by Agency on the Proposal as [F]. The symbol "[F]" indicates that the quantities shown on the Proposal form are the final pay quantities. Payment to the Contractor (except those items identified as [F]) will be made only for the actual quantities of Contract items constructed in accordance with the Plans and Specifications. Upon completion of construction, if the actual quantities show either an increase or decrease from the quantities given in the Bid schedule, the Contract Unit Prices will prevail subject to the provisions of 3-2.2.1. Payment for those items identified as [F] will be based on the quantities shown on the Proposal unless changed as provided in 3-2.2.1.

The unit and lump sum prices to be paid shall be full compensation for the items of work and all appurtenant work, including furnishing all materials, labor, equipment, tools and incidentals.

Payment for items shown on the Plans or required by the Specifications, for which no pay item is provided, shall be considered included in the prices named for the other items shown on the Proposal.

Payment will not be made for materials wasted or disposed of in a manner not called for under the Contract. This includes rejected material not unloaded from vehicles, material rejected after it has been placed and material placed outside of the Plan lines. No compensation will be allowed for disposing of rejected or excess material.

Whenever any portion of the Work is performed by the Agency at the Contractor's request, the cost thereof shall be charged against the Contractor, and may be deducted from any amount due or becoming due from the Agency.

Whenever immediate action is required to prevent injury, death, or property damage, and precautions which are the Contractor's responsibility have not been taken and are not reasonably expected to be taken, the Agency may, after reasonable attempt to notify the Contractor, cause such precautions to be taken and shall charge the cost thereof against the Contractor, or may deduct such cost from any amount due or becoming due from the Agency. Agency action or inaction under such circumstances shall not be construed as relieving the Contractor or its Surety from liability.

9-3.1 General. (Continued)

Payment shall not relieve the Contractor from its obligations under the Contract; nor shall such payment be construed to be Acceptance of any of the Work. Payment shall not be construed as the transfer of ownership of any equipment or materials to the Agency. Responsibility of ownership shall remain with the Contractor who shall be obligated to store, protect, repair, replace, rebuild, or otherwise restore any fully or partially completed work or structure for which payment has been made; or replace any materials or equipment required to be provided under the Contract which may be damaged, lost, stolen or otherwise degraded in any way prior to completion of the Work under the Contract, except as provided in 6-10.

Warranty periods shall not be affected by any payment but shall commence on the date equipment or material is placed into service at the written direction of the Engineer. In the event such items are not placed into service prior to partial or final completion of the Work, the warranty periods will commence on the date set forth as the date of field completion in the Engineer's acknowledgement of completion.

If, within the time fixed by law, a properly executed notice to stop payment is filed with the Agency, due to the Contractor's failure to pay for labor or materials used in the Work, all money due for such labor or materials will be withheld from payment to the Contractor in accordance with applicable laws.

At the expiration of 35 Days from the date of recording of the Notice of Completion, or as prescribed by law, the amount deducted from the final estimate and retained by the Agency will be paid to the Contractor except such amounts as are required by law to be withheld by properly executed and filed notices to stop payment, or as may be authorized by the Contract to be further retained.

9-3.2 Partial and Final Payment. The Engineer will, after award of Contract, establish a closure date for the purpose of making monthly progress payments. The Contractor may request in writing that such monthly closure date be changed. The Engineer may approve such request when it is compatible with the Agency's payment procedure.

Each month, the Engineer will make an approximate measurement of the Work performed to the closure date and, as a basis for making monthly payments, estimate its value based on the Contract Unit Prices or as provided for in 9-2. When the Work has been satisfactorily completed, the Engineer will determine the quantity of Work performed and prepare the final estimate.

Work not conforming to the Contract Documents shall not be measured for payment.

Conformance with the Contract Documents shall be, in addition to constructing the Work in accordance with the Contract Documents, the Contractor's compliance with those portions of the Contract Documents not directly related to the completed Work, including but not limited to: construction and maintenance of detours; diversion and control of water; protection and repair of existing facilities of the Agency and adjacent owners; site maintenance; coordination with utilities and other contractors on the site; proper survey procedures and records; obtaining required permits and inspections; complying with working hour limitations; providing a Contractor's representative while Work is being performed; complying with environmental requirements; maintaining access and safety for users of facilities that are to remain in service during construction; and obeying all laws affecting the Work.

Payment for Extra Work will be made only on approved Daily Extra Work Reports with supporting documentation as required in 3-3.

From each progress estimate, 5 percent will be deducted and retained by the Agency, and the remainder less the amount of all previous payment will be paid to the Contractor.

No progress payment made to the Contractor or its sureties will constitute a waiver of the liquidated damages under 6-9.

9-3.2 Partial and Final Payment. (Continued)

As provided for in Sections 22300 of the California Public Contract Code, the Contractor may substitute securities for any monies withheld by the Agency to ensure performance under the Contract. In substituting securities, the Contractor may either:

- a. Deposit qualifying securities already owned by the Contractor with the Escrow prior to the Contract payment date, or
- b. Direct the Agency to send retained funds to the Escrow to be invested by the Escrow in qualifying securities as directed by the Contractor.

9-3.2.1 Release of Withheld Contract Funds. Pursuant to Public Contract Code Section 22300, Contractor has the option to deposit securities with an Escrow Agent as a substitute for retention earnings required to be withheld by Agency pursuant to the construction Contract between the Agency and the Contractor. A form of Escrow Agreement for Security Deposits in Lieu of Retention has been adopted by the Agency as one of the Contract Documents; procedures for implementing the provisions of the Escrow Agreement are contained in Escrow Instructions which shall become effective upon exercise of the option by the Contractor.

The Contractor shall take the following steps if it desires to substitute securities:

- a. Execute the Escrow Agreement for Security Deposits in Lieu of Retention.
- b. Furnish to the Escrow Agent a power of attorney and other forms necessary to empower the Escrow Agent to convert the securities to cash.
- c. Furnish to the Escrow Agent the securities described.
- d. Pay the Escrow Agent's fees and costs.

When the Contractor deposits with the Escrow Agent securities in lieu of money required to be withheld from progress payments, a sum of money equivalent to the current cash value of the securities as determined by the Escrow Agent shall be released to the Contractor by, or upon the direction of, the Agency.

If the total of the money plus the current cash conversion value of securities on deposit should fall below the aggregate amount of the sums required to be withheld from progress payments pursuant to 9-3.1 and 9-3.2, an amount equal to the difference shall be withheld from the next regular progress payment in addition to the amount which would ordinarily be withheld pursuant to 9-3.1 and 9-3.2. If the next regular progress payment is less than the total of the amounts to be withheld therefrom, the Contractor shall immediately either deposit with the Agency cash in the amount of the difference or deposit with the Escrow Agent additional securities having a current cash conversion value equal to or greater than the difference.

The Contractor shall be the beneficial owner of any such securities on deposit with the Escrow Agency and shall be entitled to any interest earned thereon prior to conversion. The Agency may direct the Escrow Agency to convert securities with the Escrow Agency into cash, and to deliver the cash to the Agency, in any case where the Contractor is in default, including the following:

- a. where the Agency would be entitled to use funds withheld pursuant to 9-3.1 and 9-3.2 to satisfy claims of workers, materials suppliers or subcontractors, or to complete or correct work which the Contractor has failed or refused to complete or correct, or
- b. where the Contractor has failed to comply with the requirements of this section respecting the deposit of additional cash or securities to make up for a fall in the value of securities already on deposit with the Escrow Agency.

The Agency may hold and use cash resulting from such a conversion of securities in the same manner as it would be entitled to hold and use funds withheld pursuant to 9-3.1 and 9-3.2.

9-3.2.2 Timely Progress Payments. As required by Public Contract Code Section 20104.50, the Contractor is informed that should a progress payment not be made within 30 Days after receipt of an undisputed and properly submitted payment request from the Contractor, the Agency shall pay interest to the Contractor on the unpaid amount at the rate set forth in the Code of Civil Procedures, Section 685.010(a). Agency shall promptly review payment requests, and if not determined to be proper, document to the Contractor, within 7 Days, the reasons why the request is not proper.

Contractor should refer to the code sections cited for further information.

9-3.3 Delivered Materials. Payment for the cost of materials and equipment delivered to the Work site but not incorporated in the Work will be included in the progress estimate if, prior to the closure date for the monthly progress payment, the material or equipment is listed by the Contractor on the Agency's form together with date of delivery, vendor's or Subcontractor's name and cost; is accompanied by a copy of an invoice showing the cost thereof; has an aggregate cost in excess of \$5,000 for each progress payment; is currently on the Work site at an approved location and in good condition; and is one of the following:

1. Precast concrete units weighing more than 100 kilograms (200 pounds) each.
2. Structural steel members weighing more than 100 kilograms (200 pounds) each.
3. Individual pieces of electrical equipment costing over \$1,000 each.
4. Individual pieces of mechanical equipment costing over \$1,000 each.
5. Reinforced concrete pipe of any size.
6. Storm drainage pipe 900 mm (36") in diameter and larger.
7. Water and sewer pipe 300 mm (12") in diameter and larger.
8. Finish hardware for doors.
9. Other individual items of equipment costing over \$1,000 each
10. Materials where the aggregate value of a single type of material exceeds \$1,000 and is either:
 - a) Fabricated or cut to fit the Work before delivery, or
 - b) Of a size or type not available from any manufacturer without a special production run.

On unit price Bid items, the amount paid for materials or equipment delivered but not incorporated in the Work shall not exceed 75% of the amount of the Bid item which includes such material or equipment.

On lump sum Bid items, the amount paid for materials and equipment delivered and not incorporated in the Work shall not exceed 75% of the item in the approved schedule submitted in accordance with 9-2 of which such materials or equipment is a part.

Should materials or equipment previously paid for be damaged, destroyed, stolen or removed from the Work site, the payment previously made therefor will be deducted from the next progress payment, unless such materials or equipment are replaced prior thereto.

On the closure date for progress payments, as provided in 9-3.2, the Contractor shall certify that all materials and equipment not incorporated into the Work, for which payment has previously been made or is being requested, is still at the Work site and in good condition. Failure to provide such certification will be cause for deducting previous payments for materials not incorporated in the Work from the amount due the Contractor in the progress payment.

Payment for materials or equipment, as provided herein, shall not constitute approval or acceptance thereof nor shall such payment modify or abridge any of the rights the Agency has under the Specifications or at law nor relieve the Surety of any of its obligations under the bonds.

9-3.4 Mobilization

9-3.4.1 Scope. Mobilization includes preliminary services, work and operations, including but not limited to, furnishing required bonds, obtaining necessary permits and work areas, providing a specified field office, the movement of labor, supplies, equipment and incidentals to the Work site, and for all other work, services and operations which must be performed or for which costs are incurred prior to performing work of the other Contract items.

9-3.4.2 Payment. The Contract lump sum price bid for mobilization shall include full compensation for furnishing all labor, materials, tools, equipment, services and incidentals and for doing all work involved in mobilization as specified herein. Payment for mobilization will be made as the Work proceeds on the following basis except that where a field office is required by the Specifications, no payment for mobilization will be made until the specified field office has been provided:

Partial payment estimate (excluding mobilization & water pollution control payments) as a percentage of the original Contract price (excluding the mobilization & water pollution control Bid items).		Cumulative amount of mobilization pay item earned is the lesser of the amounts as computed by these two columns.	
Equal to or greater than	Less than	Percentage of mobilization pay item	Percentage of the original Contract total.
5	10	50	5
10	20	75	7.5
20	50	95	9.5
50	Completion of Work	100	10
Completion of Work		100	

Where no Bid item is provided for mobilization, payment for mobilization shall be considered to be included in the other Bid items.

9-4 TERMINATION OF AGENCY LIABILITY. After completion of all work required by the contract, Agency will furnish Contractor a Release on Contract form stating the amount of total authorized payments for the project. Contractor shall execute and return said form within 21 days of receipt. Said form shall release and discharge the Agency from all claims of and liability to the Contractor for all manner of debts, demands, accounts, claims, and causes of action under or by virtue of said Contract except:

- The claim against the Agency for the remainder, if any, of the amounts retained as provided in 9-3.2, and any amounts retained as required by Stop Notices or Labor Code provisions.
- Any unsettled claims or disputes listed on the Release on Contract form which has been processed in compliance with the requirements for making claims under the Contract, including given timely notice pursuant to the applicable provisions of the Contract and following the procedure set forth in 6-12.

Acceptance of the Release on Contract by the Agency shall not be deemed a waiver or release of the Agency's right to contest either the substantive or procedural validity of any listed unsettled claims or disputes.

When executing the Release on Contract, the Contractor shall certify that each unsettled claim or dispute listed thereon has been processed in compliance with the requirements for making claims under the Contract, including giving timely notice pursuant to the applicable provisions of the Contract and following the procedures for resolution of disputes or claims set forth in 6-12 and that acceptance of the Release on Contract by the Agency shall not be deemed a waiver or release of the Agency's right to contest either the substantive or procedural validity of any listed unsettled claims or disputes.

If Contractor fails to execute and submit a Release on Contract within the 21 day time period set forth above, the Release on Contract shall be deemed to have been submitted with no unsettled claims or disputes listed on the Release on Contract. A payment of \$1.00 will be made to the Contractor for such Release on Contract and waiver.

SECTION 10 - DIVERSION, CONTROL AND REMOVAL OF WATER

10-1 DESCRIPTION. This section covers the diversion, control and removal of all water entering into the construction area or otherwise affecting construction activities.

10-2 REQUIREMENTS. All permanent construction shall be performed in a site free from water unless otherwise provided for in the Special Provisions. The Contractor shall construct, maintain, and operate all necessary cofferdams, pumps, channels, flumes, drains, well points and/or other temporary diversion, protective, and water removal works required for diversion, control and removal of all water, whether surface or groundwater, whatever its source, during construction.

Inundation of partially completed Work due to lack of control during non-working periods will not be permitted, and may be cause for requiring removal and replacement of Work already completed.

The Contractor shall be responsible for obtaining the use of any property in addition to that provided for in the Plans and Specifications, which may be required for the diversion, protective, and water removal works so as not to create a hazard to persons or property or to interfere with the water rights of others.

It shall be understood and agreed that the Contractor shall hold the Agency and the Engineer harmless from legal action taken by any third party with respect to construction and operations of the diversion and protective works.

10-3 DIVERSION AND CONTROL WORKS.

Prior to beginning of work involving diversion, control and removal of water, the Contractor shall submit a water control plan to the Engineer. In the event circumstances during the course of construction require changes to the original water control plan, a revised water control plan shall be promptly submitted to the Engineer in each instance. No responsibility shall accrue to the Engineer or the Agency as a result of the plan or as a result of knowledge of the plan.

Construction and operation of the diversion, control and removal works shall be in accordance with the water control plan submitted, except deviations therefrom may be specifically approved by the Engineer.

All works installed by the Contractor in connection with dewatering, control, and diversion of water but not specified to become a permanent part of the Work, shall be removed and the site restored, insofar as practical, to its original condition prior to completion of construction or when directed by the Engineer.

10-4 PAYMENT. No separate Bid item is included. Payment for this item of Work will be considered to be included in the payments made for other items of Contract Work to which water control is incidental.

PART 2 CONSTRUCTION MATERIALS

SECTION 200 - ROCK MATERIALS

200-1 ROCK PRODUCTS

200-1.6 Stone for Riprap

200-1.6.1A Alternate Stone for Riprap. As an alternate to the requirements of Subsection 200-1.6, the sample may be subject to the following tests:

TESTS	TEST METHOD NO.	REQUIREMENTS
Apparent Specific Gravity	ASTM C 127	2.40 Min.
Resistance to Abrasion	ASTM C 535, Grading 1	35% Max.
Soundness	Section 211-8	10% Max.
Wet and Dry Loss	Section 211-9	5% Max.
Solubility	Section 211-10	No Loss

All rock shall be angular or subangular in shape. Angular shall be defined as having sharp corners and straight planes on all faces, with no evidence of wear caused by wind, water or abrasion. Subangular shall be defined the same as angular except that evidence of wear by wind, water or abrasion may be allowed. Determination of angularity will be made by the Engineer.

200-1.6.2 Riprap Size

The individual classes of rock used for riprap shall conform to the following:

Rock Sizes	RIPRAP CLASSES					
	1-Tonne (1-Ton)	½-Tonne (½-Ton)	¼-Tonne (¼-Ton)	Light	Facing	Cobble
	PERCENTAGE LARGER THAN					
2-Tonne (2-Ton)	0-5					
1-Tonne (1-Ton)	50-100	0-5				
½-Tonne (½-Ton)		50-100	0-5			
¼-Tonne (¼-Ton)	90-100		50-100	0-5		
100-kg (200-lb)		90-100		50-100	0-5	
35-kg (75-lb)			90-100	90-100	50-100	0-5
10-kg (25-lb)					90-100	95-100
0.5-kg (1-lb)	100	100	100	100	100	100

The amount of material smaller than the smallest size listed in the table for any class of riprap shall not exceed the percentage limit listed in the table determined on a weight basis.

Compliance with the percentage limit shown in the table for all other sizes of the individual pieces of any class of riprap shall be determined by the ratio of the number of individual pieces larger than the specified size compared to the total number of individual pieces larger than the smallest size listed in the table for that class.

Flat or needle shapes will not be accepted unless the thickness of individual pieces is greater than 1/3 the length.

Before placing in final location, depositing, or stockpiling within the project limits, each individual load of riprap must meet the size requirements of the class specified.

SECTION 206 - MISCELLANEOUS METAL ITEMS

206-3 GRAY IRON AND DUCTILE IRON CASTINGS

206-3.3.2A Manhole Frame and Cover Sets

Unless otherwise specified, manhole frames and covers shall be in accordance with the following Standard Plans contained in the SPPWC:

Clear Opening Diameter mm (Inches)	SPPWC Plan No.	Catalog Numbers	
		Alhambra Foundry	Long Beach Iron Works
600 (24)	630-1	A-1495	X-162
675 (27)	631-1	A-1496	X-164
750 (30)	632-1	A-1497	X-163
900 (36)	633-1	A-1498	X-106A

206-5 METAL RAILINGS.

206-5.2 Flexible Metal Guard Rail Materials.

206-5.2A Flexible Metal Guard Rail Materials; Modification. The "Construction" grade Douglas Fir for "posts, including blocks" does not have to be "free of heart center".

SECTION 210 - PAINT AND PROTECTIVE COATINGS

210-6 STORM DRAIN HARDWARE. All storm drain hardware, including manhole frames and covers, grates, protection bars, steps, etc., shall be protected from corrosion.

Storm drain hardware made of cast iron shall be protected by painting with, or dipping in, a commercial grade asphalt paint. Storm drain hardware made of steel shall be galvanized.

SECTION 211 - MATERIAL TESTS

211-6 SIEVE ANALYSIS. Sieve analysis shall be performed in accordance with ASTM C136.

211-7 Sand Equivalent Test. This test is intended to serve as a field test to indicate the presence or absence of plastic fine material. The test shall be run in accordance with Calif. test 217 or ASTM D2419. When testing material containing asphalt, this test method shall be modified by drying the sample at a temperature not exceeding 38°C (100°F).

211-8 R-VALUE. Resistance (R-value) shall be determined by California Test 301.

211-9 SPECIFIC GRAVITY AND ABSORPTION. Apparent specific gravity, bulk specific gravity and absorption shall be determined by California Test 206, 207, 208, 209, 224, 225, or 308, Method C where zinc stearate may be substituted for paraffin.

211-10 LOS ANGELES RATTLER TEST. Loss in Los Angeles Rattler shall be determined by California Test 211.

211-11 SOUNDNESS. For riprap, the soundness shall be determined in accordance with Calif. Test 214, excluding sections D, E, G.2.b, and H, and adding the following:

- a. The test sample shall be prepared by breaking or sawing a representative sampling of riprap into particles passing the 75 mm (three inch) and retained on the 50 mm (two inch) sieve. If there are a variety of rock types or degrees of weathering within a rock type, each unique type or condition must meet the loss requirement.
- b. The test sample size shall be 25,000 grams (55 lbs.) \pm 1 percent.
- c. All particles of test sample which break into three or more pieces during testing shall be discarded. The remaining sample shall be washed on a 4.75 mm (#4) sieve and all particles retained shall be oven dried.
- d. The loss in weight shall be determined by subtracting from the original weight of the test sample the final weight of all particles retained on the 4.75 mm (#4) sieve. Divide the loss in weight by the original weight and multiply by 100 to determine the percent loss.
- e. Report the following:
 - (1) The percent loss.
 - (2) The number of pieces affected, classified as to number disintegrating, splitting, crumbling, cracking, flaking, etc.

211-12 WET AND DRY LOSS. Wet and dry loss shall be determined as follows:

A sample of rock shall be crushed, screened, oven dried, and 1,000 g (2.2 lbs.) to 1,500 g (3.3 lbs.) of the 19 mm (3/4 inch) to 9.5 mm (3/8 inch) fraction shall be taken for the test.

The crushed and graded sample shall be submerged in tap water for 8 hours at room temperature, after which the sample shall be drained and oven dried at 78°C (140°F). When dry, the sample shall be cooled to room temperature. This completes one cycle.

After 10 cycles, the percent loss shall be computed as follows:

$$\% \text{ Loss} = \frac{100 \times \text{Weight of Material Passing 4.75 mm (No. 4) Sieve}}{\text{Total Weight of Sample}}$$

211-13 SOLUBILITY. Approximately 0.5 kg (one pound), air dried samples shall be immersed in local tap water and in Pacific Ocean water (or a 3.5% sodium chloride solution) for 8 hours each at 78°C (140°F). After immersion, the samples shall be washed with tap water, air dried and reweighed.

211-14 Permeability Test. Permeability tests for granular soils shall be performed in accordance with ASTM D2434, using samples compacted to the specified field density.

PART 3 CONSTRUCTION METHODS

SECTION 301 - TREATED SOILS, SUBGRADE PREPARATION AND PLACEMENT OF BASE MATERIALS

301-1 SUBGRADE PREPARATION

301-1.3 Relative Compaction

301-1.3.1 Firm, Hard and Unyielding. The term "firm, hard and unyielding" as used in 301-1.3 shall mean that when the heaviest construction and hauling equipment used on the Work drives over the subgrade, no permanent deformation shall occur either before or during pavement construction.

301-1.4 Subgrade Tolerances. Subgrade for pavement, sidewalk, curb and gutter, driveways, or other roadway structures shall not vary more than 15 mm (0.05 feet) from the specified grade and cross section. Subgrade for subbase or base material shall not vary more than 15 mm (0.05 feet) from the specified grade and cross section.

Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.

301-2 UNTREATED BASE

301-2.3 Compacting

301-2.3.1 Tolerances. The tolerance requirement in 301-2.3 is modified from 6 mm (0.02 foot) to 15 mm (0.05 foot).

SECTION 302 - ROADWAY SURFACING

302-5 ASPHALT CONCRETE PAVEMENT

302-5.1 General

302-5.1.1 Asphalt Concrete Berms. Asphalt concrete berms shall be constructed of Class III-D-PG70-10 asphalt concrete by mechanical means to conform to the details and location as shown on the Plans.

A tack coat, as provided in 302-5.4, shall be applied to the existing or new pavement preceding the placement of the asphalt concrete berms.

302-5.4 Tack Coat

302-5.4.1 Fog Seal. When specified, a fog seal consisting of material meeting the requirements of 203-3 shall be applied to the surfaces of all completed asphalt concrete at the rate of 0.36 liter per square meter (0.08 gallon per square yard) of the combined emulsion or such lesser rate ordered by the Engineer. Surface to be sealed shall be free from dust, dirt, and other foreign material. Surface shall be sealed within 7 Days after paving.

302-5.9 Measurement and Payment

302-5.9.1 Measurement and Payment for Asphalt Berm. Asphalt concrete berms will be paid for at the Contract Unit Price per linear meter (feet) of berm in place. No separate measurement or payment will be made for asphalt, aggregate, or tack coat.

302-5.9.2 Measurement and Payment for Fog Seal, Tack Coat, and Prime Coat. Measurement and payment for the specified material shall be by the tonne (ton) in place. Emulsions shall be measured after the specified dilution has been made.

SECTION 303 - CONCRETE AND MASONRY CONSTRUCTION

303-5 CONCRETE CURBS, WALKS, GUTTERS, CROSS GUTTERS, ALLEY INTERSECTIONS, ACCESS RAMPS AND DRIVEWAYS

303-5.1 Requirements

303-5.1.4 Concrete Substitution. Class 280-C-14 (470-C-2000) may be used in lieu of Class 310-C-17 (520-C-2500) and Class 280-D-14 (470-D-2000) in lieu of Class 310-D-17 (520-D-2500) as specified in 201-1.1.2 for street surface improvements, excluding concrete pavement, when no class is specified on the Plans or in the Special Provisions.

SECTION 306 - UNDERGROUND CONDUIT CONSTRUCTION

306-1 OPEN TRENCH OPERATIONS

306-1.2 Installation of Pipe

306-1.2.1 Bedding

306-1.2.1.1 Bedding Material. When native material is allowed for backfill in the bedding zone, no rocks larger than 40 mm (1½") in maximum dimensions shall be included. Material containing ashes, cinders, and types of refuse or other deleterious material shall not be used as bedding.

306-1.2.1.2 Sewer Pipe Bedding. Bedding for sewer pipe from 100 mm (4") below the pipe to the spring line (horizontal diameter) of the pipe shall be free draining, granular material with a maximum size of 15 mm (1/2 inch), unless another bedding method is shown on the Plans.

Densification of the bedding material may be by the application of water or by mechanical means. Unless otherwise specified, all bedding material shall be densified to a relative density of 90%. Acceptability of densification in the bedding zone will be determined by visual inspection and probing to determine that no voids exist in the backfill material. In this paragraph, the word "voids" does not include intergranular voids in the soil structure.

306-1.2.1.3 Flexible Pipe Bedding. Bedding for flexible drainage and sewer pipe shall be granular material having a sand equivalent of at least 50. The bedding material shall be placed and compacted from 150 mm (six inches) below the pipe to the top of the bedding as defined in 306-1.2.1. A 1 m (three foot) long section of low permeability material (50% passing 75 µm (200) sieve) shall be installed and mechanically compacted in lieu of the above specified bedding material at intervals of 60 m (200 feet) or as otherwise indicated on the Plans.

306-9 DISINFECTION. All water mains and appurtenances shall be disinfected before being placed in service in accordance with AWWA C651 except as specified herein:

- a. The water mains shall be chlorinated so that a chlorine residual of not less than 20 ppm remains in the water after standing in the pipe for 24 hours.
- b. The Agency will perform sampling and testing of bacteriologic samples. Disinfection shall be repeated until two or more consecutive samples are negative for coliform organisms.

The pressure in the line being chlorinated shall be maintained at least 35 kPa (5 psi) lower than that existing in any Agency line to which it is connected.

306-10 WATERWORKS APPURTENANCES

306-10.1 Valves. Valves shall be located as shown on the drawings.

Each valve shall be operated prior to its installation to assure proper functioning. Valves shall be installed plumb and in alignment with the water main. Valves shall be anchored by metal ties to a concrete base. Line valves may be moved to the closest joint upon approval of the Engineer.

306-10.2 Valve Boxes. Each underground valve shall be provided with a valve box. The valve boxes shall be installed plumb and centered over the operating nut of the valve. Valve boxes shall be installed with concrete collars.

Where valve boxes are to be placed in asphaltic type pavement, they shall not be set to grade until after paving has been completed.

Where valve boxes are to be placed in concrete pavement, they shall be set to grade prior to paving operations.

306-10.3 Thrust Devices. A reaction or thrust device shall be provided on all dead ends, tees, elbows, and bends with more than 5 degrees deflection on pressure pipe lines.

Thrust devices shall be cast-in-place concrete, poured against undisturbed or compacted earth. Thrust devices shall be sized and constructed in accordance with the Plans.

Thrust devices and anchor blocks shall be constructed of Class 280-C-14 (420-C-2000) concrete. Thrust devices and anchor blocks shall be cured at least 7 Days where Type IP or II cement is used or at least 48 hours where Type III cement is used.

Metal tie-rods or clamps shall be of adequate strength to prevent movement of pipe. All metal shall be coated in accordance with AWWA C110.

306-10.4 Fire Hydrants. Fire Hydrants shall be installed as shown on the Plans.

All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb, with the pumper nozzle facing the curb, except that hydrants having only two hose nozzles 90 degrees apart shall be set with each nozzle facing the curb at an angle of 45 degrees.

In uncurbed public road rights of way, fire hydrants shall be located as far as possible from the traveled way while providing a 1 m (3-foot) wide clear space between the fire hydrant and the right of way line. In curbed public road rights of way, fire hydrants shall be installed so that there is 300 mm (12 inches) clear between the face of curb and the fire hydrant.

306-10.5 Fire Hydrant Barricades. Fire hydrant barricades shall consist of 100 mm (4-inch) standard steel pipe, schedule 40, filled with concrete, and having a total length of 2 m (72 inches). They shall be embedded in concrete blocks 300 mm (12 inches) in diameter and 1000 mm (40 inches) deep below ground surface with the barricade pipe embedded to 100 mm (4 inches) above the bottom of the concrete so 1 m (36 inches) extends above ground surface. The steel pipe above ground shall be painted chrome yellow in accordance with AWWA C503.

Barricades shall be installed between the fire hydrant and vehicle traffic paths at locations indicated on the Plans or where required by the water purveyor or Fire Department. Barricades shall not be installed within public road rights of way.

Fire hydrant barricades shall not obstruct the hydrant outlets.

SECTION 310 - PAINTING

310-5 Painting Various Surfaces

310-5.6 Painting Traffic Striping, Pavement Markings, and Curb Markings.

310-5.6.8A Application of Paint - Two Coats All painted traffic striping and markings shall be applied in two coats. The price named in any Bid item for painting traffic striping and markings shall include all costs for both applications, including any delays entailed for the required drying time between applications. If bleeding, curling or discoloration occurs following application of the second coat, unsatisfactory areas shall be given an additional coat, or coats, of paint. No additional payment will be made for work necessary to correct bleeding, curling or discoloration.

PART 4

SECTION 400 - ALTERNATE ROCK PRODUCTS, ASPHALT CONCRETE, PORTLAND CEMENT CONCRETE AND UNTREATED BASE MATERIAL

400-1 Rock Products

400-1.1 Requirements

400-1.1.1 General

Alternate rock material, Type S, as specified in Section 400 may be used on the Work.

400-3 Portland Cement Concrete

Suppliers of portland cement concrete shall file mix designs as required by 400-1.1.2

400-4 Asphalt Concrete

Suppliers of asphaltic cement concrete shall file mix designs as required by 400-1.1.2



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	
	NAIC #	
INSURED	INSURER A:	
	INSURER B:	
	INSURER C:	
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES

CERTIFICATE NUMBER:

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
	GENERAL LIABILITY						EACH OCCURRENCE \$ See VCSS 7-4.2
	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence) \$
	<input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR						MED EXP (Any one person) \$
							PERSONAL & ADV INJURY \$
							GENERAL AGGREGATE \$ See VCSS 7-4.2
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG \$
	<input checked="" type="checkbox"/> POLICY <input type="checkbox"/> PROJECT <input type="checkbox"/> LOC						\$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000
	<input checked="" type="checkbox"/> ANY AUTO						BODILY INJURY (Per person) \$
	<input type="checkbox"/> ALL OWNED AUTOS						BODILY INJURY (Per accident) \$ 1,000,000
	<input type="checkbox"/> HIRED AUTOS						PROPERTY DAMAGE (Per accident) \$ 1,000,000
							\$
	UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR						EACH OCCURRENCE \$
	EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE						AGGREGATE \$
	DED <input type="checkbox"/> RETENTION \$						\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY						WC STATUTORY LIMITS <input type="checkbox"/> OTHER <input type="checkbox"/>
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICE/MEMBER EXCLUDED? (Mandatory in NH)						E L EACH ACCIDENT \$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E L DISEASE - EA EMPLOYEE \$
							E L DISEASE - POLICY LIMIT \$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

(Agency) - (Project Name) (Project Specification number)

The Agency and the County of Ventura, including its boards, all special Districts governed by the Board of Supervisors, agencies, departments, officers, consultants, employees, agents and volunteers, is named as Additional Insured as respects work done by Contractor under the terms of the contract on General Liability and Auto Liability Policies. Waiver of Subrogation is applicable to the Agency and the County of Ventura, its boards, districts, agencies, departments, officers, employees, agents and volunteers for Work Comp and General Liability. Endorsements required for referenced contract will be issued by the Insurance Company.

CERTIFICATE HOLDER

CANCELLATION

County of Ventura Public Works Agency L-1670 800 S. Victoria Avenue Ventura, CA 93009-1670	<p>SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.</p> <p>AUTHORIZED REPRESENTATIVE</p>
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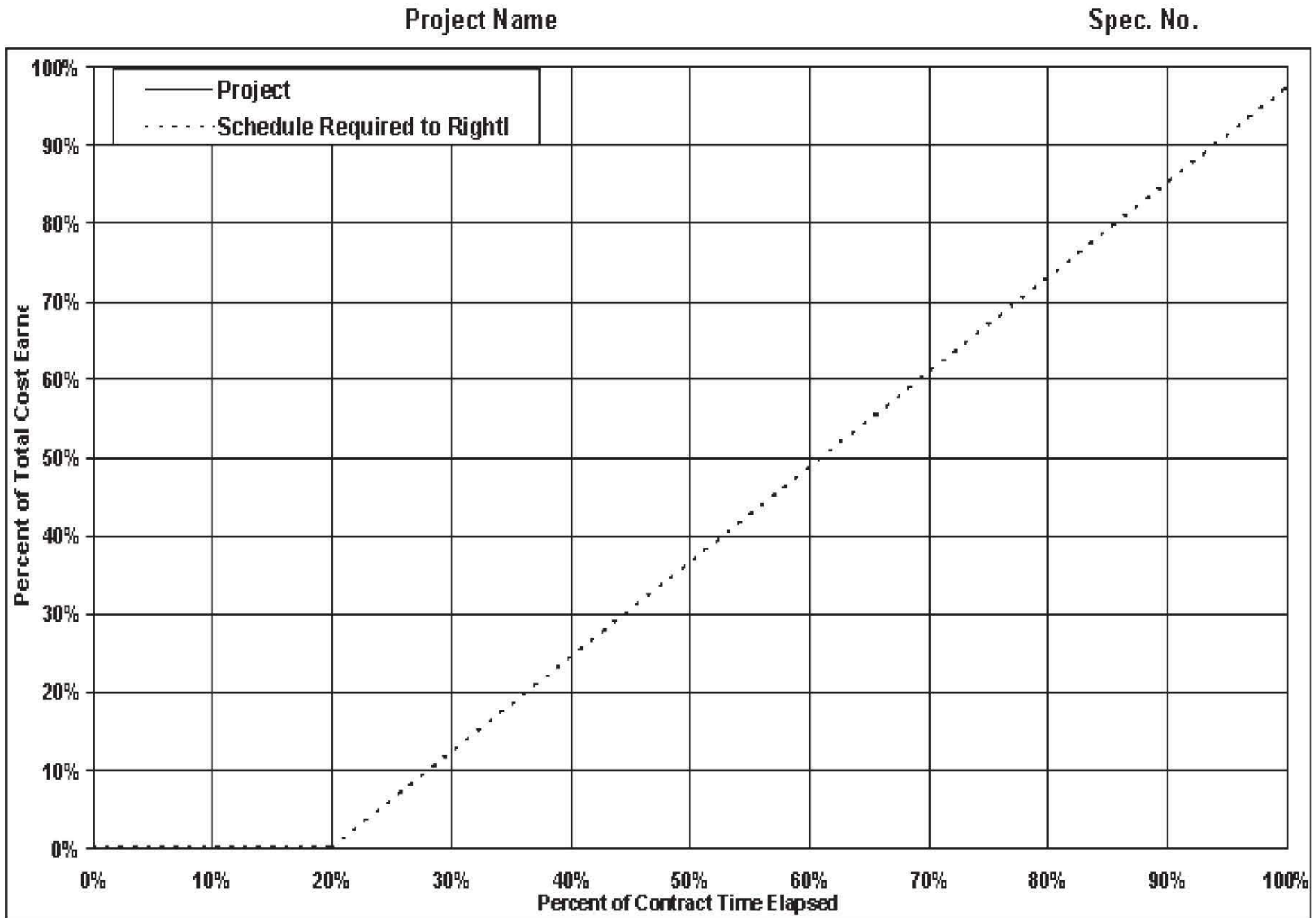
EACH HORIZONTAL INTERVAL EQUALS _____ WORKING DAYS OF CONTRACT TIME

Submitted _____

Contractor _____

By _____ Date _____

Title _____



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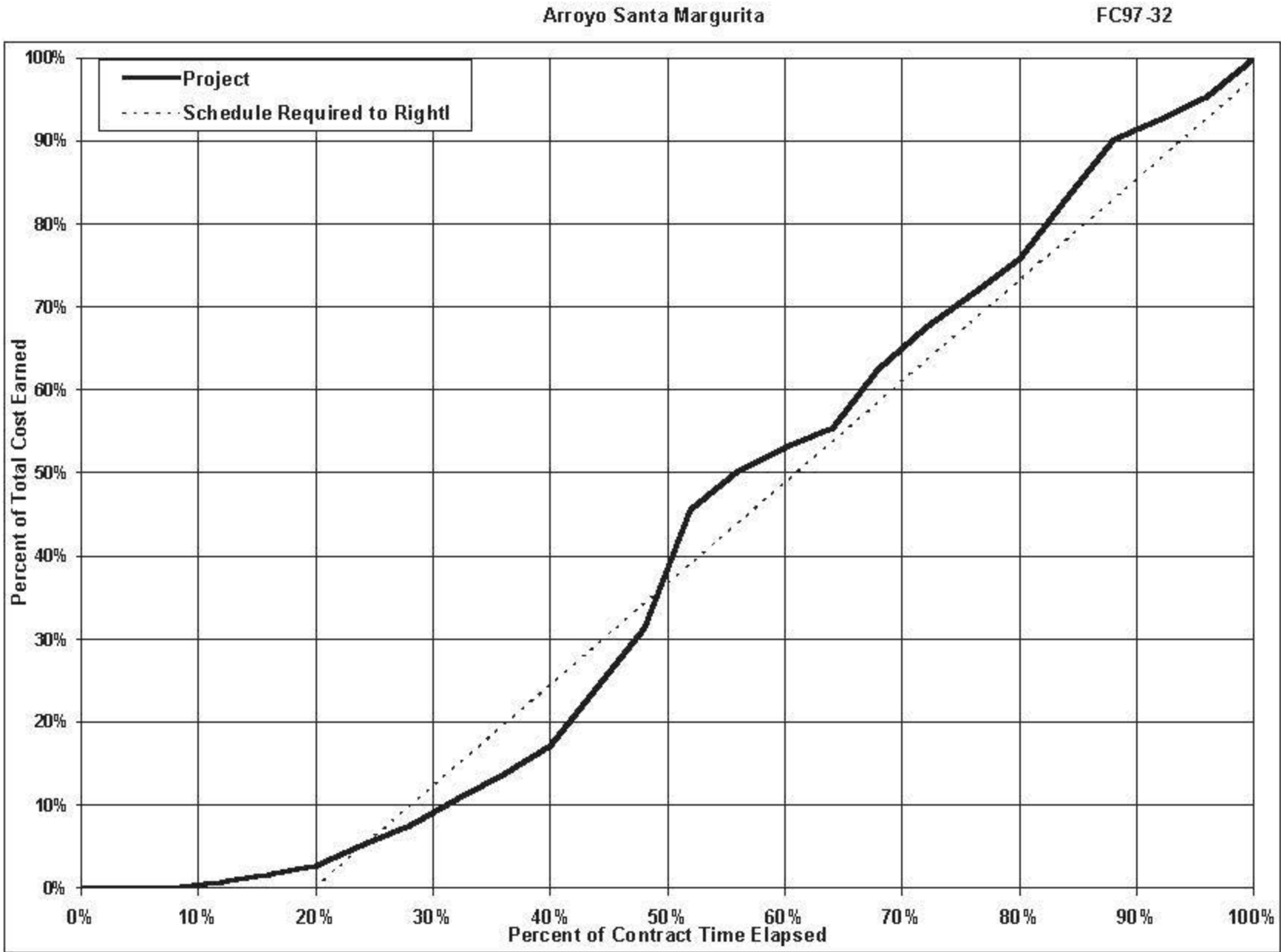
Submitted Dilbert and Company Construction
Contractor

By *Tina Blair*

Title President

5/22/97

Date _____



ESCROW AGREEMENT FOR
SECURITY DEPOSITS IN LIEU OF RETENTION

This Escrow Agreement is made and entered into by and between
("Agency") whose address is _____ and
("Contractor") whose address is _____ and
("Escrow Agent") whose address is _____.

For the consideration hereinafter set forth, the Agency, Contractor and Escrow Agent agree as follows:

- (1) Pursuant to Section 22300 of the Public Contract Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by Agency pursuant to the Construction Contract entered into between the Agency and Contractor for _____ in the amount of dated _____, (hereinafter referred to as the "Contract") which Contract is identified by Spec. No. _____ and Auditor Controller's Contract No. _____. Alternatively, on written request of the Contractor, the Agency shall make payments of the retention earnings directly to the Escrow Agent. When Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the Agency within ten days of the deposit. The market value of the securities at the time of the substitution shall be at least equal to the cash amount then required to be withheld as retention under the terms of the Contract between the Agency and Contractor. Securities shall be held in the name of _____, and shall designate the Contractor as the beneficial owner.
- (2) The Agency shall make progress payments to the Contractor for those funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above.
- (3) When the Agency makes payments of retentions earned directly to Escrow Agent, the Escrow Agent shall hold them for the benefit of the Contractor until such time as the escrow created under this contract is terminated. The Contractor may direct the investment of the payments into securities. All terms and conditions of this agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the Agency pays the Escrow Agent directly.
- (4) Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the escrow account. These expenses and payment terms shall be determined by the Agency, Contractor and Escrow Agent.
- (5) The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the Agency.
- (6) Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from Agency to the Escrow Agent that Agency consents to the withdrawal of the amount sought to be withdrawn by Contractor.
- (7) The Agency shall have a right to draw upon the securities in the event of default by the Contractor. Upon seven days' written notice to the Escrow Agent from the Agency of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by the Agency.
- (8) Upon receipt of written notification from the Agency certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, the Escrow Agent shall release to the Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payments of fees and charges.
- (9) Escrow Agent shall rely on the written notifications from the Agency and the Contractor pursuant to Sections (1) to (8), inclusive, of this Agreement and the Agency and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.

(10) The names of the persons who are authorized to give written notice or to receive written notice on behalf of the Agency and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of Agency:

_____, Director,
Public Works Agency

_____, Director
Central Services Department

_____, Director
Engineering Services Department

Address for all of the above:
Public Works Agency
800 South Victoria Avenue
Ventura, CA 93009

SAMPLE FORM
Form used for escrow will have names and
signatures of persons authorized in accordance
with paragraph 10.

On behalf of Contractor:

Title

Name

Signature

Street Address

City & State

Zip Code

On behalf of Escrow Agent:

Title

Name

Signature

Street Address

City & State

Zip Code

At the time the Escrow Account is opened, the Agency and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

Agency:
(Agency name)

Title

Name

Signature

Contractor:
(Contractor company name)

Title

Name

Signature

EXHIBIT "A"
ESCROW INSTRUCTIONS

The parties to this escrow are _____ ("Agency") and _____ ("Contractor") and _____ ("Escrow Agent"). Agency and Contractor have entered into a contract for the construction of _____ which contract is identified by Spec. No. _____ and Auditor-Controller's Contract No. _____ and was entered into by and between Agency and Contractor ("Construction Contract"). Pursuant to Public Contract Code Section 22300, Contractor may substitute certain securities for an equivalent amount of money required to be withheld from progress payments by Agency to Contractor pursuant to the Construction Contract.

The Escrow Agent is hereby instructed as follows:

1. Contractor may deliver to Escrow Agent:
 - (a) Securities of the types specified in Sections 22300 of the Public Contract Code and Section 16430 of the Government Code.
 - (b) Such other documents as are necessary to enable Escrow Agent to convert such securities into cash.
2. Upon receipt of such securities and other documents, Escrow Agent shall notify Agency within ten days of the deposit, and shall examine them to determine whether they are in a form sufficient to effect conversion of the securities into cash. Escrow Agent shall thereupon send written notice of its determination to Agency.
3. Escrow Agent shall hold such securities as trustee for Agency. The right of Agency to such securities is superior to any other lien or claim of lien; provided, however, that Contractor shall be entitled to any interest earned by such securities prior to their conversion to cash pursuant to section 5 hereof, and further provided that such interest may be withdrawn by Contractor at any time and from time to time without notice to Agency.

Securities may be substituted by Contractor, but any securities substituted for securities previously deposited shall not reduce the current cash value of securities held below that last reported to Agency by Escrow Agent.
4. Escrow Agent shall determine the current cash value of such securities held by it as of the close of business on the first business day following the _____ day of each month and, in addition, on any other days which the Agency may from time to time specify in a written notice to Escrow Agent. Current cash value shall be determined as follows:
 - (a) For securities traded over-the-counter or on a stock exchange:
 - (1) Determine either the current bid price for the securities as of the close of business or the face value of the securities, whichever is less.
 - (2) Subtract the cost of sale (broker commission).
 - (3) Subtract all unpaid escrow fees and costs associated therewith.
 - (b) For certificates of deposit:
 - (1) Determine the face amount.
 - (2) Subtract the potential interest penalty for immediate conversion.
 - (3) Subtract all unpaid escrow fees and costs associated therewith.
 - (c) Determine the value of other securities by procedures calculated to determine net realizable value. Promptly upon making each such determination, Escrow Agent shall notify Agency of the securities held and current cash value of such securities.

5. At any time or times that Agency believes it has a right to do so under the provisions of the Construction Contract, Agency may, without the consent of Contractor, deliver to Escrow Agent a written demand that Escrow Agent convert to cash all or any part of such securities. Upon seven days' written notice from Agency of such demand, Escrow Agent shall convert to cash all or part of such securities as demanded and shall distribute the cash as instructed by the Agency.
6. When the Construction Contract has been satisfactorily completed on the part of Contractor and any stop notices filed against the Construction Contract have been released, Agency shall give written notice to Escrow Agent that such securities may be returned to Contractor. Upon receipt of such written notice and payment of all escrow fees and costs, the Escrow Agent shall deliver to Contractor all money, interest, securities and other documents remaining in escrow and the escrow shall terminate.
7. Contractor, and not Agency, shall be liable to Escrow Agent for all of Escrow Agent's fees and costs associated with this escrow.
8. The Director of the Ventura County Public Works Agency, a Department Director of said Agency, or other person authorized in writing by such Director or Department Director is authorized to give written notice and to make written demands on behalf of Agency pursuant to sections 4, 5 and 6 hereof.
9. All written notices and demands pursuant to the escrow agreement and these Instructions shall be addressed as follows:
 - (a) To Agency:

Director, Ventura County Public Works Agency
800 South Victoria Avenue
Ventura, California 93009
 - (b) To Contractor:
 - (c) To Escrow Agent:

DATED: _____

By _____	By _____	By _____
Title _____	Title _____	Title _____

AGENCY

CONTRACTOR

ESCROW AGENT
 Bank Charter: State ☐
 Federal ☐
 Escrow Agent's Address:

RELEASE ON CONTRACT

CONTRACT NAME: _____

SPEC. NO. _____, PROJECT NO. _____

WHEREAS, by the terms of the contract dated _____, 20____ entered into by

_____ and the undersigned CONTRACTOR,

undersigned CONTRACTOR agreed to perform certain work for the compensation specified in said contract; and

WHEREAS, the CONTRACTOR represents that said work is fully completed and that final payment is due to the CONTRACTOR under terms of said contract,

NOW, THEREFORE, in consideration of the promises and the payment by [AGENCY NAME] to the CONTRACTOR of the amount due under the contract, to wit, the sum of \$_____ and the additional consideration of \$1.00, receipt of which is hereby acknowledged by the CONTRACTOR, the CONTRACTOR hereby releases and forever discharges _____ of and from all manner of debts, dues, demands, sum or sums of money, accounts, claims and causes of action, in law and in equity, under or by virtue of said contract except the claim against the Agency for the remainder, if any, of the amounts retained as provided in 9-3.2, any amounts retained as required by Stop Notices or Labor Code Provisions, and any unsettled claims or disputes as follows: (If none, leave blank)

Description of Claim or Dispute	Amount	Date of Claim	Date of Notice of Potential Claim
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The CONTRACTOR certifies that each unsettled claim or dispute listed hereon has been processed in compliance with the requirements for making claims under the contract, including giving notice pursuant to the applicable provisions of the contract, and following the procedures for resolution of disputes or claims set forth in subsection 6-12 of the contract. Acceptance of this Release on Contract by the [Agency Name] shall not be deemed as a waiver or release of its right to contest either the substantive or procedural validity of any listed unsettled claims or disputes.

IN WITNESS WHEREOF, the hand and seal of the CONTRACTOR have been
hereunto set this ____ day of _____, 20____.

THIS FORM MUST BE ACCOMPANIED
by a proper acknowledgement form
(See Civil Code Section 1189)

Contractor

By

Title

**SURETY BONDS
PERFORMANCE BOND**

Whereas, the «Agency», hereinafter called "Agency", and «Contr», hereinafter called "principal", have entered into a contract dated «ContrDate» whereby principal agrees to complete certain designated work identified as project «ProjName» (Spec. No. «SpecNo»), and to perform other duties and obligations as described in said contract, which is incorporated herein by this reference and made a part hereof; and Whereas, principal is required under the terms of said contract to furnish a bond to guarantee principal's faithful performance of the work and all terms and conditions of the contract;

Now, therefore, we the principal and the undersigned, as corporate surety, are held and firmly bound unto Agency in the penal sum of «CostText» (\$«OrigCostFmtd») lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, successors, executors and administrators, jointly and severally, firmly by these presents.

The condition of this obligation is such that if the principal, its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions, and provisions in the said contract and any alteration thereof made as therein provided, 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 and save harmless Agency, its officers, agents and employees, as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

The above obligation shall continue after Agency's acceptance of the work for the duration of the warranty period as specified in the contract during which time if principal fails to make full, complete, and satisfactory repair or replacement to the work and/or fails to protect Agency from loss or damage resulting from or caused by defective materials or faulty workmanship, the obligation of surety hereunder shall continue so long as any obligation of principal remains.

PAYMENT BOND

And, whereas, under the terms of said contract, principal is required before entering upon the performance of the work, to file a good and sufficient payment bond with the Agency to secure the claims to which reference is made in Title 3 (commencing with Section 9000) of Part 6 of Division 4 of the Civil Code of the State of California.

Now, therefore, said principal and the undersigned, as corporate surety, are held firmly bound unto the Agency and all contractors, subcontractors, laborers, material suppliers and other persons employed in the performance of the aforesaid contract and referred to in the aforesaid Civil Code in the like sum of «CostText» dollars (\$«OrigCostFmtd») for materials furnished or labor thereon of any kind, or for amounts due under the Unemployment Insurance Act with respect to such work or labor, or for any amounts required to be deducted, withheld and paid over to the Franchise Tax Board from the wages of employees of the contractor and the contractor's subcontractors, that said surety will pay the same in an amount not exceeding the amount hereinabove set forth, and also in case suit is brought upon this bond, will pay, in addition to the face amount thereof, costs and reasonable expenses and fees including reasonable attorney's fees incurred in successfully enforcing such obligation, to be awarded and fixed by the court, and to be taxed as costs and to be included in the judgment therein rendered.

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 Title 3 (commencing with Section 9000) of Part 6 of Division 4 of the Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should this 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.

GENERAL TERMS

The surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of said contract or the plans and specifications accompanying the same shall in any manner affect its obligations on these bonds, and it does hereby waive notice of any such change, extension, alteration or addition.

Nothing herein shall limit the Agency's rights or surety's obligations under the contract or applicable law, including, without limitation, California Code of Civil Procedure section 337.15.

In witness whereof, this instrument has been duly executed by the principal and surety above named

on _____, 20____.

«Contr»
Name of Principal

By _____

Title _____

Name of Surety

By _____

Attorney-in-Fact

Address _____

City _____

State _____ Zip _____

INDICATE COMPLETE ADDRESS OF SURETY TO WHICH
CORRESPONDENCE CONCERNING THIS BOND SHOULD BE
DIRECTED.

Telephone No. _____

SAMPLE BOND FORM

Agency will prepare the Bond in this format and transmit it to the Contractor along with the Contract and the Notice of Award letter.

Surety shall fill in the Bond No., date identification and signature of surety in places provided.

Contractor shall sign and indicate title in place provided.

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SECTION 01 00 01
GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL

- A. The following items, reference, supplement, modify, change, delete from, or add to the Ventura County Standard Specifications (VCSS), Part 1 - General Provisions, Sections 1 through 10. Where any portion of the General Provisions is modified, or any paragraph, subparagraph or clause thereof is modified or deleted, unaltered provisions remain in effect.
1. Reference VCSS 1-2 Definitions. Comply with additional requirements of Section 01 42 16.
 2. Abbreviations to paragraph VCSS 1-3.1. Refer to Section 01 42 13 for additional abbreviations.
 3. Reference VCSS 2-5.3 Submittals. Comply with additional requirements of Section 01 33 01.
 4. Reference VCSS 2-5.4 Record Drawings. Comply with the additional requirements of Section 01 78 39.
 5. Reference VCSS 4-1.2 Protection of Work and Materials. Comply with additional requirements of Section 01 65 01.
 6. Reference VCSS 4-1.6 Trade Names or Equals. Comply with additional requirements of Section 01 25 01 for methods of requesting approval for "or equal" materials or methods.
 7. Add the following paragraph to VCSS 4-1.6.1 "When one or more than one manufacturer is listed as acceptable in a specification section, the first manufacturer and/or product listed is the basis for development of the Contract Documents, and establishes the required minimum standard of quality. This is also the basis for the indicated size and dimensions of the product and/or equipment. If manufacturer and/or product other than first listed is used, then Contractor shall bear all costs of redesign and changes in construction necessary to adapt the offered equipment or product to the Work."
 8. Reference VCSS 6-8.6 Written Guarantee. Comply with additional requirements of Section 01 78 36.
 9. Reference VCSS 6-13.1 Working Hour Limitations. Comply with additional requirements of Section 01 11 01.
 10. Reference VCSS 7.5.3.2 Contractor Furnished Permits. Deferred approvals noted on Sheet T-0.00 of the drawings require the Contractor's preparation of plans and calculations to obtain approval of permits from HCAI in addition to the basic permits arranged for by the Agency as provided in VCSS 7-5.3.1. Contractor shall take action in a timely manner to obtain such approvals or permits so as not to delay completion of the Work beyond the time provided in VCSS Sections 6-7. Contractor shall include all costs and consider the time

required to obtain approvals or permits in the Contract price bid. Documents prepared for HCAI review by the Contractor or subcontractor shall comply with the HCAI requirements. Refer to "Guide to Working with HCAI" found at: <https://hcai.ca.gov/wp-content/uploads/2020/10/Guide-Working-on-Projects-OSHDPD-Jurisdiction-Tips-from-Experts.pdf>

11. Reference VCSS 7-8.1 Cleanup and Dust Control. Comply with the additional provisions of Section 01 74 01.
12. Reference VCSS 7-8.4 Sanitation. Comply with additional requirements of Section 01 51 01, Paragraph 1.04.
13. Reference VCSS 7-8.5 Temporary Light, Power and Water. Comply with additional requirements of Section 01 51 01, Paragraphs 1.01, 1.02, and 1.03.

1.02 CONFERENCE

- A. Pre-Bidding Conference. A non-mandatory pre-bidding conference will be held at 300 Hillmont Avenue Ventura, CA 93003 July 26, 2023 at 1:00pm. Meet at the main hospital entrance outside the lobby. None of the information transmitted at this meeting will be construed in any way to modify the plans and specifications. Any modification will be forwarded to all plan holders as an addendum.
- B. Pre-Construction Conference. The AGENCY will schedule a pre-construction conference after Notice of Award.

1.03 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality as indicated in Section 01 80 01.

1.04 REFERENCES

- A. Conform to reference standard by date of issue current as of date of Contract Documents.

1.05 BARRIERS AND FENCING

- A. Construct and maintain barricades for the following: As required by local authorities and State safety ordinances; as required to protect the Agency's property from injury or loss; as required for the protection of the public; and as required as indicated on the drawings.

1.06 CUTTING AND PATCHING

- A. The Contractor shall perform cutting and patching per the provisions of Section 01 73 29.

1.07 PROJECT MEETINGS

- A. Project meetings shall be held as stipulated in Section 01 31 19.

1.08 TESTS AND INSPECTIONS

- A. Tests and inspections shall be performed per the provisions of Section 01 43 00.

1.09 DELIVERY, HANDLING AND STORAGE

- A. Comply with the provisions of Section 01 64 00.

1.10 SYSTEM DEMONSTRATIONS AND INSTRUCTION

- A. Comply with the provisions of Section 01 79 00.

1.11 CLEANING

- A. The project shall be cleaned per the provisions of Section 01 74 00. this is in addition to that which is mentioned in VCSS Section 7-8.1 of the General Provisions.

1.12 OPERATION AND MAINTENANCE

- A. Furnish operation and maintenance data per Section 01 78 23.

1.13 SPARE PARTS AND MAINTENANCE MANUALS

- A. Provide spare parts and maintenance materials per the provisions of Section 01 78 23.

1.14 SUMMARY OF PROJECT

- A. The Project Work, sequencing, and other provisions will be as indicated in Sections 01 10 00 and 01 12 16.

1.15 HEALTH CARE AGENCY CONTRACTORS' HANDBOOK & INSTRUCTIONAL VIDEO

- A. The contractor shall comply with the Health Care Agency Contractor's Handbook and video. This handbook establishes the Owner's criteria for working within and around an operating health care facility. This handbook and video is made a part of the specifications by reference and is available for review from the Agency.

1.16 PROJECT SUPERINTENDENT / PROJECT MANAGER

- A. The Contractor shall provide a full-time project superintendent on the job site each working day between the contract start date specified in the contract proposal and the acknowledgement of completion of Work specified in VCSS Section 6-8. The project superintendent shall have a minimum of 5 years' experience in supervising OSHPD/HCAI projects of similar complexity. The Contractor shall also employ a project manager, who is responsible for the supervision of the project superintendent, who also has a minimum of 5 years' experience in managing construction of OSHPD/HCAI projects of similar complexity and size to the Work. For each day work is performed at the site between the start date specified in the contract proposal and the acknowledgement of completion of Work specified in VCSS Section 6-8 for which the above required project superintendent is not at the job site, or each working day the above project manager assigned to this project is not employed by the

Contractor, the Contractor will be assessed a penalty of \$1,170.00 per day. The project manager can temporarily act in the capacity of the project superintendent in the event of temporary illness, vacation, or emergency to the project superintendent. Alternatively, in the event of illness, vacation, etc., a superintendent may be substituted per the provisions of Section B, below. These liquidated damages are in addition to those specified elsewhere.

- B. The identity and qualifications, and references of the project superintendent and project manager shall be submitted to the Agency by the Contractor. Contractor shall reference the OSHPD/HCAI Project Number(s) and Project Title(s) substantiating the listed qualifications in subsection A. There shall be no substitution for the project superintendent or project manager identified by the Contractor without prior written approval of such substitution by the AGENCY. Any subsequent project superintendent or project manager shall have the minimum qualifications set forth above.

1.17 LABOR COMPLIANCE SOFTWARE

- A. The County of Ventura has implemented, and maintains, a labor compliance software service program called "LCP Tracker".
- B. Contractors and subcontractors shall keep accurate payroll records in accordance with Labor Code Section 1776 and shall furnish weekly certified payrolls for their workers and shall input their certified payroll records electronically using LCP Tracker within 7 days following the end of the preceding week.

NOTE: This requirement is in addition to the State of California requirement to upload payrolls into the State DIR electronic system. However, LCP Tracker has the functionality to upload the submitted payrolls directly to the State DIR electronic system.

- C. In bidding on the project, it shall be bidder's responsibility to evaluate the cost of complying with the above-referenced LCP Tracker requirements.
- D. Agency will provide materials and information to assist the Contractor with using LCP Tracker.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 10 00
SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Description of construction delivered under a single contract.

1.02 PROJECT INFORMATION

- A. Project Name: Ventura County Medical Center North Tower MRI
- B. Project Address: 300 Hillmont Avenue
Ventura, CA 93003
- C. Owner: County of Ventura
- D. Architect of Record: SWA Architects

1.03 PROJECT DESCRIPTION

- A. The Project Includes: Renovation of an existing shell space to provide a new MRI exam room, control room and supporting equipment room. Construction includes new walls, RF Shielding, MEP for equipment in all rooms, and new interior finishes.
- B. Type of Contract: The project is constructed under a single prime contract.

1.04 PHASING AND SEQUENCING

- A. General phasing and sequencing is the responsibility of the Contractor. Refer to Section 01 12 16 Project Phasing for additional requirements.
- B. Phasing and sequencing of the work shall be done in a manner to accommodate use of the facilities by the patients and staff during construction. Contractor shall plan for in their daily schedule the potential re-sequencing of work to accommodate the needs of the facility. Should the needs of the staff and/or patients require that the contractor stop work in a specific area, the Contractor shall stop work in that area, and move to another location to continue work that does not interfere with the facilities' operations. This re-sequencing shall be at no additional cost, or additional time, to the contract unless the Contractor can demonstrate that the area of work that is being impacted is on the critical path.

1.05 SPECIFICATION FORMAT AND CONVENTIONS

- A. Format: Specifications are organized into Divisions and Sections in conformance with the Construction Specifications Institute's 49-division *MasterFormat*TM numbering system.

- B. Titling and Arrangements: The order of articles, paragraphs, and subparagraphs within the text of any given specification section is defined by a sequence of indentations.
1. Article, paragraph, and subparagraph titles, and other identifications of subject matter in the specification sections are intended as aid in locating and recognizing various requirements in the beginning words of a sentence.
 2. Where the title establishes the subject, the titles are subordinate to and do not define, limit, or otherwise restrict the specification text.
 3. Specification text governs over titling and is interpreted as a whole.
- C. Interpretation:
1. Various subdivision captions and headings are intended only as a matter of reference and convenience, and in no way define, limit, or prescribe the scope or intent of the Contract Documents, or any subdivision thereof.
 2. Underlining, bolding or capitalizing of words in the text does not signify or mean such words convey special or unusual meaning.
- D. Specification Content: The specifications may use certain conventions for the style of language and intended meaning of certain terms, words, and phrases when used in particular applications.
1. Imperative mood and streamlined language are sometimes used in these Specifications. The words "must," "must be," or "must conform to," may be implied where a colon (:) is used within a sentence or phrase, depending on the context.
 2. Specification requirements are performed by the Contractor, unless specifically indicated otherwise.
 3. Whenever the context requires,
 - a. Words and meanings are interpreted as appropriate;
 - b. Words implied, but not stated, may be inferred;
 - c. The use of the singular number is deemed to include the plural and the plural includes the singular;
 - d. The neuter gender includes both the feminine and masculine genders;
 - e. The masculine gender includes both the feminine and neuter genders; and
 - f. The feminine gender includes both the masculine and neuter genders.
- E. Related Documents: Ventura County Standard Specification (VCSS), Drawings, and General Provisions of the Contract for Construction, including Division 00 General Conditions and Supplementary Conditions and other Division 01 General Requirements Specification Sections, apply to all subsequent technical specification sections in Divisions 02 through 49.
- F. Drawing Coordination: Requirements for materials and products indicated on the Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
 3. Keynoting: Materials and products are identified by keynotes referencing items found in this project manual.
- G. Base CAD Files: Shall be provided by request if available from the designers. Allow 48-hours for response of availability.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 12 16
PHASING AND SEQUENCING

PART 1 – GENERAL

1.1 SUMMARY

- A. The AGENCY has provided sequence and phasing recommendations herein, however, it is the Contractor's responsibility to provide a Sequencing Plan showing the order of how the work will be completed as one Contract, along with the Project Schedule as required by the specifications. Refer to the project scope of each permit for additional information.
- B. Prior to Notice to Proceed, the Contractor shall prepare and submit a construction phasing and sequencing plan for approval by the AGENCY which minimizes the impacts of construction on normal operations in accordance with this Section and the Phasing Plans or an approved alternative plan. The Construction Phasing and Sequencing Plan shall be updated as required during the course of the Work. Updates and revisions must be submitted for approval by the AGENCY. Refer to Division 01 14 01 Instruction to Contractors Working at VCMC for additional Infection Control and facility requirements.

1.2 REQUIREMENTS INCLUDED

- A. Summary of Work
- B. Life Safety Plans
- C. Safety and Staging Plan
- D. Phasing Plans

1.3 COMPLIANCE REQUIREMENTS

- A. The scheduling requirements of the contract may include proposed alternatives to the phasing included herein, which shall be prominently indicated as deviations. Such deviations do not alter the phasing requirements except as specifically approved. Criteria for acceptance include no increase to disruptions to operations and no extension to the opening dates of the project elements.
- B. Performance criteria for review and acceptance is defined in Section 1.4 below.
- C. The various portions of the work shall be operational prior to performing work which disrupts the operations.

1.4 CONSTRUCTION PHASING PERFORMANCE CRITERIA

- A. Safety
 - 1. Contractor must maintain a safe environment for Occupants and Visitors to work around. Clear and protected access and egress routes shall be maintained around construction areas and activities for people, equipment and vehicles. Provide professionally prepared temporary signage to direct people and traffic along routes not used under normal conditions.

2. Provide temporary barriers, barricades and walls as necessary to separate construction areas and activities from Occupants and Visitors.

B. Health

1. Contractor must maintain a healthy environment for Occupants and Visitors at all times.
2. Protect the occupied areas of the facility from dust, fumes, and other airborne pollutants. Provide separation walls between construction I renovation areas and occupied areas to protect the occupants. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MEREV) of (8) eight shall be used at each return air grille. Replace the filters as needed and at the conclusion of the project.
3. Protect Occupants and Visitors from excessive or harmful noise exposure.
4. Maintain occupant access and use of egress and elevators at all times.
5. Maintain all utility services during the utility relocation or new service work. Maintain utility services throughout the project. If a brief service interruption is required to accomplish the Work, the AGENCY must be notified in advance. A coordination meeting must be held with the AGENCY to review service interruption procedures prior to the service interruption.

C. Comfort

1. Provide reasonably finished spaces for use by Occupants and Visitors during the progress of the Work. Temporary construction separation walls shall be paint finished or equivalent on public sides.
2. The HVAC system improvements shall be implemented such that the occupied spaces of the building maintain comfort conditions for its occupants. The comfort conditions must be maintained during normal business hours of 7:30AM through 5:30PM. The temperature requirements are 72 to 77 degrees F.

D. Convenience

1. Maintain Occupants and Visitors access to building amenities, such as vending, seating and restroom facilities.
2. Protect the User's existing equipment during construction activities to prevent damage or contamination due to the progress of the Work.
3. Daily clean-up activities must be included in the Phasing and Sequencing Plan for Work in occupied areas performed outside normal business hours.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 12 18
ELEVATOR COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. The project is located in the basement of the hospital. Contractor shall use the loading dock elevators.

1.2 REQUIREMENTS INCLUDED

- A. Summary of Work

1.3 COMPLIANCE REQUIREMENTS

- A. The contractor is to use only (1) One elevator at a time. The (2) two elevators do not have the capability to recall a specific elevator to a specific location. (1) One elevator shall remain available for visitors and staff to use at all times.
- C. The Contractor shall install cleanable floor and wall protection in the two elevators.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

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SECTION 01 12 20
FIRE WATCH

PART 1 – GENERAL

1.1 SUMMARY

- A. Fire Watch may be required by HCAI when fire barriers are compromised during construction.
- B. It is the Contractor's responsibility to provide fire watch whenever it is required.
- C. Fire watch is generally defined as, "The assignment of a qualified person or persons having the sole responsibility for the continuous patrol of a building or premises for the purpose of detecting fires and transmitting an immediate alarm to the building occupants and fire department."

1.2 REQUIREMENTS INCLUDED

- A. HCAI/OSHPD Policy Intent Notice: 14

1.3 COMPLIANCE REQUIREMENTS

- A. Where a required fire protection system is placed out-of-order or rendered inoperable, HCAI and the fire department shall be notified, and an approved fire watch shall be provided for all occupants left unprotected by the shutdown until the fire protection system has been returned to service and termination of the fire watch is approved by HCAI.
- B. Where fire barriers and smoke compartments are breached, HCAI and/or the fire department shall be notified, and an approved fire watch shall be provided for all occupants left unprotected by the breach until the scope of work has been complete and termination of the fire watch is approved by HCAI.
- C. A fire watch shall be provided in accordance with the California Fire Code during hot work activities and shall continue for a minimum of (30) thirty minutes after the conclusion of the work.
- D. The Contractor shall assign a Fire Prevention Superintendent who will be responsible for the Fire Prevention Program and ensure it is carried out through the completion of the project. The Fire Prevention Program Superintendent shall assign personnel to the fire watch, as required, and shall instruct fire watch personnel to:
 - 1. The procedure notifying the Fire Department
 - 2. The area to be patrolled
 - 3. A method of alerting building occupants and an evacuation procedure
 - 4. Receive the training necessary to ensure Fire Watch personnel are capable of reactivating disabled systems, when required.
 - 5. Any special instructions required by HCAI and the local Fire Code Official.

- E. The Fire Prevention Program Superintendent shall provide a logbook which contains a directory of names, telephone numbers and other pertinent information to assist in making emergency calls. The logbook shall be the official document used to record a history of patrol rounds.
- F. The logbook shall be maintained on the premises and be available for inspection by the AHJ, HCAI, local Fire Code Official or State Marshall.

1.4 FIRE WATCH GUIDELINE

- A. Fire watch personnel shall complete the HCAI "FIRE WATCH GUIDELINE" and return to HCAI. The document is available at: <https://hcai.ca.gov/wp-content/uploads/2020/10/Pin-14-Fire-Watch.pdf>
- B. Fire Watch personnel shall be thoroughly familiar with the area they are patrolling.
- C. Fire Watch personnel shall perform patrol operations according to instructions from HCAI and the local Fire Code Official.
- D. Fire Watch personnel shall patrol their designated area at least once each hour.
- E. Fire Watch personnel shall make reports as instructed. A written record of patrol rounds and any significant information shall be recorded in a logbook provided by Fire Prevention Program Superintendent.
- F. Fire Watch personnel shall relay any special orders or pertinent information to relief personnel and the Fire Prevention Program Superintendent.
- G. Fire Watch personnel shall remain on duty until properly relieved.
- H. The entire building, all rooms (offices, spaces, areas) including basements, penthouses, shall be checked per Item C above unless otherwise specified by HCAI.
- I. A hot work fire watch shall be provided during hot work activities and for not less than 30 minutes after the conclusion of the work.
- J. A hot work fire watch shall include the entire hot work area and shall include additional personnel where vertical or horizontal exposures are involved.
- K. The hot work fire watch shall have fire-extinguishing equipment readily available and shall be trained in the use of such equipment and shall be responsible for extinguishing spot fires and communicating an alarm.

END OF SECTION

SECTION 01 13 13
DELEGATED DESIGN & DEFERRED APPROVAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

Administrative and Procedural Requirements for:

1. Portions of the work, the design of which is delegated to the Contractor, including engineering services.
2. Additional delegated design requirements specific to a particular work result are specified within the appropriate Specification Section.

Section Excludes:

3. Requirements for Pre-Engineered Systems and Assemblies
4. Tested Systems and Assemblies Pre-Approved by the AHJ

5. REFERENCES

Definitions:

1. Delegated: Allocated from the AGENCY to the Contractor.
2. Design: The complete planning, arrangement, and coordination of a discrete portion of the work, along with its graphic and written communication, including determination and engineering of the work's organization and structure in response to structural requirements, aesthetic requirements, functional requirements, dimensional and geometric limits; and the arrangement, performance, and other criteria indicated in the Contract Documents.
3. Delegated Design: The determination of which professional or party to a construction project carries the ultimate responsibility for the design of a discrete portion of the work. Other terms, including "design delegation", "design-build", and similar terms are synonymous with "delegated design".
4. Category I Delegated Design: Delegated design services specifically required by the Contract Documents that relate to systems, materials, and equipment.
 - a. The Contractor shall design that particular portion of the work as required by the Contract Documents, provided the AGENCY specifies the minimum performance and design criteria that the Contractor must meet.
 - b. An example of Category I Delegated Design is the design of a cold-formed steel metal framing system, where the contractor is charged with meeting certain specified loading criteria.

5. Category II Delegated Design: Delegated design services that relate to the Contractor's means, methods, techniques and procedures of construction.
 - a. This category does not involve design services for the finished work, but instead the Contractor shall design services necessary to facilitate the construction process.
 - b. An example of Category II Delegated Design is the design of temporary shoring systems.
6. Engineering Services: Services performed by a qualified licensed professional engineer for the design of a discrete portion of the work, including fabrication, and installation of systems, assemblies, and components similar in material, design, complexity and extent to that indicated for this project.
7. HCAI: Department of Health Care Access and Information (Formally known as OSHPD)]
8. Deferred Approval: Portion of the work that is not fully developed and detailed with the approved Contract Documents, typically because information is unavailable at the time for a complete design.
 - a. Such portions of the work are fully developed by the Contractor and submitted to HCAI for review and approval at a later date than the original Contract Documents submittal.
 - b. Work may not begin on the deferred portions of the work before HCAI's review and approval of the Contractor's deferred approval packages.
9. Deferred Approval Packages: Contractor-assembled documents required by HCAI for deferred approvals.

1.02 ADMINISTRATIVE REQUIREMENTS

Portions of the Contract Documents may delegate the design of certain items to the Contractor or may otherwise specify "delegated design requirements" and similar terms.

Coordination: The Contractor shall schedule and coordinate delegated design requirements and deferred approval items, including design, engineering, approvals, testing and inspections, installation, and final HCAI approval.

The Contractor is professionally liable for delegated design work, including design, engineering, fabrication, installation, and conformance to all specified performance requirements.

Drawings of delegated design portions of the work are diagrammatic; they do not identify or imply solutions to engineering issues, and are intended only to show the following:

1. The design intent of finished materials, profiles, shapes and forms;
2. Relationships and alignments between items;
3. Location, identification, dimension, and size of components, assemblies, accessories, and other items; and
4. Schematic attachment details and diagrams of fasteners and connections.

Specifications for delegated design portions of the work are the performance type and establish the minimum allowable criteria for Contractor-selected and -designed materials, fabrications, products, systems, assemblies, methods of execution; and minimum performance requirements for indicated portions of the work.

The AGENCY reviews and determines if the Contractor's designs

5. Generally conform to the overall project design;
6. Conform to the specified performance requirements, including subsequent modifications; and
7. Are acceptably integrated into the overall design of the project.

In the event of a dispute regarding Contractor-proposed delegated design solutions and the design intent of the Contract Documents, the AGENCY's interpretation is final.

Design Requirements: The Contractor shall design deferred approval portions of the work, including

1. The complete planning, arrangement, and coordination of deferred approval item;
2. Determining and engineering the organization and structure of each deferred approval item in response to the structural requirements, aesthetic requirements, functional requirements, and dimensional, geometric and other limitations indicated in the Contract Documents;
3. The arrangement, performance, and other criteria indicated in the Contract Documents;
4. The graphic and written communication of deferred approval items, including Drawings and Specifications;
5. Paying related fees and other costs;
6. Either performing or causing testing and inspections;
7. Installation, review, and approval, including securing final HCAI approvals and turning deferred approval documentation over to the Owner.

Pre-Approval Meeting: Conduct a pre-deferred-approval process meeting to review the Contractor's deferred approval items, including the Contractor's responsibilities and action plan for achieving deferred approval with AGENCY. \

Sequencing: Approved submittals must be included with all deferred approval packages. Included submittals must be completely reviewed, corrected, and approved by the AGENCY with the notation "APPROVED - NO EXCEPTIONS TAKEN". The AGENCY's action designated "APPROVED AS NOTED" is not permitted for deferred approval submittals.

1.03 PROCEDURAL REQUIREMENTS

Design Requirements: Proposed delegated design solutions must demonstrate conformance to the original design intent indicated in the Contract Documents, as determined by the Architect.

1. Unless otherwise defined by the Contract Documents, the appearance of exposed elements, including member sizes, profiles, and alignment of components must be
 - a. Within the dimensional limits and section profiles indicated;
 - b. Consistent throughout the project.
2. Deviation from the profiles, layouts, dimensional sizes, locations, or arrangements indicated is not permitted without prior written consent from the Architect; nor may the Contractor add or assume it may add items not indicated on the Contract Documents, including additional exposed supports, without prior written consent from the AGENCY.
3. The Contractor may not infer or deduce solutions to design or engineering issues directly from the Contract Documents; Contractor-proposed delegated design solutions that exactly follow the details indicated on the Drawings do not relieve the Contractor from liability for the design and performance of any delegated design portion of the work.

Engineering Requirements: Engineer delegated design portions of the work to

4. meet or exceed the specified performance criteria;
5. conform to the profiles indicated and to other requirements of the Contract Documents;
6. satisfy the requirements of the AHJ; and
7. provide structurally sound, leak-proof, non-corroding, and weather tight assemblies, as applicable, that accommodate, resist, distribute, or transfer, as applicable, the minimum specified in-service loads, and thermal, seismic, and wind sway, or other types of movement, without incipient or catastrophic failure.

Regulatory Requirements: Delegated design portions of the work must be designed and engineered in conformance with the applicable portions of the California Building Code and other requirements of the AHJ.

1.04 SUBMITTALS

General: Coordinate and process submittals for delegated design portions of the work in same manner as submittals for other portions of the work.

Informational Submittals:

1. Design Data: Submit engineering calculations demonstrating conformance to the requirements of the Contract Documents and the AHJ.
 - a. Calculations must be legible and incorporate sufficient cross-references to shop drawings to make calculations readily understandable and reviewable.
 - b. At a minimum, structural calculations must contain at least
 - 1) An analysis of framing members;
 - 2) Section property computations for framing members;
 - 3) An analysis of anchors, including anchors embedded in concrete; and
 - 4) The signature and seal of the qualified California-licensed professional Structural Engineer responsible for their preparation.
 - c. Test reports are not an acceptable substitute for calculations.

1.05 QUALITY ASSURANCE

Professional Engineer Qualifications: Must be legally qualified to practice in California with at least (10) ten consecutive years' experience providing engineering services on a weekly basis for projects similar in material, design, complexity, and extent to this project, and whose products have resulted in applications with a record of successful in-service performance.

PART 2 - PRODUCTS

2.01 MATERIALS

Provide materials, fabrications, products, components, accessories, and other items required or necessary for a complete design, whether or not such items are indicated on the Drawings or in the Specifications.

Provide anchors, attachments, inserts, fasteners, clips, bracing, framework, and other items as required or necessary to meet specified design and performance requirements; and to securely

attach or fasten delegated design portions of the work to adjacent supports, or to related adjoining work, whether or not such items are indicated on the Drawings or in the Specifications.

PART 3 - EXECUTION

3.01 DESIGN

General: Unless otherwise indicated or specified, maintain the visual concept shown, and conform to the design intent and all performance requirements indicated on the Drawings and in the Specifications, as determined by the Architect.

1. In the interest of certain fabrication or erection methods, minor dimensional changes and detailing adjustments to the original design communicated in the Contract Documents may become necessary.
2. Obtain written approval from the Architect for proposed changes and adjustments before procurement, fabrication, manufacture, assembly, or installation, as applicable.

Structural Design: Engage a qualified licensed professional structural engineer to design supports and connection details; and to determine fastener materials, types, sizes, and locations.

3. Fasteners or connections may neither conflict with, nor require revision to the finish profiles indicated; or to the supporting work.
4. Connections may not impose eccentric loading, nor induce twisting or warping to supporting structures.
5. Connections must be designed to accommodate potential and actual misalignment of adjacent work within normal, ordinary, and customary construction tolerances, and the tolerances specified in other Sections, whichever is more stringent.

Mechanical Design: Engage a qualified licensed professional mechanical engineer to design fire sprinkler systems, unless another type of engineer is required by the AGENCY or the AHJ.

Electrical Design: Engage a qualified licensed professional electrical engineer to design fire alarm systems, unless another type of engineer is required by the AGENCY or the AHJ.

Earthwork Design: Engage a qualified licensed professional civil engineer to design soil retaining and other earthwork systems, unless another type of engineer is required by the AGENCY or the AHJ.

3.02 CATEGORY I DELEGATED DESIGN SCHEDULE

Facility Construction Subgroup:

Facility Services Subgroup:

3.03 CATEGORY II DELEGATED DESIGN SCHEDULE

Facility Construction Subgroup:

END OF SECTION

SECTION 01 14 01
INSTRUCTIONS TO CONTRACTORS WORKING
AT VENTURA COUNTY MEDICAL CENTER

PART 1 - GENERAL

1.01 SUMMARY

- A. Prior to the start of a project, the Contractor must obtain approval from the AGENCY's Representative for any and all necessary arrangements for routing of workers, equipment, and material to the job location and procedures in clean and sterile areas. In addition, the Contractor shall become familiar with applicable Medical Center policies and procedures and comply with the following for the duration of the Project. The Contractor shall designate a person responsible for assuring the implementation of measures needed for environmental control and mitigation.
- B. Related Sections include the following:
 - 1. Ventura County Standard Specifications, Part 1 - General Provisions
 - 2. Section 01 00 01 General Requirements
- C. References
 - 1. Facilities Guidelines Institute (FIG), *Guidelines for Design and Construction of Health Care Facilities*, Includes ANSI/ASHRAE/ASHE Standard 170-2008, Ventilation of Health Care Facilities, Current Edition
 - 2. Association for Professionals in Infection Control and Epidemiology, Inc. (APIC), Washington, D.C.
 - 3. California Code of Regulations, Title 17, Public Health.
 - 4. Joint Commission on Accreditation of Healthcare Organizations (JCAHO), *Comprehensive Accreditation Manual for Hospitals*, latest edition, JCAHO, Oak Brook Terrace, IL, 60181.
 - 5. U.S. Department of Health and Human Services, Centers for Disease Control, *Guidelines for Environmental Infection Control in Health-Care Facilities*, Centers for Disease Control, Atlanta, GA, Current Edition
 - 6. AGENCY, *Facility Construction, Renovation and Maintenance: Infection Control Risk Assessment*, Current Edition.
 - 7. URS Report: *Environmental & Infection Control Study*, Current Edition.
 - 8. California Code of Regulations; Title 16; Division 17.
 - 9. Guide to Working with HCAI: <https://hcai.ca.gov/construction-finance/resources/training-education/>

1.02 SUBMITTALS

- A. Medical Safety and Infection Control Program: Within (15) fifteen days after Notice to Proceed, but not less than (10) ten days before gaining access to the site to start Work, Contractor shall submit its written program with detailed outline of procedures for complying with AGENCY requirements. The program shall be coordinated with the Contractor's schedule.

1.03 COMMUNICATION, COORDINATION AND PLANNING

- A. The Contractor shall comply with supplemental instructions from the AGENCY concerning the facility's medical safety and infection control. When necessary to prevent unsafe conditions, supplemental instructions may include work stoppages to reschedule and/or redirect the Work.

1.04 TRAINING

- A. Provide training and orientation on infection control and AGENCY procedures for all personnel employed by the Contractor, subcontractors and any other personnel entering AGENCY in support of the Contractor.

1.05 UTILITY INTERRUPTIONS AND PRIOR NOTIFICATION

- A. Shutdown or interruption of water, chilled water, steam, electrical services, natural gas, compressed air, vacuum, oxygen, nitrous oxide, or any utility system requires written notice a minimum of (14) fourteen working days in advance. Contractor is not authorized to interrupt utility services without this advance notification and the prior approval of the AGENCY's Representative.

1.06 ENVIRONMENTAL CONTROLS

- A. Noise: All work shall be performed with a minimum of noise or disruption to normal activities in the surrounding areas.

Extraordinary care and concern must be exercised to avoid disruption of the patient population during construction. If the AGENCY's Representative indicates a problem due to construction activities, activities shall be stopped. The Contractor is to notify the Engineer immediately to make satisfactory arrangements for the approved continuation of the Work. The Contractor shall develop a Workplan, for the AGENCY's approval, which demonstrates noise considerations for the patients' sleep period, patients' medical visits, adjacent neighbors and the ongoing function of the facility. The following noise control procedures shall be employed:

1. Maximum increase in noise shall be limited to approximately 15db over ambient.
2. The onsite construction supervisor shall have the responsibility and authority to receive and resolve noise complaints. A clear appeal process shall be established prior to construction commencement that will allow for resolution of noise problems that cannot be immediately solved by the site supervisor.
3. All noise-producing equipment and vehicles using internal combustion engines shall be equipped with mufflers, air-inlet silencers where appropriate or directed by AGENCY, and any other shrouds, shields, or other noise-reducing features in good operating condition that meet or exceed original factory specification. Mobile or fixed "package" equipment (e.g., arc-welders, air compressors) shall be equipped with shrouds and noise control features that are readily available for that type of equipment.

4. All mobile or fixed noise-producing equipment used on the project that is regulated for noise output by a local, state or federal agency, shall comply with such regulation throughout the duration of the project.
 5. Use electrically powered equipment instead of pneumatic or internal combustion powered equipment where feasible and needed to control excessive noise.
 6. Material stockpiles and mobile equipment staging, parking and maintenance areas shall be located as far as practicable from noise-sensitive receptors.
 7. The hours of material transport shall be restricted to the periods and days permitted by both this contract and local noise or other applicable ordinance.
 8. The use of noise producing signals, including horns, whistles, alarms and bells shall be for safety warning purposes only.
 9. No project-related public address or music system shall be audible to any adjacent noise-sensitive receptor.
- B. Odors: When odors are a concern, arrangements shall be made by the Contractor for their containment or control. Where this is not feasible, specific arrangements should be made to minimize the disturbance of normal AGENCY activities. Where controllable, fumes and odors shall not be allowed to migrate to occupied areas. Contractor shall work with Facilities to modify adjacent air circulation systems as deemed necessary during the construction period. Modification shall be at the Contractor's expense.
- C. Vibrations: If vibration becomes an impact to facility and hospital operations, the Contractor shall stop operations, reschedule and/or implement the following with the approval of the AGENCY's Representative:
1. Phase demolition, earthmoving and ground-impacting operations so as not to occur in the same time period, to the extent practicable. The total vibration level produced could be less when each vibration source operates separately.
 2. Select demolition methods not involving impact, where practicable.
 3. Avoid vibratory rollers and packers near vibration-sensitive areas.
- 1.07 SALVAGE AND DISPOSAL
- A. All existing property of the AGENCY that is removed from the construction site and has been identified to be salvaged by the AGENCY shall be delivered to a secure site as specified by the AGENCY's Representative.
- B. Construction debris, or material that has no redeemable value, is to be placed in Contractor-furnished refuse bins for safe and legal removal from the premises. AGENCY refuse bins may not be utilized unless so authorized by the AGENCY.
- C. Trash shall be covered when transported in public areas.
- 1.08 PARKING
- A. Contractor and related personnel shall park in authorized areas only.
- B. The Contractor's parking is restricted to street parking on Hillmont Avenue and designated loading and unloading zone. The Contractor's lay-down and storage of materials is restricted to within the project area. Any deviation requires the AGENCY's approval.

1.09 SANITARY

- A. Contractor shall provide temporary toilet facilities. The Contractor will not be allowed to use the AGENCY restroom facilities whether in existing facilities or those being constructed.
- B. Contractor shall submit proposed location of temporary toilet(s) to the AGENCY's Representative for approval.
- C. Construction personnel will not be allowed to use VCMC Campus restroom facilities for personal or equipment clean-up.
- D. Sanitary Facilities shall be in accordance with OSHA regulations.

1.10 CAFETERIA AND FOOD

- A. Construction personnel shall police their own areas. All cups, cans, paper, wrappers and discarded food must be placed in trash receptacles at the end of each break.
- B. Contractors shall submit the proposed location of any break and eating areas, either inside or outside of the project boundaries, to the AGENCY's Representative for approval.
- C. Construction personnel are not allowed to have food within the facilities under construction except for areas that have been designated by the Contractor and approved by the AGENCY's Representative.

1.11 BADGES

- A. Badges shall be worn by all Contractor's personnel and all of their subcontractors' personnel.

1.12 PHONES

- A. No cellular telephones shall be operated in patient care areas.
- B. Construction personnel shall pay for separate phone services. Pay phones are not available for Contractor use. Pay phones onsite are reserved for staff, patients and their families.

1.13 SMOKING AND TOBACCO

- A. Smoking and the use of tobacco products including chewing tobacco are prohibited within the boundaries of the VCMC Campus.

1.14 SECURITY

- A. The phone number for Security is: (805) 652-6283.
- B. All personnel must obey and act immediately upon any request by security.
- C. In an emergency, dial 911.

1.15 SAFETY

A. General

1. Watch for guests and patients.
2. Work only where there is a positive barrier separation between construction activities and others.
3. Clean up all work areas immediately in occupied areas.
4. Do not drape cords across corridors. All cords must be attached to the ceiling or taped to the floor (use tape with non-marring adhesive).
5. Maintain a minimum of 6'-0" clear within all corridors.
6. Do not leave materials or equipment in the corridor.

B. Safety equipment and consideration should include, but are not limited to:

1. Anyone known to be under the influence of alcohol or drugs shall be dismissed from the Project at once and not be allowed to return.
2. Offensive language is not permitted in any area where it may be overheard by patients, staff or visitors.
3. Provide adequate emergency first aid equipment.
4. Post location and emergency phone numbers for local medical care.
5. Monitor safe ladder usage.
6. Monitor noise levels and establish safe limitations.
7. Ensure safe ventilation for air contaminants.
8. Insist on personal protective equipment, such as hard hats, safety shoes and eye, ear, and face protection equipment.
9. Safety nets, belts, harnesses and lifelines shall be used, as appropriate.
10. Provide adequate emergency fire protection equipment.
11. Post location and emergency phone numbers for local fire departments.
12. Provide safe storage for all flammable and combustible materials.
13. Insist on safe and proper use of hand power tools and electrical drop cords.
14. Operation of cranes, derricks and hoists should be in accordance with manufacturer's recommendations and appropriate ANSI regulations.
15. All construction operations and personnel are subject to CAL-OSHA and AGENCY Environmental Health & Safety regulations.
16. Provide adequate barricades and safety lighting at all open trenches adjacent to public access.
17. Properly fence entire confines of project site to avoid public access or unauthorized personnel.
18. All wall, floor and ceiling penetrations shall be sealed to maintain fire and smoke ratings in accordance with CBC, NFPA 99 and *Life Safety Code*.
19. All emergency exit passages must be maintained free of obstructions.
20. Provide barricades and fencing in accordance with the Construction Logistic Drawings.

C. Fire Prevention During Welding, Cutting and Other Hot Work

1. Hot work includes welding, heat treating grinding, thawing pipe, powder-driven fasteners, hot riveting and similar applications producing a spark, flame or heat.
2. Hot work shall be performed in a designated area that is approved for hot work by the AGENCY's Representative.
3. The Contractor shall ensure that only approved apparatus, such as torches, manifolds, regulators, or pressure-reducing valves, and acetylene generators are used.
4. The Contractor shall ensure that all individuals involved in hot work are:
 - a. Trained in the safe operation of their equipment and the safe use of the process.
 - b. Have an awareness of the inherent risks involved and understand the emergency procedures in the event of a fire.
 - c. Are aware if any special risks, such a flammable materials or hazardous conditions at the hot work site.

D. Emergency Codes Procedures

1. Emergency Codes are announced over the public address system. At any and all times that a Code is announced:
 - a. Quickly remove all equipment and obstructions from corridors and doorways.
 - b. Maintain these conditions until "code clear" is announced.

E. Alarms

1. Fire alarm signals are initiated manually or automatically through smoke and heat sensing devices.
2. Construction activities often create dust or smoke, which will activate the fire alarm system. Prior to conducting any work, notify Facility Services of the scope of work, the duration and location of the work and determine if the work will create dust or smoke. If the work will create dust or smoke, proceed as follows:
 - a. For localized operations, cover the smoke detector with a dust cover approved by VCMC Facility Services and HCAI FLSO. Remove promptly when work is complete.
 - b. For larger areas, the detection system must be disabled. This is to be done only by Facilities Management staff. Even though the system is disabled, dust covers must be installed on all area smoke detectors.
 - 1) Contractor shall provide a continuous fire-watch until the system is restored.
 - 2) Remove dust covers promptly when work is complete.
 - 3) Detection system shall be restored to proper working order prior to releasing the fire-watch.

F. Interim Life Safety Measures

1. Interim Life Safety Measures (ILSMs) are a series of administrative actions required to temporarily compensate for the significant hazards posed by existing NFPA 101 2000 *Life Safety Code (LSC)* deficiencies or construction activities. Implementation of ILSM is required in or adjacent to all construction areas and throughout buildings with existing *LSC* deficiencies. ILSMs apply to all personnel (including construction workers), must be implemented upon project development, and must be continuously enforced through project completion. ILSMs are intended to provide a level of life-

safety comparable to that described in Chapters 1-7, 31, and the applicable occupancy chapters of the LSC. Each ILSM action must be documented through written policies and procedures. The ILSMs are:

- a. Ensuring free and unobstructed exits. Personnel receive additional training when alternative exits are designated. Buildings or areas under construction must maintain escape routes for construction workers at all times. Means of exiting construction areas are inspected daily.
 - b. Ensuring free and unobstructed access to emergency services and for fire, police, and other emergency forces.
 - c. Ensuring fire alarm, detection, and suppression systems are in good working order. A temporary but equivalent system shall be provided when any fire system is impaired. Temporary systems must be inspected and tested monthly.
 - d. Ensuring temporary partitions are smoke tight and built of noncombustible or limited combustible materials that will not contribute to the development or spread of fire.
 - e. Providing additional fire-fighting equipment and training personnel in its use.
 - f. Prohibiting smoking throughout the buildings, in and adjacent to construction areas.
 - g. Developing and enforcing storage, housekeeping and debris removal practices that reduce the building's flammable and combustible fire load to the lowest feasible level.
 - h. Conducting a minimum of (2) two fire drills per shift, per quarter.
 - i. Increasing hazard surveillance of buildings, grounds and equipment with special attention to excavations, construction areas, construction storage and field offices.
 - j. Training personnel to compensate for impaired structural or compartmentalization features of fire safety.
 - k. Conducting organization wide education programs to promote awareness of LSC deficiencies, construction hazards, and ILSMs.
2. The Contractor must maintain the ILSM Daily Monitoring Form on site for inspection by Environmental Health and Safety (EH&S) and submit it to the AGENCY and Facility Services monthly and provide a complete set compiled as a report at each project close-out.

G. Infection Control

1. Infection control is critical in all in-patient and out-patient areas of the hospital. Dust in ceilings and construction debris, contains fungus which, if inhaled by patients, can cause pneumonia and even death. Construction, demolition, and remodeling activities in hospitals have been implicated as a risk factor for certain nosocomial infections in immune compromised patients. The most notable organism is aspergillums, a fungus ubiquitous in ceiling and wall spaces where dust has accumulated. Activities that disturb accumulation of dust may cause fungal spores to become airborne, inhaled by the susceptible individual and cause disease.
2. Patients at risk include those with congenital or acquired immunodeficiency, premature neonates and those receiving immunosuppressive therapy.

3. Activities that disturb the environment where settled dust is found may cause spores to become airborne and increase risk for nosocomial infection. Activities include:
 - Demolition, grading or remodeling
 - Exposure of ceiling spaces
 - Storage and removal of uncovered or partially covered debris from construction areas.
4. See Section 3.01 for Infection Control planning and implementation requirements for this project.

H. Project Inspector

1. Provision of inspectors by the AGENCY, and/or by Office of Health Care Access and Information (HCAI) pursuant to provisions of this section shall be subject to following:
 - a. Contractor shall allow inspectors full access to project at all times Work is in progress.
 - b. Contractor shall not take any direction, approvals or disapprovals from inspectors.
 - c. Contractor shall not rely on inspectors to ensure Work is completed in accordance with Contract documents.
2. Acts or omissions of any inspector (including, without limitation, inspector's failure to observe or report deficiencies in Contractor's Work) shall not relieve Contractor from its responsibility to complete Work in accordance with Contract documents.

I. COVID 19 Requirements:

1. Masks shall be worn at all times within the project site and within the medical facilities.
2. Contractor shall take temperatures of all personnel and visitors to the site and keep a daily log when required by the facility.
3. Anyone entering the hospital entrances will be screened by VCMC staff when required by the facility.
4. Notify the AGENCY if anyone tests positive for COVID and suspected of having the virus while on the jobsite.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 INFECTION CONTROL

- A. Infection Control Risk Assessment (ICRA). See the Project Infection Control Pre-Construction Risk Assessment, located after the Special Provisions.

1. AGENCY implements the infection control risk assessment process instituted by the Center for Disease Control (CDC). This process identifies the Type of Construction Project Activity (Type A-D), the Patient Risk Groups that will be affected and the Class of Infection Control Precautions that are warranted. The VCMC Pediatric Unit Project is:
 - a. Type D – Any project that requires major demolition and/or major re-construction, extended over several days.
 - b. Class II Precautions - Patient Low Risk where barriers are in place separating work area from occupied spaces (See CDC Patient Risk Table).
 - c. Class III Precautions - Patient Medium Risk (See CDC Patient Risk Table).
 - d. Class III/IV Precautions - Patient High Risk (See CDC Patient Risk Table).

CDC Patient Risk Table

Group 1: Lowest Risk	Group 2: Medium Risk	Group 3: Medium-High Risk	Group 4: Highest Risk
Vacant spaces, Loading Dock, Non-patient corridor	Occupied Corridors, Public Areas	Radiology/ MRI	None

2. An ICRA permit is a check list of applicable controls warranted during the construction for the project. The permit will be issued at the end of a one hour discussion on the project. The parties present during this meeting are:
 - a. VCMC Infection Control Nurse
 - b. VCMC Representative
 - c. AGENCY Representatives
 - d. Contractor's Representative
- B. General Safe Work Practices
1. The subject work areas will be restricted to authorized visitors and personnel. Workers will be required to have attended an infection control training meeting prior to working on the site. All contractors, vendors and staff are required to follow the precautions defined in the ICRA.
 2. The work area must be left free from accumulation of waste and rubbish at the end of each work shift.
 3. The handling, containerization and disposal of hazardous wastes shall be performed in accordance with all applicable county, state and federal regulations, including but not limited to Title 22 of the California Code of Regulations and Titles 40 and 49 of the Code of Federal Regulations.
- C. Inspections
1. Ventura County Public Works AGENCY (VCPWA) is responsible for Inspection and all regulatory compliance of the construction of the work. This includes construction compliance with the requirements of the ICRA permit. VCPWA will ensure their

employees, vendors and any other ancillary personnel under their supervision comply with the requirements of the ICRA permit.

- D. The Contractor shall implement the conditions of approval identified through the ICRA permit issued by the Infection Control Officer. The Contractor shall incorporate these requirements into their Quality Control Plan.
- E. ICRA conditions of approval may include, but are not limited to, the following requirements:
1. Develop and implement an appropriate airborne testing program for fungi and respirable dust including baseline, construction and post-construction measurements.
 2. Disturbed or removed materials shall be cautiously removed, contained and immediately removed to the Contractor's rubbish containment area.
 3. The following Table provides a list of typical infection control precautions. Many of these precautions are standard practice.

Infection Control Precautions	
Minimizing street dust	Schedule regular street cleaning to minimize traffic dust.
Clean HVAC system	See Campus Standards & Specs
Delivery of Interior Materials (drywall, paneling, ceiling tiles, framing lumber, casework, etc)	<p>All Interior Materials shall be free from excess moisture, mold and any other damage prior to installation. Damaged materials will be removed from the site and shall not be installed. Protective measures include:</p> <ul style="list-style-type: none"> ▪ Schedule delivery of material when conditions are such that adequate weather protection has been established. ▪ Provide dry storage of materials-off ground, away from moisture sources. ▪ Minimize storage time. ▪ Plastic sheeting or tarps used to cover materials are secured loosely to allow air circulation.
Dry Wall Placement	Dry wall installation shall comply with UL listed assembly; specification to include installation at about 1/4 to 1/2 inch off the slab for minimizing water wicking when it is spilled during construction and after occupancy. Assure proper caulking of gap under drywall for acoustical or fire rating.
Notification to Owners of Water Damage	Contractor will notify AGENCY of any water damage to building and plan for repair.
Drying Equipment Access	Prearrange for drying equipment access to use if water intrudes into building
Removal of Debris & Dust	<ul style="list-style-type: none"> ▪ Construction areas will be kept free from debris, trash, excessive dust, etc. and will be monitored daily. ▪ Provide for proper disposal of food waste during construction. ▪ Provide sufficient portable restroom facilities for workers during construction; keep clean and well-maintained. ▪ No waste disposal of any kind in walls.

Table 2 – Infection Control Measures for Internal Construction & Repair Projects (Adapted from CDC Guidelines Table 9)

Item	Recommendation
Prepare for the Project	Use a multi-disciplinary team approach to incorporate infection control into the project. Conduct the risk assessment and a preliminary walk-through with project managers and staff.
Issue Hazard & Warning Notices	Post signs to identify construction areas and potential hazards. Mark detours requiring pedestrians to avoid the work area.
Relocate High-Risk Patients as Needed, If work is in or Adjacent to a PE	Identify target patient populations for relocation based on the risk assessment. Arrange for the transfer in advance to avoid delays. At-risk patients should wear protective respiratory equipment (e.g., a high-efficiency mask) when outside their Protective Environment (PE) rooms.
Establish Alternate Traffic Patterns for Staff, Patients, Visitors & Construction Workers	Determine appropriate alternate routes from the risk assessment. Designate areas (e.g., hallways, elevators, and entrances/exits) for construction worker use. Do not transport patients on the same elevator with construction materials and debris.
Erect Appropriate Barrier Containment	Use fire retardant prefabricated plastic units or plastic sheeting for short-term projects that will generate minimal dust. Use durable rigid barriers for ongoing, long-term projects.
Establish Proper Ventilation / Remodel Construction	Shut off return air vents, if possible, and seal around grilles. Exhaust air and discharge to the outside, if possible. If re-circulated air from the construction zone is unavoidable, use a pre-filter and a HEPA filter before the air returns to the HVAC system. When vibration-related work is being done that may dislodge dust in the ventilation system or when modifications are made to ductwork serving occupied spaces, install filters on the supply air grilles temporarily. Set pressure differentials so that the contained work area is under negative pressure. Use air flow monitoring devices to verify the direction of the air pattern. Monitor temperature, air changes per hour (ACH), and humidity levels (humidity levels should be <65%). Use portable, industrial grade HEPA filters in the adjacent area and/or the construction zone for additional ACH. Keep windows closed, if possible.
Control Solid Debris	When replacing filters, place the old filter in a bag prior to transport and dispose as a routine solid waste. Clean the construction zone daily or more often, as needed. Designate a removal route for small quantities of solid debris. Mist debris and cover disposal carts before transport (i.e., leaving the construction zone). Use window chutes and negative pressure equipment for removal of larger pieces of debris while maintaining pressure differentials in the construction zone. Schedule debris removal to periods when patient exposure to dust is minimal.
Control Water Damage	Make provisions for dry storage of building materials. Do not install wet, porous building materials (i.e., sheet rock). Replace water-damaged porous building materials if they cannot be completely dried out within 72 hours.
Control Dust in Air and on Surfaces	Monitor the construction area daily for compliance with the infection-control plan. Protective outer clothing for construction workers shall be removed before entering clean areas. Use mats with tack surfaces within the construction zone at the entry; cover sufficient area so that both feet make contact with the mat while walking through the entry. Clean the construction zone and all areas used by construction workers with a wet mop. If the area is carpeted, vacuum daily with a HEPA-filter equipped vacuum. Provide temporary essential services (e.g., toilets) and worker conveniences (e.g., vending machines) in the construction zone as appropriate. Damp-wipe tools if removed from the construction zone or left in the area. Ensure that construction barriers remain well sealed; use particle sampling as needed. Ensure that the clinical laboratory is free from dust contamination.
Complete the Project	Flush the main water system to clear dust-contaminated lines. Terminally clean the construction zone, by vacuuming with HEPA-filtered vacuum and mopping with disinfectant, before the construction barriers are removed. Check for visible mold/mildew and eliminate if present. Verify appropriate ventilation parameters for the new area as needed. Do not accept ventilation deficiencies, especially in special care areas. Clean or replace HVAC filters using proper dust-containment procedures. Remove the barriers and clean the area of any dust generated during this work. Ensure that the designated air balances in the operating rooms (OR) and protective environments (PE) are achieved before occupancy. Commission the space as indicated especially in the OR and PE, ensuring that the room's required engineering specifications are met.

END OF SECTION

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SECTION 01 14 02
COORDINATION WITH PHILIPS

PART 1 - GENERAL

1.1 SUMMARY

- A. The facility has purchased the MRI equipment directly from Philips. The MRI equipment specifically is OFOI, however there is required coordination between the selected contractor and Philips.
- B. Drawings pages 64-97 are the Philips plans. The contractor is to provide all infrastructure required to support the equipment provided by Philips.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 SCHEDULE COORDINATION

- A. The contractor shall coordinate the MRI Chiller that is mounted on the roof with Philips. The mechanical system installation and verification will be required before the MRI magnet is delivered and installed by Philips.
- B. The contractor shall coordinate the site preparation for the installation of the magnet. The skylight in the canopy of the ambulance bay is required to be removed prior to the magnet showing up on site. The contractor shall be responsible for removing the skylight, protecting the skylight, and reinstalling the skylight after the magnet has been installed.
- C. The contractor shall coordinate connection for the removal of the concrete hatch at the ambulance bay for the magnet installation. The contractor is responsible for preparing the hatch connectors by removing the material at the hook locations and preparing the hooks for Philips to remove the hatch.
- D. The contractor shall install the infill panel after the installation of the MRI magnet.
- E. The contractor is responsible for proving a physicist report validating the RF shielding installation.
- F. After Philips has delivered the equipment, the contractor shall connect the equipment to the building infrastructure including but not limited to: HVAC, plumbing, electrical, low voltage systems, and seismic anchoring.

END OF SECTION

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SECTION 01 14 13
ACCESS TO THE SITE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section Includes:

1. Access to the Project Site
2. Vehicular Site Success
3. Site Restrictions
4. Coordination with Occupants
5. Work Site Restrictions
6. Contractor Work Rules

B. Related Requirements:

1. Section 01 50 00 for limitations and procedures governing temporary use of the Owner's facilities.

1.02 ACCESS TO THE PROJECT SITE

- A. Use of the Site: Limit use of the project site to areas within the Contract limits indicated. Do not disturb portions of the project site beyond areas in which the work is indicated.
- B. Existing Building Condition: Maintain portions of the existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.03 VEHICULAR SITE ACCESS

- A. Driveways, Walkways and Entrances: Keep driveways, parking garage, loading areas, and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for materials storage.
1. Schedule deliveries to minimize the use of driveways and entrances for construction operations.
 2. Schedule deliveries to minimize space and time required for on-site materials and equipment storage.
- B. Truck and Equipment Access:
1. Limit delivery, pick-up, and standby activities to areas designated by the Owner.
 2. To avoid traffic conflict with the Owner's or Owner's employees and the general public, and to avoid overloading streets and driveways elsewhere on the project site, or adjacent to the project site, limit truck and equipment access to those routes (a) designated by the Owner; and (b) acceptable to the AHJ.
 3. Protect from damage all curbs and sidewalks over which trucks and equipment pass to access the project site.

- C. Contractor's Vehicle Access and Parking: Contractor vehicles, the Contractor's employees' vehicles, and all other vehicles entering and exiting the project site for construction operations may:
 - 1. Only use entrances, routes, and exits designated by the Owner.
 - 2. Only park in those areas designated by the Owner and may not park in any other project site area.
 - 3. Street parking on public roads is allowed.

1.04 SITE RESTRICTIONS

- A. Restrict access of all persons entering the project site for construction operations to the access routes and to other areas designated by the Owner; and to the limits of the work.

1.05 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: The Owner will occupy the premises during the entire construction period, with the exception of those areas under construction. Cooperate with the Owner during construction operations to minimize conflicts and facilitate the Owner's usage; perform the work in a manner that does not interfere with the Owner's day-to-day operations; maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities, or portions of facilities, without prior written authorization from the Owner and approval of the AHJ.
 - 2. Notify the Owner at least 72-hours in advance of activities that affect the Owner's operations and usage.
- B. Phasing and sequencing of the work shall be done in a manner to accommodate use of the facilities by the patients and staff during construction. Contractor shall plan for in their daily schedule the potential re-sequencing of work to accommodate the needs of the facility. Should the needs of the staff and/or patients require that the contractor stop work in a specific area, the Contractor shall stop work in that area, and move to another location to continue work that does not interfere with the facilities' operations. This re-sequencing shall be at no additional cost, or additional time, to the contract unless the Contractor can demonstrate that the area of work that is being impacted is on the critical path.

1.06 WORK RESTRICTIONS

- A. General:
 - 1. Comply with construction operations restrictions.
 - 2. Comply with limitations on use of public streets and with other requirements of the AHJ.
- B. On-Site Work Hours: Unless otherwise indicated or authorized by the Owner, limit work in the existing building to Monday through Saturday working hours between 5 AM and 8 PM. Noisy work shall be completed before 9:00am.
 - 1. Weekend Hours: to be approved in advance by the Agency's Representative.
 - 2. Early Morning Hours: if the Agency determines that it is unlikely to affect adjacent campus activities, neighbors and personnel.

3. Hours for Utility Shutdowns: shall be during off hours or weekends unless otherwise approved by the Agency's Representative.
4. Hours for Core Drilling and other noisy activity: Refer to Section 01 14 01, Instructions to Contractors Working at VCMC, for noise control requirements.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities or portions of facilities occupied by the Owner or others unless authorized under the following conditions only after providing temporary utility services that conform to the requirements indicated.
 1. Notify the Owner at least (14) business days in advance of proposed utility interruptions.
 2. Obtain the Owner's written authorization prior to proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate all operations with the Owner that may result in high levels of noise and vibration, odors, and other disruption to the Owner occupancy.
 1. Notify the Owner at least (2) business days in advance of proposed disruptive operations.
 2. Obtain the Owner's written authorization before proceeding with disruptive operations.
- E. Nonsmoking Building: Per County of Ventura Ordinance 4502, Section 6707, smoking and tobacco product use is prohibited on County campuses.
- F. Controlled Substances: The use of tobacco products and other controlled substances on the project site is prohibited.
- G. Employee Identification: Provide identification tags for the Contractor personnel working on the project site. Cause personnel to use identification tags at all times.
- H. Employee Screening: Comply with the Owner's requirements for drug and background screening of all personnel working on the project site that are involved with construction operations.
 1. Maintain a list with the Owner's representative of screened and approved personnel.
- I. COVID Screening: CDC guidelines and California State requirement concerning COVID screening, masking, testing, and quarantine shall be followed.
 1. CDPH requirements for medical facilities shall be followed. Contractor to provide required vaccination and/or testing records within 48 hours of CDPH request.
- J. Additional Information: Refer to the following documents for requirements that may impose additional on-site work restrictions:
 1. Section 01 14 01, Instructions to Contractors Working at VCMC.
 2. Visit: www.cdph.ca/gov for latest COVID requirements.

1.07 CONTRACTOR WORK RULES

- A. All Contractors, Contractor's employees, and other persons entering the project site for construction operations must comply with the following:

1. Food and drink are not allowed to be consumed in the project area. Only water is allowed to be consumed in the project area.
2. Everyone must sign in and out on a daily basis. If required by the Owner, provide identification tags for the Contractor personnel working at the project site. Contractor personnel are required to use identification tags at all times.
3. Everyone working at the project site must eat and take breaks only in areas designated by the Owner.
4. Contractor is responsible for the protection of Owner's, the Owner's employees, and tenant equipment and merchandise during both demolition and construction.
5. The Contractor provides all flagging, barricades, and safety equipment for all personnel and the general public while working in construction areas.
6. Whenever using a torch, welding, or working with combustibles, a charged and fully functioning fire extinguisher must be adjacent, visible, and readily accessible to the work being performed. All welding activities must be fully screened from the public's view.
7. The Contractor shall ensure all sprinkler heads and motion detectors are protected before spraying ceilings.
8. Unsafe work practices, including horseplay, failure to utilize safety equipment, and other activities that endanger other workers, the Owner's personnel, the general public, or anybody else at the project site, are prohibited.
9. Vandalism, theft, drinking alcoholic beverages, the use of illicit drugs, and other counterproductive behavior, including cursing, are prohibited.
10. Trash may only be removed through designated exits.
11. The Contractor shall maintain reasonable dress code standards. Sandals, cut-offs, shorts, string T-shirts, and not wearing a shirt are prohibited.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for substitutions during the after the Contract Award and during the construction phase.
- B. Related Requirements:
 - 1. Ventura County Standard Specification Section 4-1.6

1.02 REFERENCES

A. Definitions:

- 1. Substitutions: Contractor-suggested changes to products, materials, equipment, systems, assemblies, and methods of construction from those required by the Contract Documents to similar items that are not necessarily identical but are still alike with respect to appearance and performance.
- 2. Proposed Substitutions: Substitutions proposed and considered during the bidding period that are allowed, provided the bidder indicates the difference in cost that results if the substitution request is accepted.
 - a. Bid prices for each substitution request include all costs required to incorporate the substitution into the project.
 - b. Later requests for additional costs for substitutions are not considered.
- 3. Controlled Substitutions: Substitutions proposed and considered during the construction period that are allowed under procedures specified in this specification Section.
 - a. Substitutions for Cause: Contractor- suggested changes resulting from changing project conditions, such as product unavailability, regulatory change, or unavailability of required warranty terms.
 - b. Substitutions for Convenience: Contractor- and Owner- suggested changes that are not necessary to meet project requirements, but that may offer an advantage to the Contractor or the Owner.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Substitution Requests:

- 1. The AGENCY will consider only formal requests for substitution prepared by the Contractor on an approved substitution request form, for items and fabrication or installation methods in lieu of those specified when:

- a. In the Contractor's opinion, the specified product or process will not fulfill the design intent;
 - b. Contractor ascertains the specified product is unavailable, as evidenced by written documentation that firm orders were placed in a timely manner; or that the unavailability is due to strike, lockout, bankruptcy, discontinuance of manufacture, or an act of God.
2. The AGENCY will not consider substitutions when:
 - a. Indicated or implied on RFIs, shop drawings or project data submittals, without additional requests submitted on an approved substitution request form in conformance with the requirements of this Section.
 - b. Requested directly by a subcontractor or supplier.
 - c. Acceptance requires substantial revision of Contract Documents.
3. By issuing a substitution request, the Contractor is stating:
 - a. The Contractor has investigated the substitute item or method, and has determined that it is equal to, or superior, in all respects, to the originally-specified item or method and that it will perform intended function.
 - b. The same warranties are provided for the substitution request item or method as the originally-specified item or method, without exception or limitation.
 - c. The Contractor shall coordinate the installation of accepted substitutions into the Work, making such changes to adjacent materials as required to make the Work complete in all respects, without re-design of adjacent items and supporting materials.
 - d. The Contractor waives all claims for extensions of time or time/sequence related intended or unintended consequences, including additional costs that subsequently arise.
 - e. All cost data is complete, and includes all related costs under the Contractor's Contract, but excludes development and implementation costs incurred by the County.
 - f. The Contractor will pay all redesign and other costs resulting from substitution.
 - g. Acknowledgement and acceptance to these provisions in the request.
- B. Compatibility: Investigate and document the compatibility of substitutions with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended or required by the manufacturers.
- C. Approval or Rejection: Approval or rejection of a substitution is final, the decision of which is the sole discretion of the Owner and the Architect, and includes consideration of the following factors, among others, in comparing the equality of substitutions with all originally-indicated or -specified requirements.
 1. The quality of materials, structural strength, construction, fabrication, and performance.
 2. Final appearance, finishes, and surface characteristics.
 3. The supplier's, fabricator's, manufacturer's history, track record, or reputation.
 4. Installation is as originally specified or approved alternate installation method.
 5. Impact on adjoining or related work. Arrangements resulting in acceptance a substitution include equal in appearance, convenience, and practicality to original arrangements.
 6. Availability of replacement parts and maintenance services.
 7. Ease of maintenance, repair, cleaning, adjusting, and re-finishing.
 8. Code approvals and service history.
- D. Resubmittal: Do not resubmit previously-rejected substitution requests in a modified form.

1. Upon rejection of a substitution request, the Contractor may submit a different substitution within the specified time limits.
 2. If a second a substitution request is rejected or is not received by the Architect within specified time limits, provide the original item or method as specified, and without substitution.
- E. Conformance: Acceptance of substitution requests does not relieve the Contractor from conformance to the Contract Documents. The Contractor bears all additional expenses resulting from approved substitutions, and those expenses resulting from approved substitutions affecting adjoining or adjacent work.
- F. Unauthorized Substitutions: Substitute items installed without prior written approval are considered defective work. At no additional cost to the Owner, remove and replace defective work and install the originally-specified item.

1.04 SUBMITTALS

- A. Substitution Requests: Submit for consideration the substitution request on the web-based construction management program. Identify originally-specified and substitution request items, or fabrication or installation methods. Include the specification Section Number and title, and the Drawing Numbers and titles.
1. Substitution Request Form: Use the PWA Substitution Request form.
 2. Documentation: As evidence that substitution requests conform to the originally-specified requirements, submit the following, as applicable.
 - a. A statement indicating why the specified item or installation cannot be provided, if applicable.
 - b. Coordination information necessary to accommodate the substitution request, including a list of changes, modifications, or revisions to other parts of the work, and to construction performed by the Owner and separate contractors.
 - c. A detailed line-by-line comparison of significant qualities, salient properties, and performance of the substitution request with the originally-specified items. Include an annotated copy of the applicable Specification section.
 - 1) Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated.
 - 2) Indicate deviations, if any, from the specified requirements.
- d. Product Data, including drawings and descriptions of products; and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. A list of similar installations for completed projects with project names and addresses, and the names and addresses of the architects and owners.
 - h. Material test reports issued by a qualified testing agency indicating and interpreting test results for conformance to the specified requirements.
 - i. Research reports issued by ICC-ES evidencing conformance with the building code in effect for project,
 - j. A detailed comparison of the Contractor's construction schedule using the substitution request versus the specified items, including the overall effect on the Contract Time. If the specified item or method of construction cannot be provided within the Contract Time, include a letter from manufacturer, on manufacturer's

- letterhead, stating the date of receipt of the purchase order, lack of availability, or delays in delivery.
- k. Cost information, including a proposal for change, if any, to the Contract Sum.
 - l. The Contractor's certification that the substitution request conforms to the requirements of the Contract Documents, except as indicated in the substitution request; is compatible with related materials; and is appropriate for the applications indicated.
 - m. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of the substitution request to produce indicated results.
3. AGENCY's Action: When necessary, the AGENCY requests additional information or documentation for evaluation within **(7)** seven calendar days of receiving a substitution request. The AGENCY notifies the Contractor of acceptance or rejection of the substitution request within (15) fifteen business days of receipt of receiving a substitution request, or within (7) seven calendar days of receiving additional information or documentation, whichever is later.
- a. A Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the work must be issued as acceptance of a substitution request. No exceptions.
 - b. Provide the originally-specified item or method if the Architect does not make a decision on the use of a substitution request within time allocated for a response.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. General:

- 1. Failure of the Contractor to submit substitution requests for approval in the manner indicated above and within the prescribed time indicated below is sufficient cause for the AGENCY to reject such substitution.
- 2. If a substitution request is submitted after the time periods indicated below, the AGENCY, at its sole discretion, may still agree to review such substitution, in which case the Architect's reasonable expenses for such reviews are be paid by the Contractor and are deducted from the Contract Sum, as approved by AGENCY.

B. Substitutions for Cause: Submit requests for substitution promptly upon discovery of a perceived need for change, but at least (15) fifteen business days before to the time required to prepare and review of related submittals.

- 1. The AGENCY considers the Contractor's request for substitution only when all of the following conditions are satisfied. If the following conditions are not satisfied, the AGENCY returns requests for substitution without action, except to record nonconformance with these requirements.
 - a. The requested substitution conforms to the Contract Documents and produces the indicated results.
 - b. The requested substitution provides sustainable design characteristics that the specified product provided.
 - c. The requested substitution is fully documented on the approved substitution request form and properly submitted.

- d. The requested substitution does not adversely affect the Contractor's construction schedule.
 - e. The requested substitution has all current and necessary approvals from the AHJ.
 - f. The requested substitution is compatible in all respects with other portions of the work.
 - g. The requested substitution is fully coordinated with other portions of the work.
 - h. The requested substitution provides the minimum specified warranty or warranties.
- 2. If the requested substitution involves more than one contractor, then the requested substitution is also:
 - a. Coordinated with other portions of the work.
 - b. Uniform and consistent.
 - c. Compatible with other products.
 - d. Acceptable to all other involved contractors.
- C. Substitutions for Convenience: Not permitted unless otherwise indicated.
- D. Substitutions for Convenience: The AGENCY considers requests for substitution if received within 30 calendar days after commencement of the work, the Notice to Proceed.
 - 1. The AGENCY considers the Contractor's request for substitution only when all of the following conditions are satisfied. If the following conditions are not satisfied, the Architect returns requests for substitution without action, except to record nonconformance with these requirements.
 - a. The requested substitution offers the AGENCY a substantial advantage in cost, time, energy conservation, or other consideration, after deducting additional responsibilities the AGENCY must assume, including additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the AGENCY, and similar considerations.
 - b. The requested substitution does not require extensive revision to the Contract Documents.
 - c. The requested substitution conforms to the Contract Documents and produces the indicated results.
 - d. The requested substitution provides sustainable design characteristics that the specified product provided.
 - e. The requested substitution is fully documented on the approved substitution request form and properly submitted.
 - f. The requested substitution does not adversely affect the Contractor's construction schedule.
 - g. The requested substitution has all current and necessary approvals from the AHJ.
 - h. The requested substitution is compatible in all respects with other portions of the work.
 - i. The requested substitution is fully coordinated with other portions of the work.
 - j. The requested substitution provides the minimum specified warranty or warranties.
 - 2. If the requested substitution involves more than one contractor, the requested substitution is also:
 - a. Coordinated with other portions of the work.
 - b. Uniform and consistent.
 - c. Compatible with other products.
 - d. acceptable to all contractors involved.

3. Requests must be received by the AGENCY no later than (30) thirty days after Notice to Proceed or (30) thirty days prior to when item was scheduled for submission under Section 01 29 73.
- E. Substitution requests will not be considered during bidding.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 01 21 00 for administrative procedures for the preparation of Change Order Proposals for adjusting the Contract Sum to reflect actual costs of allowances.
 - 2. Section 01 22 00 for administrative procedures for the preparation of Change Order Proposals for adjusting the Contract Sum to reflect the measured scope of unit-price work.
 - 3. Ventura County Standard Specification Section 3-1 for County of Ventura procedures for changes in work.

1.02 REFERENCES

- A. Definitions:
 - 1. Proposal Request: Request to determine the effect of a proposed change in the work to the Contract Sum or the Contract Time.
 - a. Work Changes Proposal Request: Owner-initiated changes to the work that may require adjustment to the Contract Sum or the Contract Time.
 - b. Change Order Proposal Request: Contractor-initiated changes to the work related to latent or changed conditions that might require adjustment to the Contract Sum or the Contract Time.
 - 2. Change Order: The process by which work agreed to by the AGENCY is added to or deleted from the original Contract scope of work that might require adjustment to the Contract Sum or the Contract Time.

1.03 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: The AGENCY issues Work Changes Proposal Requests to the Contractor via Web-based Construction Management , "Change Order Requests. If necessary, the description includes supplemental or revised Drawings and Specifications.
 - 1. Change Order Requests issued by the AGENCY are not instructions to either stop the work in progress or to execute the proposed change.
 - 2. Within the (20) twenty business days after receipt of the Change Order Request, when not otherwise specified, submit estimate of probable cost adjustments to the Contract Sum and Contract Time that are necessary to execute the proposed change.

- a. Include a list of the quantities of items required or eliminated, and unit costs, with the total amount of purchases and credits. Furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and trade discount amounts.
 - c. Include labor and supervision costs directly attributable to the proposed change.
 - d. Include an updated Contractor's construction schedule indicating the effect of the change, including changes in activity duration, start and finish times, and activity relationships. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Change Order Requests: The Contractor initiates a claim to modify the Contract by submitting a Change Order Request Proposal to the AGENCY.
- 1. Furnish a complete description of the proposed change, including a statement outlining the reasons for the proposed change, the effect of the change on the work, and on the Contract Sum and Contract Time.
 - 2. Include a list of the quantities of items required or eliminated, and unit costs, with the total amount of purchases and credits. Furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and trade discount amounts.
 - 4. Include labor and supervision costs directly attributable to the proposed change.
 - 5. Comply with requirements of Section 01 25 00 if the change order proposal request requires the substitution of an item from what was originally specified.

1.04 CHANGES IN WORK

- A. Reference VCSS 3.2.2.3 See additional requirements below.

- a. Work by Contractor. The following percentage shall be added to the Contractor's costs and shall constitute the markup for all overhead and profits, and all other cost not specifically provided for:
 - (1) Labor15%
 - (2) Materials15%
 - (3) Equipment Rental15%
 - (4) Other Items and expenditures15%

To the sum of the cost and markups provided in this section, 1% shall be added as compensation for bonding.

When all or any of the Extra Work is performed by a Subcontractor, the markup established in 01 26 00, 1.04 A shall be applied to the Subcontractor's actual cost of such work. A mark up of 10% on the first \$5,000 of the subcontractor's portion of the Extra Work and the markup of 5% on work in excess of \$5,000 of the subcontracted portion of the Extra Work may be added by the Contractor.

- B. Refer to VCSS Section 3 and add the following sub-section:

3-6 CHANGE ORDERS

3-6.1 Signed Change Orders. By signing the Contract Change Order (CCO), the Contractor agrees to the total cost and time, if applicable, of the contract modification, and will accept as full payment for all costs related in any way to the signed Change Order. This shall

also constitute full compensation for any extended Overhead or General Condition costs attributed as a result of this change.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 26 13
REQUESTS FOR INFORMATION

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for RFIs.
- B. Form to be completed in web-based construction management program and submitted by the Contractor requesting clarification of a portion of the Contract Documents, hereafter referred to as RFI.
- C. Related Requirements:
 - 1. Ventura County Standard Specifications
 - 2. Section 01 31 23 for web-based construction management
 - 3. Section 01 26 00 for contract modification procedures

1.02 REFERENCES

- A. Abbreviations and Acronyms:
 - 1. RFI: Contractor's Requests for Information.
- B. Definitions:
 - 1. Out of Sequence: A task indicated on the submittal and construction schedules that is (a) performed outside of the particular order in which project milestones, events, movements, or other activities follow each other; or (b) begun before its predecessor is started.
 - 2. Reasonably Inferable: If an item, system, or assembly, including components, accessories, and facility services, is either indicated or specified, then all material, labor, equipment, and facility services that are (a) normally furnished with such items, systems, or assemblies; and (b) that are necessary to make a complete installation, must be provided whether or not indicated or specified.
 - a. Items the Contractor either could or should have reasonably anticipated must be included as part of the work, based on (1) the Contractor's skill, knowledge, and experience; and (2) using an objective industry standard and not a subjective standard.
 - b. Only those items specifically excepted may be omitted from the project.
 - 3. Request for Information: Procedure used by the AGENCY or the Contractor when it is necessary to confirm the interpretation of a detail, specification or note on the Drawings; or to secure a documented directive or clarification from the AGENCY that is needed in executing the work. Other terms, including "request for interpretation" and similar terms, are synonymous with "request for information".

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submit an RFI to the AGENCY when:

1. An unforeseen condition occurs.
2. Questions regarding design intent of the Contract Documents or constructability arise.
3. Clarification of information contained within the Contract Documents, or supplementary information not contained within the Contract Documents, is required.
4. An interpretation of the Contract Documents, including that of apparent conflicts, is necessary.

B. Do not use RFIs to:

1. Confirm existing information contained in Contract Documents without providing any reason the existing information may be invalid.
2. Confirm or request information provided in a previous RFI.
3. Request approval of proposed substitutions.
4. Request approval of submittals.
5. Solicit comments or clarifications for any submittal or shop drawing review transmitted by the AGENCY to the Contractor.
6. Request contract modifications.
7. Confirm actions taken by the Contractor for requested contract modifications.
8. Transfer coordination responsibility from the Contractor to the AGENCY.
9. Request the AGENCY accept deviations from the Contract Documents for any reason.
10. Request the AGENCY accept non-conforming work.

C. RFIs that fail to conform to the above restrictions are considered frivolous, and are identified as such by the AGENCY, whose decision is final.

1. The Contractor shall promptly remove frivolous RFI's from the RFI log.
2. The AGENCY may assess the Contractor for any time and material costs incurred by the AGENCY, the AGENCY's personnel, the Architect, the Architect's consultants, and other individuals responding frivolous RFIs.

D. The RFI log will be maintained by the web-based construction management program.

1.04 PROCEDURAL REQUIREMENTS

A. RFIs shall be submitted through the web-based construction management program.

1. Forms shall be completely filled in as indicated by the AGENCY.
2. RFIs shall be completed filled in as indicated by the AGENCY.
3. Each page of attachments to RFIs shall bear RFI number and shall be consecutively numbered in chronological order.
4. If approved by the AGENCY, the RFI will be closed in web-based construction management program.

B. The Architect considers the Contractor's RFIs only when all of the following conditions are satisfied. If the following conditions are not fully satisfied, then the Architect returns the incomplete RFI without action, except to record nonconformance with these requirements.

1. Each RFI may address only one subject or request.
2. RFIs must be consecutively numbered; each page of the RFI, and every attachment to the RFI, must also bear the RFI number.
3. Every section of the RFI form must be filled-in and complete.

4. Each RFI must include:
 - a. Project name matching that listed on the Contract Documents; and the Architect's project number or other identifying number matching that listed on the Contract Documents, if any.
 - b. Date the RFI is submitted (not the date the RFI was generated).
 - c. Contractor's name, address, telephone, and fax numbers.
 - d. Drawing numbers and detail references, where appropriate, including the date of each referenced Drawing.
 - e. Section number and title of all affected specification Section or Sections, including the date of each referenced specification Section.
 - f. Clear and concise question, along with both a summary and explanation, and brief history, of the question when these are not self-evident.
 - g. Supplementary sketches and related documents material to the Contractor's request, and that are for clarification of the issue, including copies of the original subcontractor RFI.
 - h. Contractor-recommended solution or response to the requested interpretation or clarification.
 - i. Blank space for the Architect's written response.
 5. When the Contractor anticipates that the Architect's written response to an RFI might necessitate a change the Contract Sum or Contract Time, a properly executed Change Order Proposal Request conforming to the requirements of Section 01 26 00 must also be submitted along with the RFI.
- C. Submit RFIs within a reasonable time frame so as not to interfere with or impede the progress of the work.
1. Each RFI must be submitted with such promptness as to not cause any delay in the Contractor's own work, or the work of any subcontractor.
 2. Adjustments to the Contract Time or Contract Sum resulting from the Contractor's failure to submit an RFI with sufficient time to allow for the orderly processing of a response by the Architect are prohibited.
- D. Allow at least 10 [20 days for HCAI approval] business days in the Contractor's construction schedule for review and response time for each RFI, unless additional time is requested or needed by the AGENCY. The response time is increased when:
1. [for HCAI] RFI that require OSHPD approval shall be left open until HCAI has completed the review and provided approval. The AGENCY has no control of HCAI timelines or schedules.
 2. More information from the Contractor is requested by the AGENCY;
 3. The RFI is submitted out of sequence; or
 4. In the opinion of the AGENCY, more time is needed to respond to the RFI.
 - a. The Contractor shall alert the AGENCY in writing of the time available before a response may cause an impact to the Contract Sum or Contract Time.
 - b. The Contractor's failure of to alert the AGENCY in writing inures to the benefit of the AGENCY.

1.05 QUALITY ASSURANCE

- A. Before submitting RFIs to the AGENCY, verify the interpretation requested is not indicated in the Contract Documents, or cannot be determined from a careful review of the Contract Documents.

1. Carefully study the Contract Documents to ensure requested interpretations are not reasonably inferable therein.
 2. RFIs requesting interpretations reasonable inferable from the Contract Documents are returned to the Contractor without review, except to record nonconformance with this requirement.
- B. Where field conditions may dictate solutions, provide both an assessment of the potential problem and a suggested solution with each RFI submitted. RFIs that do not include a suggested solution may be returned to the Contractor without review, except to record nonconformance with this requirement.
- C. When the Contractor believes that an AGENCY's written response to an RFI might necessitate a change the Contract Sum or Contract Time, the Contractor shall notify the Owner in writing within (5) five business days of receiving the AGENCY's response.
1. RFI responses are not approvals to perform additional or extra work.
 2. When the Contractor believes that an AGENCY's written response to an RFI might necessitate a change the Contract Sum or Contract Time, the Contractor shall provide evidence supporting the basis of the Contractor's estimates changes as they relates to the RFI.
 3. The Contractor may not proceed with any additional or extra work indicated by the RFI response until a Change Order or other acceptable modification is properly prepared, submitted, and executed in conformance with the requirements of Section 01 26 00.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for preparing schedules of values.

1.02 REFERENCES

- A. See VCSS section 9-2.
- B. Definitions:
 - 1. Schedule of Values: Document that breaks down the Contract Sum into smaller, measurable portions, often itemized by specification section. The Schedule of Values is prepared by the Contractor for use as the basis of the Contractor's applications for payment; and used by the AGENCY to observe, measure, and determine percentages of completion.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. General:
 - 1. The Contractor shall prepare, produce and update a construction Schedule of Values, including all information required by this Section.
 - 2. If the Schedule of Values is not attached as an exhibit to the Agreement (and thereby made a part of the Contract for Construction), then the Schedule of Values must be consistent with the Contract Documents.
 - a. The AGENCY may request the Contractor engage in the process set forth in this section to further refine the Schedule of Values after the execution of the Contract for Construction.
 - b. The requirements of this Section must be met by the Contractor in preparing its Schedule of Values, even if the Schedule of Values is prepared prior to execution of the Contract for Construction.
- B. Coordination: Coordinate preparation of the Schedule of Values with the preparation of the Contractor's construction schedule.
 - 1. Coordinate line items in the Schedule of Values with other required administrative forms and schedules, including:
 - a. Application for payment forms with continuation sheets.
 - b. The submittal schedule.
 - c. Other items indicated as separate activities in the Contractor's construction schedule.
 - 2. Submit the Schedule of Values to the AGENCY at the earliest possible date, but not more than 15 calendar days after award of contract.

3. Subschedules for Phased Work: Where the work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each payment phase.
4. No additional contract time will be given for late schedule of values submittal.

1.04 PROCEDURAL REQUIREMENTS

- A. Within (15) fifteen calendar days after award of contract, and in preparation for submittal of a proposed Schedule of Values, the Contractor shall submit to the AGENCY for review and approval a complete cost for all work broken down by trade; a list of all Subcontractors organized by trade, and a complete list of unit prices for all products proposed for installation, tabulated to correspond to the appropriate specification Sections.
 1. Break out costs for identifying the work of all major trades beginning at the execution of the Contract for Construction and continuing through Acceptance of Substantial Completion by the AGENCY.
- B. The proposed Schedule of Values must include:
 1. Costs for work by all major trades, activity, main element or other cost center, and each activity, task or sub-activity.;
 2. Where more than one designer or subcontractor comprises the work of a work item or activity, the schedule of values shall show a separate line item for each subcontractor.
- C. Material cost components include the delivered cost of product, with taxes paid, and the total quantities of designated materials shown:
 1. Labor cost components include all related installation costs.
 2. Costs involved with Owner-furnished products must be shown as a separate cost items.
 3. All tasks necessary for the execution of the work, beginning with the execution of the Contract for Construction and continuing through acceptance of Substantial Completion by the AGENCY.
 4. The total cost of all items, as well as the columns of their related cost components must be totaled, and the sum of all columns must equal the total Contract Sum.
 5. The following general cost items shown as separate items under Division 01 in the proposed Schedule of Values:
 - a. Mobilization costs.
 - b. Permits and fees.
 - c. Performance and payment bonds.
 - d. Field coordination, including engineering, supervision and site layout.
 - e. Temporary construction facilities.
- D. Upon request by the AGENCY, the Contractor shall provide all requested supporting documentation to substantiate the cost components included in the Contractor's proposed Schedule of Values.
 1. When requested by the AGENCY, the Contractor shall meet with the AGENCY to assist with analysis of the submitted proposed Schedule of Values and determination as to whether additional data, if any, is required.
 2. If requested by the AGENCY, the Contractor shall provide copies of all subcontracts and other required data acceptable to the AGENCY, to substantiate cost components listed.
- E. AGENCY will review the breakdown in conjunction with the Progress Schedule to ensure that the dollar amounts of this Schedule of Values are, in fact, reasonable cost allocations for the

Work items listed. Upon favorable review by AGENCY, AGENCY will accept this Schedule of Values for use. AGENCY shall be the sole judge of fair market cost allocations.

- F. AGENCY will reject any attempt to increase the cost of early activities, i.e., “front loading,” resulting in a complete reallocation of moneys until such “front loading” is corrected. Repeated attempts at “front loading” may result in suspension or termination of the Work for default, or refusal to process progress payments until such time as the Schedule of Values is acceptable to Agency.
- G. Schedule of Values shall be revised to reflect Change Orders, subject to AGENCY approval.
- H. Acceptance of the proposed Schedule of Values by the AGENCY is required before the AGENCY is obligated to make payment on any application for Payment.
 - 1. If rejected, the Contractor shall modify as necessary to resolve the issues identified by the AGENCY, and then resubmit the proposed Schedule of Values within (5) five days of being rejected.
 - 2. Once approved by the AGENCY, the proposed Schedule of Values becomes the Schedule of Values for the work and is used as the basis for processing the Contractor's Payment Estimates.

1.05 SCHEDULE OF VALUES

- A. 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. the AGENCY's specification and project number.
 - c. The Contractor's name and address.
 - d. Date of submittal.
 - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following.
 - a. Related specification Section or Division.
 - b. Description of the work.
 - 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.
 - 4. Round amounts to nearest whole dollar; totals must 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. [See VCSS 9-3.3 for materials that qualify.]
 - 6. Allowances: Provide a separate line item in the Schedule of Values for each allowance.
 - 7. Each item in the Schedule of Values and the applications for payment must be complete. Include the total cost and proportionate share of the general overhead and profit for each item.

- a. Temporary facilities and other major cost items that are not a 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 the Contractor's option.

1.06 SUBMITTALS

- A. The Complete Cost Breakdown, complete list of Unit Prices, and proposed Schedule of Values must be in a format as approved or directed by the AGENCY:
 1. Unless directed otherwise by the AGENCY, use the Specifications Table of Contents as the basis for organizing each cost item under the CSI divisions.;
 2. Identify each line with number and description; and
 3. Identify each document with the name of the project, location and nature of work, and also provide the name of the Owner, the Architect and the Contractor, as well as the date of submission.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section Includes:
- B. Administrative for coordinating construction operations for the project.
- C. Related Requirements:
 - 1. Ventura County Standard Specifications Section 7.

1.02 ADMINISTRATIVE REQUIREMENTS

A. PROJECT SUPERINTENDENT AND PROJECT MANAGER

- 1. The Contractor shall provide a full-time project superintendent on the job site each working day between the contract start date specified in the contract proposal and the acknowledgement of completion of Work specified in VCSS Section 6-8. The project superintendent shall have a minimum of (5) five years' experience in supervising HCAI projects of similar complexity. The Contractor shall also employ a project manager, who is responsible for the supervision of the project superintendent, who also has a minimum of (5) five years' experience in managing construction of HCAI projects of similar complexity and size to the Work. For each day work is performed at the site between the start date specified in the contract proposal and the acknowledgement of completion of Work specified in VCSS Section 6-8 for which the above required project superintendent is not at the job site, or each working day the above project manager assigned to this project is not employed by the Contractor, the Contractor will be assessed liquidated damages of \$1,100.00 per day. The project manager can temporarily act in the capacity of the project superintendent in the event of temporary illness, vacation, or emergency to the project superintendent. Alternatively, in the event of illness, vacation, etc., a superintendent may be substituted per the provisions of Section 2, below. These liquidated damages are in addition to those specified elsewhere.
- 2. The identity and qualifications, and references of the project superintendent and project manager shall be submitted to the AGENCY by the Contractor with the Bid Proposal. Contractor shall reference the HCAI Project Number(s) and Project Title(s) substantiating the listed qualifications in subsection 1. There shall be no substitution for the project superintendent or project manager identified by the Contractor without prior written approval of such substitution by the AGENCY. Any subsequent project superintendent or project manager shall have the minimum qualifications set forth above.

B. Coordination: Coordinate the work of all subcontractors.

- 1. Establish on-site lines of authority and communication.
- 2. Allocate spaces for temporary structures furnished by subcontractors.
- 3. Monitor the use of temporary utilities.
- 4. Administer traffic and parking controls.

- C. Construction Schedule: Prepare detailed construction schedules as specified in Section 01 32 00 and monitor compliance of all subcontractors with the schedule as the work progresses.
- D. Construction Documents Review: Review the Construction Documents and prepare review reports as indicated in the executed Construction Manager at Risk Agreement.
- E. Changes:
 - 1. Before submitting to the AGENCY, review subcontractors' requests for information and substitution requests.
 - 2. Submit to the AGENCY all recommendations for necessary or desirable changes in the work.
 - 3. Process Change Orders.
- F. Permits and Fees: Verify that subcontractors obtain permits for all required inspections.
- G. Submittals: Before submitting to the AGENCY, review subcontractor submittals for conformance to the Contract Documents.
- H. Interpretation of Documents: Consult the Architect for Contract Document Interpretations as specified in Section 01 26 13.
 - 1. Assist in resolution of questions that arise.
 - 2. Transmit resolved interpretations in writing to all affected parties.
- I. Cleaning: Verify cleaning specified in Section 01 74 00 is performed during progress of the work, and at the completion of each stage of the work.
- J. Startup:
 - 1. Direct checkout of utilities, operating systems and equipment.
 - 2. Assist initial startup testing.
 - 3. Record operation start dates of systems and equipment.
 - 4. Submit to the Architect a written notice that startup operations and placing of equipment in service is complete.
- K. Substantial Completion:
 - 1. Upon determination the work is complete, submit a notice to the Architect that the work is ready for final inspection.
- L. Final Completion:
 - 1. Secure and transmit all required closeout submittals.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY

This section includes:

- A. Administrative and procedural requirements for project meetings, including:
 - 1. Preconstruction meeting.
 - 2. Weekly progress meetings.
 - 3. Coordination meetings.
 - 4. Other meetings.
- B. Related Requirements: Additional requirements for preinstallation meetings specific to a particular work result are specified within the appropriate specification section.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. The Contractor shall:
 - 1. Conduct meetings specified in the Contract Documents.
 - 2. Arrange for and distribute notice and maintain records of all preinstallation conference project meetings conducted during execution of the Contract that are required for the work.
 - 3. Notify and invite the AGENCY and the Architect to all project-related meetings.
 - 4. Attend all project-related meetings scheduled by the AGENCY or the Architect.
 - 5. Arrange for, distribute notice of, and maintain records of all special meetings when requested by the AGENCY or the Architect.

1.03 PROCEDURAL REQUIREMENTS

- A. General: Schedule and conduct meetings and conferences at the project site, unless otherwise indicated.
- B. Attendees: Notify all participants and involved parties, and individuals whose presence is required, of the date, time, and location of each meeting. Also, notify the AGENCY and the Architect of scheduled meeting dates and times.
- C. Agenda: Prepare the meeting agenda and distribute the agenda to all invited attendees at least (3) three business days before each meeting date.
- D. Minutes: Record all discussions and agreements. Distribute meeting minutes to concerned parties, including the AGENCY and the Architect, within 3 business days of each meeting.
- E. Revisions to Published Minutes:
 - 1. If the published meeting minutes are not challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as accurately stating the activities and decisions of the meeting.

2. Individuals challenging published minutes must submit their changes in writing and distribute their revisions to all attendees/ recipients.
3. Challenges to minutes will be discussed and resolved at the next regularly scheduled progress meeting as the first topic of discussion titled "Old Business".

1.04 PRECONSTRUCTION MEETING

- A. General: Not more than (5) five business days after execution of the Agreement, and before beginning work, AGENCY will schedule a preconstruction meeting at the project site or another convenient location to review responsibilities and personnel assignments.

1.05 WEEKLY PROGRESS MEETINGS

- A. General: Attend progress meetings at weekly intervals. Coordinate dates of meetings with the preparation of payment requests.
- B. Attendees: The following individuals are required to attend the weekly progress meetings.
 1. The Contractor's Project Manager.
 2. The Contractor's Jobsite Superintendent.
 3. The AGENCY's representative.
 4. The Architect and the Architect's Consultants, as required by the published agenda.
 5. Subcontractors, as required by the published agenda.
- C. Agenda:
 1. Review and approve the minutes from the previous progress meeting.
 2. Review and determine what progress has been made since the last meeting and:
 - a. Determine whether each activity is on time, ahead of schedule or behind schedule in relationship to the Contractor's construction schedule.
 - b. For items that are behind schedule, review and determine what is necessary to accelerate construction progress and secure firm time commitments from all parties involved in expediting the work.
 - c. Discuss and determine whether schedule revisions are necessary to ensure current and subsequent activities will be completed within the Contract Time.
 3. Review the status of RFIs and submittals that have not been returned within the minimum time allotted or should have been allotted in conformance with Section 01 26 00 and Section 01 33 00.
 - a. Discuss the status of only those RFIs and submittals that have not been returned within the period of time allotted for the Architect's response specified in Section 01 26 00 and Section 01 33 00. RFI's whose review is still within the period of time allotted for the Architect's response do not need to be discussed unless there is a significant change in status that may affect progress.
 - b. Review the time available before any late response may cause an impact to the Contract Sum or Contract Time.
 4. Review other items of significance that may affect construction progress.
 - a. Note any field observations, problems, decisions and determinations.
 - b. Review any off-site fabrication problems.
 - c. Review any possible material delays.

- d. Develop corrective measures and procedures to regain planned schedule.
 - e. Revise construction schedule as indicated.
 - f. Discuss and plan construction progress during next work period.
5. Include topics for discussion as appropriate.
 6. Complete other current business.
- D. Meeting Minutes: Record conference discussions, agreements, and determinations, including required corrective measures and actions.
1. Meeting Minutes will be distributed to all attendees and to parties who should have been present.
 2. Contractor shall revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Contractor to provide an updated schedule concurrently with the agenda of each weekly progress meeting.

1.06 OTHER MEETINGS & PREINSTALLATION CONFERENCE

- A. When required for the coordination of the work, the Contractor may convene other meetings to discuss project procedures, coordinate the sequencing of the work, coordinate testing and inspection, coordinate the work of specialty trades, and schedule work by the AGENCY's other contractors:
1. Prepare agenda and make physical arrangements to conduct meetings in a convenient, comfortable room, furnished as necessary to accommodate all attendees and to accomplish the purpose of the meeting.
 2. Coordinate all meetings in advance with the AGENCY.
 3. Distribute written notices and agendas for all meetings, including regularly scheduled and/or special meetings, (3) three days in advance of the meeting date.
 4. Preside over meetings.
 5. Prepare agendas and minutes of meetings.
 - a. Document all issues, discussions, decisions, and determinations.
 - b. Distribute copies of minutes to all participants within (48) forty-eight hours after meeting through the Project Management Information System.

END OF SECTION

SECTION 01 31 23
WEB-BASED CONSTRUCTION MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. The AGENCY and Contractor shall utilize Procore, a Web-based building project management software, for electronic submittal of all data and throughout the duration of the Contract. The Contractor will utilize the AGENCY's Procore account. When required by the AGENCY's Representative, paper documents will also be provided (e.g., the signature of Contract Modifications and submission of Contract Claims). In the event of discrepancy between the electronic version and paper documents, the paper documents will govern.
- B. Contractor shall include all costs associated with using this software, including user training, in the Contract bid price. The AGENCY will provide user profiles to the Contractor.
- C. Procore is a registered trademark of Procore Technologies, Inc. Microsoft, Internet Explorer, Outlook, Word, and Excel are registered trademarks of Microsoft Corporation in the U.S.A. Adobe and Acrobat are registered trademarks of Adobe Systems Incorporated.
- D. The web-based construction management program does not take precedence over the Ventura County Standard Specifications or the contract documents.

1.02 USER ACCESS LIMITATIONS

- A. The AGENCY's Representative will control the Contractor's access to Procore by allowing access and assigning user profiles only to accepted personnel. User profiles will define levels of access into the system; determine assigned function-based authorizations (determines what can be seen) and user privileges (determines what they can do). Subcontractors and suppliers may not have direct access to Procore.

1.03 AUTOMATED SYSTEM NOTIFICATION AND AUDIT LOG TRACKING

- A. Review comments made (or lack thereof) by the AGENCY on Contractor submitted documentation shall not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for managing, tracking, and documenting the Work to comply with the requirements of the Contract Documents. AGENCY acceptance via automated system notifications or audit logs extends only to the face value of the submitted documentation and does not constitute validation of the Contractor's submitted information.

1.04 SUBMITTALS

- A. AGENCY Representative's approval is required for most submittals except submittals for information only.

1.05 COMPUTER REQUIREMENTS

- A. The Contractor shall use computer hardware and software that meets the requirements of the Procore system.
- B. System Requirements:
 - 1. Operating System: Windows 7 or later and Mac X or later

2. Internet Browser: Google Chrome recommended
3. Screen Resolution: Minimum 1024 x 768 (Recommended horizontal resolution: 1280 or higher)
4. Minimum Recommended Connection Speed: 30Mbps or above
5. Processor Speed: 1G and above
6. RAM: 1G and above
7. Recommendation of 32GB of free storage when using Procore app on mobile devices

1.06 CONTRACTOR RESPONSIBILITY

- A. The Contractor shall be responsible for the validity of the information it places in Procore and for the abilities of their personnel. Accepted users shall be knowledgeable in the use of computers, including Internet Explorer, e-mail programs such as Outlook, word processing programs such as Word, spreadsheet programs such as Excel, and Adobe Portable Document Format (PDF) document distribution program. The Contractor shall utilize the existing forms in Procore to the maximum extent possible. If a form does not exist in Procore and the Contractor must include as an attachment or by uploading the data file, PDF documents will be created through electronic conversion rather than optically scanned.
- B. The Contractor is responsible for the training of their personnel in the use of Procore as needed. All costs associated with the use of this system, will be evenly distributed in the project overheads and spread across the duration of the contract; a separate cost line item will not be allowed. Procore training is available at: <https://education.procore.com/>. Contractor shall provide completed training certificates for each assigned profile requested.

1.07 CONNECTIVITY PROBLEMS

- A. Procore is a web-based environment and therefore subject to the inherent speed and connectivity problems of the Internet. The Contractor is responsible for its own connectivity to the Internet. Procore response time is dependent on the Contractor's equipment, including processor speed, modem speed, Internet access speed, etc. and current traffic on the Internet. The AGENCY will not be liable for any delays associated with the use of Procore including, but not limited to slow response time, down time periods, connectivity problems, or loss of information. Under no circumstances shall the use of the Procore be grounds for a time extension or cost adjustment to the contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 UTILIZATION

- A. SUBMITTAL: Procore shall be utilized in connection with submittal preparation and information management required by Section 01 33 00 Submittals and other Division 01 Sections. Requirements of this section are in addition to requirements of all other sections of the specifications.
- B. RFI: Procore shall be utilized in connection with RFI preparation and information management required by Section 01 26 13 and other Division 1 Sections. Requirements of this section are in addition to requirements of all other sections of the specifications.

- C. Meeting Agenda and Minutes: Procore shall be utilized in connection with Meeting Agenda and Minute preparation and information management required by Section 01 31 19 and other Division 1 Sections. Requirements of this section are in addition to requirements of all other sections of the specifications.
- D. Photographic Documentation: Procore shall be utilized in connection with photographic documentation and information management required by Section 01 32 33 and other Division 1 Sections. Requirements of this section are in addition to requirements of all other sections of the specifications.
- E. Schedules: Procore shall be utilized in connection with schedule transmittance and information management required by Section 01 32 00 and other Division 1 Sections. Requirements of this section are in addition to requirements of all other sections of the specifications.
- F. Punch List: Procore shall be utilized in connection with the punchlist preparation and information management required by Section 01 77 00 and other Division 1 Sections. Requirements of this section are in addition to requirements of all other sections of the specifications.
- G. Correspondence - COR-CCO, ASI, Field/Pay Estimates, General Correspondence, Statement of Working Days, Notice of Delay, Substitution Requests: Procore shall be utilized in connection with correspondence transmittance and information management required by other Division 1 Sections. Requirements of this section are in addition to requirements of all other sections of the specifications.

PART 4 – PROCEDURES

4.01 RFIs and Submittals

- A. The Contractor will be responsible for submitting all RFIs and Submittals through the software and assigning them to the appropriate parties.
- B. The contractor shall reference previous and related RFIs and Submittals.
- C. Architects / Engineers / Consultants etc. are responsible for posting all responses to these items via the software, including all relevant attachments.
- D. The Contractor will distribute responses to all affected subcontractors and confirm agreement with the response by closing the item.

4.02 Construction Documentation

- A. The AGENCY will manage The Drawings, Specifications and Documents in the software to ensure that the current version of all applicable construction documentation is available to the entire team via web and mobile.
- B. The Contractor will ensure that all RFIs which modify the current drawings are posted to the drawings and available via web and mobile within 24-hours of the RFI being responded to.

4.03 Contractor will review and distribute meeting minutes and action items via the software.

4.04 Contractor will take daily site photos and make them publicly available.

4.05 All punchlist items will be managed through the software.

4.06 Contractor to acknowledge correspondence items within (5) five working days.

END OF SECTION

SECTION 01 32 00
PROGRESS SCHEDULES AND REPORTS

PART 1 - GENERAL

1.01 SUMMARY

This section includes:

A. Administrative and procedural requirements for documenting construction progress, including:

1. A startup construction schedule.
2. The contractor's construction schedule.
3. Project look ahead schedule.
4. Construction schedule updating reports.
5. Daily construction reports.
6. Material location reports.
7. Site condition reports.
8. Special reports.

1.02 REFERENCES

A. Abbreviations and Acronyms:

1. CPM: Critical Path Method.

B. Definitions:

1. 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.
 - a. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - b. Predecessor Activity: An activity that precedes another activity in the network.
 - c. Successor Activity: An activity that follows another activity in the network.
2. COST LOADING: Allocating the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by the Architect.
3. CRITICAL PATH METHOD: A method of planning and scheduling a construction project by arranging activities based on relationships. Network calculations (a) determine when activities can be performed; and (b) identify the critical path.
4. CRITICAL PATH: The longest connected chain of planned activities through the network schedule that establishes the minimum overall project duration and contains no float. Any delay of an activity on the critical path directly impacts the planned project completion date.
5. EVENT: The starting or ending point of an activity.
6. FLOAT: The measure of leeway in starting and completing an activity.
 - a. Float time belongs to the AGENCY.
 - b. Free Float: The amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

- c. Total Float: The measure of leeway in starting or completing an activity without adversely affecting the planned project completion date.
 - d. Float or Total Float shall be defined as the difference between the early finish and late finish dates for an activity.
 - e. Project Float shall be defined as the difference, if any, between the Contractor's planned Final Completion date and the Contract Completion date.
 - f. Negative Float is any such calculated float which results in a "negative" number.
7. RESOURCE LOADING: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.
- 8.
9. CONTRACT TIME (or TIME OF COMPLETION): In accordance with Ventura County Standard Specifications (VCSS) Part 1 - General Provisions, Sections 6-7, the duration for the Contractor to complete each portion of the Work as set forth in the Contract.
- 10.
11. INITIAL SCHEDULE SUBMITTAL: The Schedule shall be submitted concurrently with the submittal of the signed Contract, Contract Bonds, and Certificate of Insurance. Once received, reviewed and accepted by the Agency, it will become the Contract Schedule.
12. CONTRACT SCHEDULE: The schedule submitted by Contractor representing the sole work plan for accomplishing the Work. Once the submitted Initial Schedule Submittal is reviewed and accepted, it shall be the base line schedule document that forms the basis of all measurements of Contract Time in the Contract Documents. The Contract Schedule may not be modified other than as called for in this Document.
13. UPDATED PROGRESS SCHEDULE: A schedule submitted periodically reflecting current work status of all Work Activities measured against the latest accepted Contract Schedule. An updated progress schedule shall be submitted monthly, at a minimum, prior to each progress payment closure date. Processing of the progress payment will be delayed until such revised schedule complying with this section is received.
14. CONTRACTOR'S REQUESTED REVISIONS REPORT: A written statement of any proposed revisions to the Contract Schedule that modify the Contractor's plan of construction, activity durations, logic or other non-progress related schedule data. The report shall list all such changes to the Contract Schedule including a description of the specific change, the reason for the change and the effect the change will have on the scheduled completion date.
15. RECOVERY SCHEDULE: As called for by this section, a schedule produced by the Contractor once the Updated Progress Schedule forecasts that the Contractor will not finish the Work within the tolerances of the Contract Time. Once the Recovery Schedule is reviewed and accepted by the AGENCY, it will be considered the Contract Schedule.
16. SUBMITTAL SCHEDULE: A separate schedule or portion of the Contract Schedule maintained by the Contractor that reflects the schedule for submission and approval of Submittals for materials and equipment as required in the specifications.

17. **WORK ACTIVITY:** Any individual task of work shown on a submitted schedule that requires time and resources (manpower, equipment, materials, etc.) to be completed in a continuous operation.
18. **MILESTONE:** An element of the schedule that indicates the beginning or end of a major event or phase, or any other important point in the project.
19. **LOOK AHEAD SCHEDULE:** A schedule based on the Updated Progress Schedule that shows a limited portion of the schedule. The limited portion of the schedule shall show Work Activities that were performed at least two (2) weeks before and Work Activities planned to be performed three (3) weeks beyond the date the schedule is presented, or as reasonably requested by the AGENCY. Include submittal number corresponding with the work taking place.
20. **CHANGE ORDER FRAGNET SCHEDULE:** A schedule submitted anytime the Contractor requests an adjustment in the Contract Time. A Change Order Fragnet Schedule shall be based on the applicable portion of the Contract Schedule that is claimed to be impacted, necessitating and demonstrating an extension of the Contract Time. All modifications to the Contract Schedule's Work Activities and their associated information (including float, duration, logic, manpower, etc.) shall be clearly identified. The Change Order Fragnet Schedule submittal shall show and clearly identify the unchanged ("unimpacted") Work Activities or Milestones from the Contract Schedule that have logical ties to and from the impacted activity or chain of impacted activities. The Contract Schedule shall be left unchanged and a similar portion (i.e., the same Work Activities from the Contract Schedule) shall also be submitted for comparative purposes.
21. **CRITICAL WORK ACTIVITY:** A Work Activity that, if delayed, will delay the scheduled completion of the Work (i.e., Work Activities that comprise the path of least total float). All other Work Activities are defined as non-critical and considered to have float.
22. **BENEFICIAL OCCUPANCY:** The stage of work in the progress of the Construction Work, as determined by AGENCY's Representative, when the Construction is complete and in accordance with the Contract Documents except only for completion of minor items which do not impair AGENCY's ability to occupy and fully utilize the Construction Work for its intended purpose and a Certificate of Occupancy has been issued by the Authority Having Jurisdiction.

1.03 SUBMITTALS

A. Submittal Formats: Submit required submittals in the following format:

1. Working electronic copy of the schedule file, where indicated.
2. PDF electronic file.
3. Native File

B. Startup construction schedule:

1. Approval of cost-loaded, startup construction schedule does not constitute an approval of the schedule of values for cost-loaded activities.

- C. Startup Network Diagram: Submit the startup network diagram at a size required to display the entire network for the entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Submit the initial schedule at a size required to display the entire schedule for the entire construction period.
1. Submit a working electronic copy of the schedule, using software indicated, and labeled to conform to the requirements for submittals. Include the type of the schedule (initial or updated) and date on label.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. The format for each activity in the reports must contain an activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
1. Activity Report: Submit a list of all activities sorted by activity number, then early start date or actual start date, if known.
 2. Logic Report: Submit a list of preceding and succeeding activities for all activities sorted in ascending order by activity number, then early start date or actual start date, if known.
 3. Total Float Report: Submit a list of all activities sorted in ascending order of total float.
 4. Earnings Report: Submit a compilation of the Contractor's total earnings from beginning work until the most recent Application for Payment.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Daily Construction Reports: Submit at weekly intervals.
- H. Material Location Reports: Submit at monthly intervals.
- I. Site Condition Reports: Submit at the time of discovery of differing conditions.
- J. Special Reports: Submit at the time of each unusual event.

1.04 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: Must be an experienced specialist in CPM scheduling and reporting, with the ability and capability of producing CPM reports and diagrams within 24 hours of the Architect or Owner's request.
- B. Prescheduling Conference: Conduct a prescheduling conference at the project site in conformance with Section 01 31 00. Review methods and procedures related to the preliminary construction schedule and the Contractor's construction schedule, including, the following.
1. Review software limitations; and report content and format.
 2. Verify the availability of qualified personnel needed to develop and update the schedule.
 3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
 4. Review delivery dates for Owner-furnished products.
 5. Review the schedule for the work of the Owner's separate contracts.
 6. Review the submittal requirements and procedures.
 7. Review the time required for review of submittals and resubmittals.
 8. Review the requirements for tests and inspections by independent testing and inspection agencies.
 9. Review the time required for project closeout, and the Owner startup procedures, including commissioning activities.

10. Review and finalize a list of construction activities included in the schedule.
11. Review procedures for updating schedule.

1.05 COORDINATION

- A. All cost for preparing, printing, mailing of any schedules called for by this section, or the Contract Documents shall be part of the Contract Sum.
- B. AGENCY acceptance of the monthly Updated Progress Schedule will be a condition precedent to making monthly progress payments for Work performed.
- C. All Requirements of the Contract Schedule shall also apply to the Initial Schedule Submittal, Recovery Schedule, Updated Progress Schedule, Change Order Fragnet Schedule, and As-Built Schedule.
- D. The Contractor shall coordinate with the AGENCY and utilize the schedule portion of the web-based construction management schedule.
- E. Contractor's construction schedule shall coordinate with the schedule of values, **list of subcontracts**, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the work from all entities involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Time Frame: Extend the schedule from the date established for **beginning work** to date of **final completion**.
 1. The contract completion date may not be changed by submitting a schedule that shows an early completion date, unless specifically authorized by a properly executed Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the work. Comply with the following.
 1. Activity Duration: Define activities so that each activity is no longer than (20) twenty days, unless specifically authorized in writing by the Architect.
 2. Procurement Activities: Include procurement process activities for long lead items and major items requiring a at least (60) sixty days as separate activities in schedule. Procurement cycle activities include submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 in the schedule. Coordinate submittal review times listed in the Contractor's construction schedule with the submittal schedule.
 4. Startup and Testing Time: Include at least (15) fifteen business days for startup and testing.

5. Substantial Completion: Indicate completion in advance of the date established for Substantial Completion and allow time for the Architect's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include at least (30) thirty calendar days for completion of punch list items and final completion.
- C. Constraints: Include in schedule constraints and work restrictions indicated in the Contract Documents and the following, show how the sequence of the work is affected.
1. Phasing: Arrange a list of activities on the schedule by phase.
 2. Work Under More Than One Contract: Include a separate activity for each contract.
 3. Work by the Owner: Include a separate activity for each portion of the work performed by the Owner.
 4. Products Ordered in Advance: Include a separate activity for each product:
 - a. Include delivery dates indicated in Section 01 10 00.
 - b. Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product.
 - a. Include delivery date indicated in Section 01 10 00.
 - b. Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule.
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use-of-premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. 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. Sub grade: completion of excavation and shoring.
 - b. Foundation: completion of Mat foundation.
 - c. Structural completion.
 - d. Completion of elevator installation and permit for elevator use.
 - e. Temporary enclosure and space conditioning.
 - f. Podium: Completion of L5 podium deck
 - g. Permanent space enclosure.
 - h. Completion of mechanical installation.
 - i. Completion of electrical installation.
 - j. Substantial Completion.
- D. Milestones: Include in schedule milestones indicated on the Contract Documents, including the Notice to Proceed, Substantial Completion, and final completion.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show the planned and actual dollar volume of the work performed as of the planned and actual dates used for preparation of payment requests.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence before the next schedule update. Summarize the following:

1. Unresolved issues.
2. Unanswered Requests for Interpretation.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the work and Contract Time.

G. Recovery Schedule: When periodic updates indicate the work is [14] fourteen calendar days or more behind the current approved schedule, submit a separate recovery schedule indicating the means by which the Contractor intends to regain conformance to the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve conformance, and the outside date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program developed specifically to manage construction schedules.

2.02 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit horizontal, bar-chart-type startup construction schedule within (7) seven calendar days of the date established for beginning work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for the first (90) ninety calendar days of construction. Include skeleton diagram for the remainder of the work and a cash requirement prediction based on indicated activities.

2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within (30) thirty calendar days of the date established for beginning work. Base the schedule on the submitted startup construction schedule and additional information received since the beginning of project.

B. Preparation: Indicate each significant construction activity separately. Identify the first workday of each week with a continuous vertical line.

1. For each construction activities that requires (3) three months or longer to complete, indicate an estimated completion percentage in 10% increments within a time bar.

2.04 REPORTS

A. Daily Construction Reports: Prepare a daily construction report concerning events at the project site and recording at least the following.

1. List of subcontractors at the project site.
2. List of separate contractors at the project site.
3. Approximate count of personnel at the project site.
4. Equipment at the project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including the presence of rain or snow.
7. Accidents.

8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. AHJ orders and requests.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services that are connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorization.

B. Site Condition Reports: Upon discovery of a difference between site conditions and the Contract Documents, promptly prepare and submit a detailed report along with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for modifying the Contract Documents.

2.05 TIME OF COMPLETION

- A. Acceptance by the Agency of a Schedule that indicates completion of the Work prior to Contract Completion date, or completion of an interim Milestone prior to the Contract Milestone date shall be for the convenience of the Contractor and shall not change any of the Contract requirements including but not limited to Contract Completion Date; nor shall such an early completion schedule serve as a waiver of the Contractor's nor the Owner's right to utilize the full amount of time specified in the Contract, unless so modified in a Contract Change Order.
- B. The Agency shall not be responsible or liable to Contractor for any constructive acceleration due to failure of the Agency to grant time extensions under the Contract Documents; including Contractor time extension requests that fail to substantially comply with the submission requirements and the justification requirements of this Contract for time extension requests.

2.06 CONTRACTOR COVENANTS AND GUARANTEES

- A. Contractor covenants and guarantees that Contractor will not:
 1. Misrepresent to Agency its Schedule and all of its components or Contractor's actual execution of the work.
 2. Use schedules materially different from those submitted by Contractor to the Agency for the direction, execution or coordination of the Work.
 3. Prepare schedules, updates, revisions or reports for the work which are not feasible or realistic; or which do not accurately reflect the actual intent or reasonable and actual expectations of Contractor and its Subcontractors.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Updating the Contractor's Construction Schedule: Update the contractor's construction schedule at least monthly to reflect actual construction progress and activities. Issue updated schedules at least (5) five business days before the end of each month to coincide with the monthly progress payment.

1. Promptly revise the schedule after each meeting or other activity where revisions are recognized or made. Issue an updated schedule concurrently with the report of each meeting.
 2. Include a report with an updated schedule that indicates every change, including, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the work progresses, indicate the final completion percentage for each activity.
- B. Distribution: Distribute copies of the Contractor's construction schedule to the AGENCY, separate contractors, testing and inspecting agencies, and other parties identified by the Contractor with a need-to-know schedule responsibility.
1. Post copies of the schedule in all project meeting rooms and all temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and re-post copies in the same locations. Delete parties from distribution when their assigned portion of the work is complete and they are no longer involved in performance of construction activities.

3.02 SUBMITTALS

- A. INITIAL SCHEDULE SUBMITTAL: Per VCSS 6-1, The Contractor shall submit the Initial Schedule Submittal concurrently with the submittal of signed Contract, Contract Bonds, and Certificate of Insurance. The Notice to Proceed will be delayed until the schedule is received and approved by AGENCY. See VCSS 6-7.4, Starting of Contract Time.
- B. FORM: Schedule submittals shall be provided as described below.
1. The Contractor shall submit an electronic copy of the Schedule. The electronic copy of the schedule will be provided in the scheduling software's native file format so that it may be restored, opened and analyzed by the AGENCY, as well as a PDF electronic printout. The PDF printout shall indicate the Activity Number, Activity Description, Total Float, Percent Complete, Early Start date and Early Finish date, as well as display the bars representing activity durations.
 2. The Contractor shall submit a PDF electronic printout of the schedule's critical path. The PDF printout shall indicate the Activity Number, Activity Description, Total Float, Percent Complete, Early Start date and Early Finish date, as well as display the bars representing activity durations.
 3. The contractor shall submit the following Schedule reports on 8-1/2" x 11" media or as requested by the Agency:
 - a. Monthly Progress Report: The Monthly Progress Report shall be organized as follows:
 - (i) Contractor Transmittal Letter.
 - (ii) A description of Work completed during the period.
 - (iii) Identification of unusual resources: manpower, material, or equipment restrictions or use, including multiple shifts, 6-day work weeks, specified overtime, or work at times other than regular days or hours.
 - (iv) Description of the current critical path.
 - (v) Changes to the critical path since the last schedule submittal.
 - (vi) Description of problem areas.
 - (vii) Current and anticipated delays, including:
 1. Cause of delay.
 2. Impact on other activities milestone and completion dates.
 3. Corrective action and schedule adjustments to correct the delay.

(viii) Pending items and status of:

1. Permits.
2. Change Orders.
3. Time Adjustments.
4. Non-Compliance Notices.

(ix) Contract Completion Date Status:

1. Ahead of schedule and number of days.
 2. Bend schedule and number of days.
 3. Causes for any changes
- b. Activity Report: The Activity Report shall include all of the activities sorted by activity number and present the following information: Activity Number, Activity Description, Original Duration, Remaining Duration, Percentage Complete, Responsibility Code, Area Code, Early/Actual Start, Early/Actual Finish, Late Start, Late Finish, Total Float (except as specifically indicated otherwise).
- c. Early Start Report: The Early Start Report shall be per the above Activity Report requirements with the exception that it shall be sorted by early start. (Note: This report shall be required with the Initial and Updated Progress Schedule submittals).

3.03 WEEKLY PROGRESS MEETING

A. Once each week, on a day established by the AGENCY, a meeting will be held to assess the progress achieved by the Contractor during the previous work week. The Contractor shall submit the Look Ahead Schedule (if requested) and a manpower/construction report for the previous week (the Weekly Report). The Weekly Report shall indicate for each day of the preceding week the actual manpower for each activity which was in progress. This report shall include the actual number of tradesmen which were working for the Contractor and each subcontractor each day. The Weekly Report shall also indicate for each day the weather conditions, potential delays and inspections occurring on that day. The Weekly Report shall be a report derived from the Schedule which may be completed by hand providing that the handwriting is legible to the AGENCY.

B. See also Section 01 31 19 Project Meetings.

3.04 PROGRESS REPORTING AND SCHEDULE REVISIONS

- A. Once each month on the date specified by the AGENCY, the Contractor shall prepare and submit to the AGENCY an Updated Progress Schedule and reports stipulated within this Section. The Updated Progress Schedule shall:
1. Have a data date and be stated as of the first calendar day of the month, or other date as established by the AGENCY.
 2. Show all progress, including but not limited to as-built dates, percent complete, and resources expended.
 3. Show accepted changes, including but not limited to changes as the result of change orders and any changes in contract completion dates which have been accepted within this section since the last revision of the Schedule.
 4. Only include changes to the schedule that follow the procedure outlined in paragraph B below.

- B. Should the Contractor after AGENCY's acceptance of the Initial Schedule Submittal desire to change Contractor's plan of construction, activity durations, logic or other non-progress related schedule data, Contractor shall submit a Contractor's Requested Revisions Report, as defined in Part 1 of this Section, to the AGENCY at least (1) one week prior to the submittal of a schedule incorporating any such changes. Attached to the Report shall be a schedule analysis report (generated from the software indicated in Part 2) comparing the previously accepted schedule to the proposed schedule. At a minimum, this schedule analysis report shall show the added activities, deleted activities, added relationships, deleted relationships, changed original durations, changed remaining durations, and changed driving relationships. Requested changes that are acceptable to the AGENCY will be incorporated into the next Updated Progress Schedule.
- C. The Contractor shall revise the Schedule as reasonable to mitigate the impact of changes and delays to the project with no change in Contract price. However, when the AGENCY orders changes which have the potential to impact the specific dates stipulated, a Change Order Fragnet will be prepared by the Contractor and provided with the Contractor's proposed price or extra work tabulation as required to the AGENCY for concurrence or revision as AGENCY deems necessary. After the Change Order Fragnet has been accepted by the AGENCY, it will be incorporated into the next Updated Progress Schedule submitted by the Contractor. Change Order logic will affect only those activities and performance dates directly concerned. Adjustments in scheduled intermediate completion dates or for the Contract as a whole will be considered only to the extent that there is insufficient remaining float to absorb these changes.
- D. Neither the updating or revision of the Contractor's Schedule, nor the submission, updating, change or revision of any report or Schedule submitted to AGENCY by Contractor under this Section, nor AGENCY's review of any report or Schedule, or the nonexistence of any such report or Schedule shall have the effect of amending or modifying in any way the Contract Time, or the Contract Completion Date, nor shall it modify or limit in any way Contractor's obligations under this Contract.

3.05 REVIEW AND ACCEPTANCE

- A. The AGENCY will review the Contractor's schedule submittals for constructability, cost allocation, and adherence to plans and specifications. The Contractor shall revise the Schedule as required by the AGENCY and shall submit revised Schedule to the AGENCY within (7) seven calendar days. Within (10) ten calendar days following submission of an acceptable schedule, the Contractor will provide electronic and/or hardcopy versions of the Contractor's Schedule Submittal as outlined above. Acceptance by the AGENCY of the Contractor's Schedule is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the work in accordance with the Contract. Omissions and errors in the accepted Schedule shall not excuse performance which is not in compliance with the Contract. Acceptance by the AGENCY in no way makes the AGENCY an insurer of the Schedule's success or liable for time or cost overruns flowing from its shortcomings. The AGENCY hereby disclaims any obligation or liability by reason of AGENCY's acceptance of or acquiescence to the Schedule.
- B. If the AGENCY determines the Contractor is falling behind the progress schedule, the Contractor shall take any and all steps necessary to improve Contractor's progress at no additional cost to the AGENCY; including cost impacts to other contractors, utilities, or agencies directly caused by Contractor's delay. Such steps include but are not limited to the following:
1. Increase construction manpower in such quantities and crafts as will substantially eliminate the lag in schedule progress.
 2. Increase the number of working hours per shift, shifts per working day, working days per week (as allowed by the AGENCY), or the amount of construction equipment, or any

combination of the foregoing, sufficiently to substantially eliminate lag in scheduled progress.

3.06 RECOVERY SCHEDULE

- A. If requested by the AGENCY, the Contractor shall prepare and submit within (14) fourteen days from notification from the AGENCY a Recovery Schedule in accordance with the definition included in Part 1 of this Section. The Recovery Schedule shall address a new work plan to accomplish the remaining Work within the Contract Time and shall include and identify additional concurrent operations, logic and sequence changes, additional manpower, additional shifts, or overtime work. Once reviewed and accepted by the AGENCY, the Recovery Schedule shall be used as the Contractor's Updated Progress Schedule.

3.07 CHANGE ORDER FRAGNET SCHEDULE

- A. In accordance with the definition included within Part 1 of this Section, a Change Order Fragnet Schedule shall be submitted any time the Contractor requests an extension of the Contract Time or an extension to other Contract requirements. A condition precedent to obtaining a time extension under the Contract shall be the timely submission of a Change Order Fragnet schedule pursuant to the requirements of this paragraph.
- B. A Change Order Fragnet shall be submitted within (15) fifteen days after a delay occurs or with the Contractor's cost proposal in response to a notice of change from the AGENCY. In cases where the Contractor does not submit a Change Order Fragnet for a specific change order, delay, or other Contractor requested time extension within the specified period of time, then it is mutually agreed that the particular change order, delay or Contractor request has no time impact on the Contract completion date and no time extension is required.
- C. Actual delays in activities which do not affect the critical path work or which do not move the Contractor's planned completion date beyond the Contract completion date will not be the basis for an adjustment of the Contract Time.
- D. All other requirements of the Contract Schedule shall apply to a Change Order Fragnet Schedule.
- E. Approval or rejection of the Change Order Fragnet will be made within (15) fifteen days after receipt of the Change Order Fragnet unless additional information, subsequent meetings and negotiations are necessary. Upon mutual agreement of both parties, schedule revisions illustrating the influence of the change orders, delays, and/or Contractor requests will be incorporated into the next Updated Progress Schedule.

3.08 LOOK AHEAD SCHEDULES

- A. In accordance with the definition included within Part 1 of this Document, a Look Ahead Schedule shall be submitted at each progress meeting of the Work or as reasonably requested by the AGENCY and show a minimum 3-week look ahead.
- B. The schedule shall display the activity ID, activity description, planned start/finish dates, total float, and the percentage complete.

3.09 SUBMITTAL SCHEDULE

- A. In accordance with the definition included within Part 1 of this Document and Section 01 33 01 (SUBMITTALS), the Submittal Schedule shall be submitted and maintained by the Contractor. The Submittal Schedule shall be a comprehensive and complete representation of task activities and dates related to the procurement of materials, equipment or other items requiring AGENCY or designer approval (e.g., shop drawings, product data, etc.). Provide all such dates and activity durations for submittal review and approval activities in accordance with the specification sections regarding submittals. Resubmittals shall have the same review time as the Contractor's initial submittals. For additional information on requirements for Submittals, see Section 01 33 01.
- B. Include any required or necessary items furnished by the AGENCY or a third party.
- C. Consider the nature and complexity of each submittal item and allow ample time for review, revision, correction, resubmittal, and approval sufficiently in advance of the construction requirements. Coordinate preparation and processing of submittals with performance of the Work so that work will not be delayed by submittal processing. Coordinate and sequence different categories of submittals for same work, and for interfacing units of work, so that one will not be delayed by lack of coordination with another.
- D. Make the Submittal Schedule consistent with the Contract Schedule required under this Section.
- E. Consider time required for preparation and review of mock-ups and the relationship between mockups and the Work.
- F. Schedule submittals in sequence with the schedule for Work except as required for products known to require long lead-times. For submittal of items requiring long lead-times, submit written verification of the required lead-time from the supplier, if requested.
- G. Identify on the schedule all items required by the Contract Documents, indicating:
1. The Submittal Number and Submittal Sequence Number.
 2. The Specification Section Number.
 3. The Submittal description and manufacturer.
 4. The Submittal Designation character.
 5. Whether the Submittal is required for review or for the record.
 6. Schedule date for first submittal.
 7. Schedule date for resubmittal.
 8. Schedule date when AGENCY or Designer's final release or approval is required to be returned to the Contractor.
 9. Scheduled date by which the material or equipment must be on the site so as not to delay the progress of the work.
- H. To the greatest extent possible, make single submissions covering the entire work of individual technical Specification Sections. Partial or "phased" submittals for work of the same Section will not be reviewed.
- I. Receipt of the Submittal Schedule by AGENCY will be a precondition of the receipt of the first progress payment. AGENCY and Designer will review the Submittal Schedule in accordance with the procedures for the Updated Progress Schedule included in this Section.
- J. Submittal Schedule shall be updated and presented at progress meetings, or as requested by AGENCY.

END OF SECTION

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and Procedural Requirements for:
 - 1. Pre-Construction Photographs
 - 2. Periodic Construction Photographs
 - 3. Final Completion Construction Photographs
 - 4. Web-Based Construction Photographic Documentation

1.02 SUBMITTALS

- A. Key Plan: Submit key plan of the project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within (3) three business days of taking photographs.
 - 1. Digital Camera: Minimum sensor resolution of 8 Megapixels
 - 2. Format: Minimum 3200 x 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
 - 3. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of the project
 - b. Name and contact information for photographer
 - c. Name of the Architect
 - d. Name of the Contractor
 - e. Date photograph was taken
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction
 - g. Unique sequential identifier keyed to accompanying key plan

1.03 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged in construction projects for at least (5) five years.
- B. Web-Based Photographic Documentation Service Provider: A firm specializing in providing photographic equipment, web-based software and related services for construction projects. Firm to have a record of providing satisfactory services similar to those required for the project.

1.04 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to the AGENCY for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 Megapixels, and at an image resolution of at least 3200 x 2400 pixels.
- B. Digital Video Recordings: Provide high-resolution, digital video disc in format acceptable to the AGENCY.

PART 3 - EXECUTION

3.01 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in file name for each image.
 - 2. Field Office Images: Maintain (1) one set of images accessible in the field office at the project site, available at any time for reference. Identify images in the same manner as those submitted to the Architect.
 - 3. Provide photographs via a web link or on an external storage device.
- D. Pre-Construction Photographs: Before commencement of WORK, take photographs of the project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by the AGENCY.
 - 1. Flag excavation areas before taking construction photographs.
 - 2. Take as many photographs and/or videos as necessary to show existing conditions adjacent to property before starting the work.
 - 3. Take as many photographs and/or videos as necessary of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- E. Periodic Construction Photographs: Every month, take (20) twenty color photographs that coincide with the monthly Payment Application cut-off date. Select vantage points to show status of construction and progress since last photographs were taken.

- F. Final Completion Construction Photographs: After the Substantial Completion date, take (20) twenty color photographs for submittal as project record documents. The Architect will inform photographer of desired vantage points.

1. Do not include date stamp.

3.02 WEB-BASED CONSTRUCTION PHOTOGRAPHIC DOCUMENTATION

- A. Time-Lapse Sequence Construction Site Recordings: Provide video recording from a fixed-location camera to show status of construction and progress.

1. Frequency: Record one frame of video recording every (60) sixty minutes, from same vantage point each time, to create a time-lapse sequence of construction activities.
2. Timer: Provide timer to automatically start and stop video recorder, so recording occurs only during daylight construction work hours.

- B. Maintain cameras and web-based access in good working order, according to web-based construction photographic documentation service provider's written instructions until final completion. Provide for service of cameras and related networking devices and software.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements for initial construction submittals, including a proposed products list, a proposed substitutions list, a proposed subcontractor's list, and a submittal schedule.
2. Administrative and procedural requirements for submitting shop drawings, product, samples, and other specified submittals.

B. Related Requirements:

1. Ventura County Standard Specifications 2-5.
2. Section 01 13 13 for submittals related to delegated design portions of the work.
3. Section 01 29 00 for submitting applications for payment.
4. Section 01 29 73 for submitting the schedule of values.
5. Section 01 31 33 for submitting coordination drawings.
6. Section 01 32 00 for submitting schedules and reports, including the contractor's construction schedule.
7. Section 01 43 00 for submitting test and inspection reports.
8. Section 01 78 36 for submitting warranties.
9. Section 01 78 23 for submitting operation and maintenance manuals.
10. Section 01 78 39 for submitting project record documents, including record drawings, record specifications, and record product data.
11. Section 01 79 00 for submitting video recordings of demonstration of equipment and training of the Owner's personnel.

1.02 DEFINITIONS

- A. Action Submittal: Information or physical samples required by the specifications, which receive a responsive action from the Architect. Action submittals are those submittals indicated in individual specification Sections as "action submittals."
- B. Informational Submittal: Information required by the specifications that does not require responsive action from the Architect. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual specification Sections as "informational submittals."
1. Information submittals must be printed on green-colored paper.
 2. If submitted digitally, each page must be clearly marked as an informational submittal.
- C. Partial or Incomplete Submittal: Means a submittal that does not contain complete information about all specified requirements.
- D. Combined Submittal: Submittal for which information for each specific item or class of material or equipment required by multiple specification sections is organized into a single submittal package.

- E. Early Submittal: Submittal for products or assemblies that do not affecting the critical path, and do not correspond to the chronological sequence of construction.
- F. Out of Sequence Submittal: Submittal that is (a) submitted outside of the particular order indicated on the submittal and construction schedules in which project milestones, events, movements, or other activities follow each other; or (b) submitted before its predecessor submittals are submitted.
- G. Samples for Initial Selection: Complete collection showing the manufacturer's full range of colors, textures, and patterns available for selection. The Architect returns the submittal with options selected.
- H. Samples for Verification: Full-size production units prepared from the same material and finish as what is specified for the work.

1.03 INITIAL CONSTRUCTION SUBMITTALS

- A. Proposed Products List: Within (15) fifteen business days of the Notice to Proceed, submit a complete list of major products proposed for inclusion on the project, with the manufacturer's name, trade name, and model number of each product. For products specified only by reference standards, furnish the manufacturer's trade name, model or catalog designation, and reference standards.
- B. Proposed Substitutions List: Within (30) thirty calendar days of the Notice to Proceed, prepare and submit a written summary using form acceptable to the Architect identifying proposed substitute materials and equipment.
- C. Submittals 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 revisions to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Transmit concurrently with the startup construction schedule. Include submittals required during the first (60) sixty days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Transmit concurrently with the first complete submittal of the Contractor's construction schedule.
 - a. Transmit revisions to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in tabular format:
 - a. Scheduled date for first submittal.
 - b. specification Section numbers and titles.
 - c. Submittal category (e.g., Action, Informational, etc.)
 - d. Name of subcontractor.
 - e. Description of the work covered.
 - f. Scheduled date for the Architect's final release or approval.
 - g. Scheduled date of fabrication.

1.04 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 action.
 - 2. Transmit all submittal items required for each specification section concurrently unless partial submittals for portions of the Work are indicated on the approved submittal schedule.
 - 3. Transmit action submittals and informational submittals required by the same specification section as separate packages under separate transmittals.
 - 4. Coordinate the transmittal of different types of submittals for related parts of the Work so processing is not delayed because of a need to review submittals concurrently for coordination.
 - a. The Architect may withhold action on submittals requiring coordination with other submittals until related submittals are received.
- B. Transmit submittals within a reasonable time frame so as not to interfere with or impede the progress of the work.
 - 1. Each submittal must be transmitted with such promptness as to not cause any delay in the Contractor's own work, or the work of any subcontractor.
 - 2. Adjustments to the Contract Time or Contract Sum resulting from the Contractor's failure to transmit a submittal with sufficient time to allow for the orderly processing and review by the Architect are prohibited.
- C. Review and response time for each submittal begins when:
 - 1. The Architect receives the complete submittal from the Contractor (not when the submittal is transmitted by the Contractor).
 - 2. The Architect receives all requested additional information from the Contractor for those submittals requiring additional information or clarification from the Contractor.
- D. Review and response time for each submittal is increased when:
 - 1. Additional information from the Contractor is requested by the Architect.
 - 2. The submittal is transmitted out of sequence.
 - 3. In the opinion of the Architect, more time is needed to review the submittal:
 - a. The Contractor shall alert the Architect in writing of the time available before a review may cause an impact to the Contract Sum or Contract Time.
 - b. The Contractor's failure of to alert the Architect in writing inures to the benefit of the Architect.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows.
 - 1. Assemble the complete submittal package into a single indexed file incorporating the submittal requirements of a single specification Section, and a transmittal form with links enabling navigation to each item.
 - 2. Provide a means for insertion to permanently record the Contractor's review and approval markings and the action taken by the Architect.

3. Transmittal Form for Electronic Submittals: Use electronic form acceptable to AGENCY, containing the following information:
 - 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. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
 4. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate specification section.
 - c. Manufacturer name.
 - d. Product name.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations and Additional Information: On an attached separate sheet, prepared on the Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by the Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include the same identification information as required for the related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as the initial submittal. Resubmittals shall contain all the originally approved items with the revised items for a complete package.
1. Note the date and content of the previous submittal.
 2. Note the date and content of the revision in the label or title block and clearly indicate the extent of the revision.
 3. Retransmit submittals until they are marked with approval notation from Architect's action stamp.
- I. Distribution: Furnish copies of final submittals to the manufacturers, subcontractors, suppliers, fabricators, installers, AHJ, and others as necessary for performance of the Work. Include a distribution on each transmittal form.

- J. Use for Construction: Retain one complete copy of each submittal, including all resubmittal(s), at the project site.
 - 1. Use only final action submittals that are marked with approval notation from Architect's action stamp.
 - 2. Do not perform any portion of the work requiring submittal and review until the Architect has reviewed and returned the respective submittal. Perform such work in compliance with returned submittals.

1.05 PROCEDURAL REQUIREMENTS

A. General Submittal Procedure Requirements:

- 1. Prepare and transmit only complete submittals that are required by each individual specification Section.
 - a. Submittals not required by the specifications are returned to the Contractor without review, except to record nonconformance with these requirements.
 - b. Partial or incomplete submittals are returned to the Contractor without review, except to record nonconformance with these requirements.
 - c. Multiple submittals are returned to the Contractor without review, except to record nonconformance with these requirements.
- 2. Submittals not conforming to the specified procedural requirements are returned to the Contractor without review, except to record nonconformance with these requirements.

B. Electronic Submittals:

- a. See section 01 31 23 for submitting e-file submittals.

1.06 ACTION SUBMITTALS

A. 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 a submittal because standard published data are not suitable for use, transmit as Shop Drawings, not as Product Data.
- 2. Mark each copy of every 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. Transmit Product Data before or concurrent with Samples through Web-Based Project Management program.
 6. Transmit Product Data as an electronic PDF through Web-Based Project Management program.
- B. 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.
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, transmit Shop Drawings on sheets at least 8-1/2 by 11 inches, but not larger than 30 by 42 inches.
 3. Transmit Shop Drawings in PDF electronic file.
 4. BIM File Incorporation: Develop and incorporate Shop Drawing files into the Building Information Model established for project.
 - a. Prepare Shop Drawings in the following format: The same digital data software program, version, and operating system as the original Drawings.
 - b. Refer to Section 01 31 33 for requirements for coordination drawings.
- C. Samples: Transmit Samples for reviewing the kind, color, pattern, and texture for comparison to other submittals and actual components, as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in (1) one submittal package.
 2. Identification: Attach a label on an unexposed side of each Sample that includes the following.
 - a. Generic description of the sample.
 - b. Product name and manufacturer's name.
 - c. Sample source.
 - d. Number and title of applicable specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. All projects require electronic submittals, provide corresponding electronic submittal of the Sample transmittal, a digital image file illustrating the Sample's characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at project site, available for quality-control comparisons throughout the course of the project. 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 the time of use.
 - b. Samples not incorporated into the work, or otherwise designated as the AGENCY's property, are the property of Contractor.
- 5. Samples: Transmit full-size units or Samples of the specified size, prepared from the same material used for the Work, cured and finished in the manner specified and physically identical to the material or product proposed for use; and that shows the full range of color and texture variations expected. Samples are to include 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: Transmit (3) three sets of Samples. The AGENCY retains (2) two Sample sets; the remainder are returned. Mark up and retain (1) one returned Sample set as a project record sample.
 - 1) Transmit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, transmit at least (3) three sets of paired units that show approximate limits of variations.
- D. Decorative Materials and finishes: Submit coordinating finish and decorative submittals at one time for review. Early submittals will be held until all of the finish submittals in the area have been received for review.

1.07 INFORMATIONAL SUBMITTALS

A. Product Schedule:

- 1. As required in individual specification sections, prepare a written summary indicating the types of products required for the work along with their intended location. Include the following information in tabular form:
 - a. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - b. Manufacturer and product name, and model number if applicable.
 - c. Number and name of room or space.
 - d. Location within room or space.
- 2. Transmit product schedule in PDF electronic file.

B. Application for Payment and Schedule of Values: As specified in Section 01 29 00.

C. Contractor's Construction Schedule: As specified in Section 01 32 00.

D. Coordination Drawing Submittals: As specified in Section 01 32 33.

E. Closeout Submittals and Maintenance Material Submittals: As specified in Section 01 77 00.

- F. Maintenance Data: As specified in Section 01 78 23.
- G. LEED Submittals: To be provided as an addendum.
- H. Qualification Data: Prepare written information that demonstrates the capabilities and experience of the company and the ability of the person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- I. Welding Certificates: Prepare written certification that welding procedures and personnel conform to the requirements in the Contract Documents. Transmit a record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include the names of firms and personnel certified.
- J. Installer Certificates: Submit written statements on manufacturers' letterhead certifying that the installer complies with requirements in the Contract Documents and, where required, is authorized by the manufacturer for this specific project.
- K. Manufacturer Certificates: Submit written statements, prepared on the manufacturer's letterhead, certifying that the manufacturer's qualification and other characteristics conform to the requirements of the Contract Documents. Include evidence of manufacturing experience, when requested.
- L. Product Certificates: Submit written statements, prepared on the manufacturer's letterhead, certifying that the product complies with requirements in the Contract Documents.
- M. Material Certificates: Submit written statements, prepared on the manufacturer's letterhead, certifying that the material complies with requirements in the Contract Documents.
- N. Material Test Reports: Submit reports prepared by a qualified testing and inspection agency, on the testing agency's standard form, indicating and interpreting the results of tested or inspected material for conformance with the requirements in the Contract Documents.
- O. Research Reports: Submit reports issued by a model code organization acceptable to the AHJ, that the products conform to the building code in effect for project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- P. Preconstruction Test Reports: Submit reports prepared by a qualified testing and inspection agency, on the testing agency's standard form, indicating and interpreting the results of tests or inspections performed before installation to confirm conformance to the Contract Documents.
- Q. Compatibility Test Reports: Submit reports prepared by a qualified testing and inspection agency, on the testing agency's standard form, indicating and interpreting the results of compatibility tests performed before installation of a particular product. Include written recommendations for primers and substrate preparation necessary to promote proper adhesion.

- R. Field Test Reports: Submit reports prepared by a qualified testing and inspection agency, on the testing agency's standard form, indicating and interpreting the results of field tests for conformance with the requirements in the Contract Documents performed either during the installation of a product or after the product is installed in its final location.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONTRACTOR'S SUBMITTAL REVIEW

- A. Review each submittal and check for coordination with other work of the Contract and for compliance with the Contract Documents.
1. Note corrections and field dimensions.
 2. Mark with review stamp before submitting to the AGENCY.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Review stamp:
1. Provide a uniform review stamp containing, at a minimum, the following information:
 - a. Name of company.
 - b. Status of review.
 - c. Date.
 - d. Initials of reviewer.
 2. Stamp and initial submittals as follows:
 - a. Stamp and initial the first page of every product data submittal.
 - b. Stamp and initial every sheet of each shop drawing submittal.
 - c. Stamp and initial the back of every sample submitted for review.
 3. By stamping and submitting each submittal, the Contractor represents that the Contractor has determined and verified the following:
 - a. Compliance with the requirements of the Contract Documents.
 - b. Field measurements.
 - c. Quantities.
 - d. Dimensions.
 - e. Specified performance criteria.
 - f. Installation requirements.
 - g. Catalog number and similar information.
 - h. Materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to performance of the work.
 - i. Coordination of the requirements of the item submitted with the overall the project.
 - J. Additional information relative to the Contractor's sole responsibility for means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

- D. Submittals that do not correctly bear the Contractor's approval stamp will be returned to the Contractor without review.

3.02 AGENCY'S ACTION

- A. Action Submittals: The AGENCY will review each submittal for conformance with the information given and the design concept expressed in the Contract Documents, will make marks to indicate corrections or modifications required, and will return each submittal to the Contractor for distribution.
- B. The AGENCY marks each submittal with an action notation and marks appropriately to indicate the action taken as follows:
 - 1. "NO EXCEPTIONS": Fabrication, manufacture and/or construction may proceed. The work generally is in compliance with the Contract Documents.
 - 2. "MAKE CORRECTIONS NOTED": Fabrication, manufacture and/or construction may proceed providing the work is in compliance with the AGENCY's and Designer of Record notations and the Contract Documents.
 - 3. "REVISE AND RESUBMIT": No work may be fabricated, manufactured and/or constructed. Additional submittal required. This submittal is not permitted on the site.
 - 4. "REJECTED": No work may be fabricated, manufactured and/or constructed. New submittal required. This submittal is not permitted on the site.
- C. Review of separate item does not constitute review of an assembly in which item functions.
- D. Informational Submittals: The AGENCY will review each submittal and will not return it; or will return it if it does not comply with requirements. The AGENCY will forward each submittal to appropriate party.
- E. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from the AGENCY.
- F. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- G. Submittals not required by the Contract Documents may be returned by the AGENCY without action.
- H. Submittals containing substitutions for specified materials, products, equipment, manufacturers, model numbers, components, assemblies, color, texture, finish, pattern, characteristics, elements or other properties are rejected.

3.03 RESUBMITTAL REQUIREMENTS

- A. Revise initial shop drawings, when required, and retransmit as specified for initial submittal. Indicate on drawings changes made, other than those requested by the AGENCY, clearly by clouding or similar acceptable method.
- B. Transmit new product data and samples as required for initial submittal.
- C. Transmit revised calculations as required for initial submittal.
- D. Create revision from original submittal in the web-based construction management program.

- E. Include all other approved materials from previous submittals in revised submittal package for a complete standalone document.

END OF SECTION

SECTION 01 42 00
REFERENCES

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and Procedural Requirements for:
 - 1. Specification format and conventions.
 - 2. Abbreviations and acronyms used throughout the Contract Documents.
 - 3. Definitions used throughout the Contract Documents.
- B. Related Sections: Reference VCSS

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Abbreviations and Acronyms:
 - 1. Certain abbreviations and acronyms contained in the Contract Documents are defined particularly for these specifications.
 - 2. Where acronyms are not defined, they mean the recognized name of the standard, regulation, or organization indicated in either
 - a. "Encyclopedia of Associations: National Organizations of the U.S." published by Gale/CENGAGE Learning; or
 - b. "National Trade and Professional Associations of the United States" published by Columbia Books & Information Services.
- B. Definitions:
 - 1. Basic Contract Document definitions are included in VCSS 1-2.
 - 2. Certain terms, phrases, and words, and their derivatives, contained in the Contract Documents are defined particularly for these Specifications in either this Section or within the appropriate Specification Section where a specific term is used.
 - 3. Where terms, phrases, or words, and their derivatives and abbreviations, are not defined, their ordinary meanings indicated in "Webster's Third New International Dictionary of the English Language, Unabridged", copyright 1986, are assumed to apply as the context of usage requires.
 - 4. Words implied, but not stated, are inferred as the context of usage requires.
 - 5. Terms, phrases, and words used in the neuter gender include the feminine and the masculine; the masculine gender includes the feminine and neuter; and the feminine gender includes the masculine and neuter. Similarly, when the context requires, the singular includes the plural, and the plural the singular.
 - 6. Underlined, bold, or capitalized words do not signify, imply, or convey any special or unusual meaning; nor do they signify, imply, or convey that words not underlined, bolded, or capitalized have any less meaning.

1.03 REFERENCES

A. Abbreviations:

1. Basic Contract Abbreviations are included in VCSS 1-3.2.

B. Acronyms:

1. AA: Aluminum Association
2. AAMA: Architectural Aluminum Manufacturer's Association
3. AHJ: Authority (Authorities) Having Jurisdiction
4. AISI: American Iron and Steel Institute
5. ANSI: American National Standards Institute
6. ASTM: American Society for Testing and Materials
7. AWS: American Welding Society
8. CARB: California Air Resources Board
9. CFS: Cold-Formed Steel.
10. CHPS: The Collaborative for High Performance Schools
11. CRI: Carpet and Rug Institute
12. DFT: Dry Film Thickness
13. DSA: Division of the State the Architect
14. EPA: U.S. Environmental Protection Agency.
15. FSC: Forest Stewardship Council
16. FSI: Flame Spread Index
17. GEI: GREENGUARD Environmental Institute
18. HDG: Hot Dip Galvanized
19. IOR: Inspector of Record
20. LEED: Leadership in Energy and Environmental Design
21. NFPA: National Fire Protection Association.
22. OSHPD: Office of Statewide Health Planning and Development
23. HDG: Hot Dip Galvanized
24. MFMA: Metal Framing Manufactures Association
25. MSG: Manufacturer's Standard Gage
26. NOMMA: National Ornamental Metals Manufacturer's Association
27. SC: Service Condition
28. SCAQMD: South Coast Air Quality Management District
29. SCS Scientific Certification Systems
30. SDI: Smoke Developed Index
31. SSMA: Steel Stud Manufacturing Association
32. SSPC: Society for Protective Coatings.
33. SWG: Standard Wire Gage
34. TCA: Tile Council of America
35. UBC: Uniform Building Code.
36. UL: Underwriters Laboratories.
37. USGBC U.S. Green Building Council
38. VCSS: Ventura County Standard Specifications
39. RWQCB: Rain Water Quality Control Board
40. IAPMO: International Association of Plumbing & Mechanical Officials
41. SMACNA: Sheet Metal and Air Conditioning Contractors National Association
42. APCD: Air Pollution Control District
43. SWPPP: Stormwater Pollution Prevention Plans

C. Definitions:

1. **Aboveground:** Situated completely on or above the final finish grade or surface of the ground, or finish floor of grade-level floor construction. Other similar terms, including

- “above grade” are synonymous with “aboveground”. Locations that do not meet the definition above for “aboveground” are considered “below ground” or “below grade”, and similar locations.
2. **Appearance:** Characteristic visible aspect of an item; specifically, its color, sheen, and texture.
 3. **Approved:** Recognized in writing by the Architect as in conformance with the requirements of the Contract Documents. Other terms, including “approve”, “approval”, and similar terms are synonymous with “approved”.
 - a. Approvals are restricted to limitations of the Architect's responsibilities and duties outlined in the Conditions of the Contract, without any implied meaning extending the Architect's responsibility into the Contractor's area of the Contractor coordination, supervision, or means and methods of construction as outlined in the Conditions of the Contract.
 - b. In no situation does an approval by the Architect release the Contractor from responsibility to fulfill all requirements of the Contract Documents.
 4. **Approved Substitute:** A substitution proposed and evidenced by the Contractor as either in compliance with or exceeding the quality of specified products, systems or methods of execution relative to appearance, convenience and practicality, including product considerations, manufacturer considerations, manufacturer's product representative considerations, installation considerations and cost considerations, and approved by the Architect for incorporation into the work.
 5. **As Indicated:** Shown on the Contract Drawings.
 6. **As Necessary:** Essential to the completion of the work.
 7. **As Required:** Either (a) as instructed by the Contract Documents or (b) essential to the completing the work.
 8. **Assembly:** A composite entity composed of various parts fit together in an orderly way, usually with logical selection or sequence, so as to make into an operative whole (e.g., a stair or curtain wall assembly)
 9. **Authority (Authorities) Having Jurisdiction:** Agencies, either individually or collectively, charged by statute with administration and enforcement of building code requirements and other regulations at the project location.
 10. **Below Ground:** See definition of “Aboveground”.
 11. **Board:** Sawn timber measuring less than 2 inches in nominal thickness at the least dimension.
 12. **Building Information Model:** Digital computer data used by the Architect as instruments of service to produce Contract Documents, including 2-dimensional and 3-dimensional computer model and drawing files in CAD format, and spreadsheet or word processing files.
 13. **Cold-Formed Metal Framing:** Structural metal framing members having a base metal thickness range of between 118 mils (10-gage) and 33 mils (20-gage) and installed in transverse and axial load-bearing applications.
 14. **Concealed:** Embedded in concrete, masonry or other construction; located or installed within furred spaces; situated within walls or partitions; suspended above ceilings; or placed in trenches, crawl spaces, or enclosures; or otherwise not visible, either outside the building or inside occupied space within the building, during normal activity when the project is completed; or that is identified as exposed on Drawings.
 15. **Component:** One of a group of individual parts of which a subassembly, assembly or system is comprised; especially a part that can be separated from or attached to the group.
 16. **Concealed:** See definition for “Exposed”.
 17. **Defective:** A product, system, or method of execution that has failed, or that otherwise does not comply with the requirements of the Contract Documents. Other terms, including “defect”, “defective work”, and similar terms, have the same meaning as

“defective”. See definition for “failure” for a partial list of defects, which are not limited to those indicated.

18. **Dimension Lumber:** awn timber measuring between 2 and 5 inches in nominal thickness at the least dimension.
19. **Directed:** A written instruction issued by the Architect to the Contractor. Other terms, including “authorized”, “permitted”, “requested”, and similar terms, have the same meaning as “directed”.
20. **Enclosure:** A level of protective resistance to weather for interior spaces provided during the construction phase by either permanent construction or substantial temporary closures. Other similar terms, including “enclosed” are synonymous with “enclosure”.
 - a. **Uncontrolled Enclosure:** Short-term, limited, temporary protection against wind for up to (6) six months before completion of the permanent enclosure, as determined by the Architect.
 - b. **Partially-Controlled Enclosure:** Medium-term, limited, temporary protection against both wind and rain for up to (12) twelve months before completion of the permanent enclosure, as determined by the Architect.
 - c. **Permanent Enclosure:** Complete permanent protection against wind, temperature, humidity, atmospheric pressure, and precipitation, provided by a permanent insulated and weathertight roofing system, permanent insulated and weathertight exterior wall construction, and openings closed with permanent construction or substantial temporary closures equivalent in protection to permanent construction, as determined by the Architect.
21. **Engineering Services:** Services performed for the design, fabrication and installation of components and assemblies similar in material, design, complexity and extent to those indicated or required for this project.
22. **Equipment:** A product with operational parts and controls, whether motorized or manually operated, that requires service connections including wiring, piping or similar connections.
23. **Ex situ:** Either off-site or away from the position an item will ultimately occupy.
24. **Existing Products:** An item salvaged or recycled from the project, or from another project or facility, where indicated, and incorporated into the work.
25. **Exposed:** An item that either does not meet the definition above for “concealed”, or that is identified as exposed on Drawings.
 - a. **Weather-Exposed:** Floor, wall, soffit, ceiling, roof or similar surface that is exposed to unconditioned wind, temperature, humidity, atmospheric pressure or precipitation, except
 - 1) Ceilings or roof soffits enclosed by walls or by beams that extend at least 12 inches below such ceilings or roof soffits.
 - 2) Walls or portions of walls within an enclosed roof area when located a horizontal distance from an exterior opening equal to twice the height of the opening.
 - 3) Ceiling or roof soffits beyond a horizontal distance 10 feet from the outer edge of the ceiling or roof soffits.
26. **Exterior:** See definition below for “interior”.
27. **Fabricate:** Specifically assemble, or make out of selected materials, to meet individual requirements for the project. Other terms, including “fabrication”, “fabricator” and similar terms, have the same meaning as “fabricate”.
28. **Factory finished:** Finished off the project site under controlled environmental conditions, requiring no additional finish at the project site except for minor touchup of areas damaged during delivery, storage, handling and installation. Other similar terms, including “shop-applied” and “prefinished”, are synonymous with “factory finished”.

29. **Failure:** The inability of an item, system, assembly, or method of execution to perform its intended function as designed, including incipient and catastrophic failure.
- a. **Incipient Failure:** Initial or nascent non-catastrophic failure of a product or system, or a method of execution leading to such a failure, including
- 1) Excessive material loss due to abrasion resulting from normal traffic.
 - 2) Cracking, flaking, spalling, or eroding in excess of specified requirements.
 - 3) Peeling or delaminating from substrate.
 - 4) Staining of adjacent surfaces caused by migration of materials, components or accessories.
 - 5) Buckling, deflection, or other structural performance exceeding the specified limits.
 - 6) Performance either exceeding maximum specified performance requirement limits or falling below minimum specified performance requirement limits.
 - 7) Stresses transferred from supporting framing members to other items that are not engineered to support or resist the transferred loads.
 - 8) Material fatigue, including deterioration, cracking or brittleness, identified by inspection, data analysis or other means of detection.
 - 9) Displacement of glazing gaskets.
 - 10) Loosening, weakening, or permanent damage to fasteners, anchors, attachments and other components.
 - 11) Vibration or noise caused by thermal or structural movement, or wind, including rattle and flutter.
- b. **Catastrophic Failure:** Discernible failure impossible to acceptably remedy or correct in place, or that necessitates remedial repair, in each case as determined by the Architect, including
- 1) Buckling, deflection, or other structural performance necessitating remedial repair.
 - 2) Failure of operable units to open or close, or to otherwise achieve the full range of design movement.
 - 3) Permanent deformation of any material or component exceeding specified limits.
 - 4) Breakage or fallout from an assembly of any material or component.
 - 5) Air infiltration or water leakage.
 - 6) Material adhesive or cohesive failure, including tearing.
 - 7) Corrosion, staining or other deleterious effects due either to physical contact of dissimilar metals or to water runoff passing over dissimilar metals.
 - 8) Water leakage.
 - 9) Loss of waterproofing integrity, allowing the intrusion of water, oils, gasoline, grease, salt, chemicals, acids or other fluids to outside surface of substrate.
 - 10) Chalking or color changes relative to a control sample of the original application beyond those described in manufacturer-published information.
30. **Furnish:** To supply and deliver an item to the project site in an operable condition, ready for unpacking, assembly, and installation.
31. **Heavy Timber:** Sawn timber measuring 5- inches or more in nominal thickness at the least dimension.
32. **Include:** Inclusion without limitation, in the largest encompassing sense. Other terms, including “such as”, and similar terms are synonymous with “include”.
33. **Indicate:** Expressed by graphic representations or in written form on the Contract Drawings, or elsewhere in the specifications, without limitation of location, unless specifically noted. Other terms, including “indicated”, “shown”, “noted”, “scheduled”, and similar terms, are synonymous with “indicated”.
34. **In situ:** In the position an item will finally occupy.

35. **Install:** Handle, unload, store, unpackage, assemble, erect, construct, place, anchor, apply, connect, work to dimension, complete, finish, cure, adjust, clean, protect and similar operations at the project site, in final position, and in operable and useable condition.
36. **Installer:** Contractor or other entity engaged by the Contractor as an employee, subcontractor, or sub-subcontractor to perform a particular construction operation at the project site, including preparation, erection, installation, application, construction, re-installation and similar operations required for execution of the work.
37. **Instructions:** Written directions, diagrams, recommendations, precautions, specifications and similar instructions published by a product supplier, manufacturer or fabricator.
38. **Interior:** Conditioned space or pertaining to conditioned space that is completely enclosed by floor, wall, and ceiling or roof construction, and solid doors or fenestration systems. Ventilated unconditioned spaces are not interior spaces.
- a. **Semi-Exterior:** An unconditioned or semi-heated space or pertaining to unconditioned or semi-heated space that is completely enclosed by floor, wall, and ceiling or roof construction, and solid doors or fenestration systems through which thermal energy may be transferred to or from interior spaces, other semi-exterior spaces, or the exterior. Ventilated unconditioned spaces are not semi-exterior spaces.
 - b. **Exterior:** A space that does not meet the definition above for either an "interior" or a "semi-exterior" space.
39. **LEED:** U.S. Green Building Council (USGBC) Leadership in Energy & Environmental Design rating system.
40. **Lightgage Metal Framing:** Non-structural metal framing members having a base metal thickness of 30 mils (20-gage) or less and installed in non-load-bearing interior construction assemblies supporting plaster or gypsum board.
41. **Manufacture:** Produce standard, custom or proprietary units generally utilizing a mass-production method. Other terms, including "manufactured", "manufacturer", and similar terms, have the same meaning as "manufacture".
42. **Match:** Provide a portion of the work using the same product, system or execution method identical in dimension, finish, color, texture, and work results to one of the following, as determined by the Architect.
- a. Another portion of the work.
 - b. Existing conditions adjacent to new work.
 - c. A design reference sample in the Owner's or the Architect's possession.
 - d. An approved sample, range of samples, mockup or sample panel.
43. **Material:** A basic substance, often a commodity, used in construction or to manufacturer products and other items used in construction
44. **May:** "Has discretion to", "is permitted to", or "is authorized to". See definitions below for "must" and "shall".
45. **Must:** "Is required to" when used to impose an obligation on someone or something other than the object of a sentence; or when the active subject is incapable of assuming a duty or obligation. See definition above for "may" and definition below for "shall".
46. **Non-Roof Surface:** Top cover of a building having a slope more than 60 degrees from the zero-degree horizontal plane.
47. **Or Equal:** See definition above for "approved substitute".
48. **Partially-Controlled Enclosure:** See definition above for "enclosure".
49. **Permanent Enclosure:** See definition above for "enclosure".
50. **Permanent Deformation:** Displacement or change in dimension of a material or component after an applied load has been removed and the specimen has relaxed for specified period of time.
51. **Practical:** Useful, based on previous experience.

52. **Practicable:** Useable for a specific purpose capable of being done with means at hand and circumstances as they are.
53. **Product:** Components, or assemblies of components, purchased for permanent incorporation into the work, whether purchased specifically for the project or taken from previously purchased stock that was not previously incorporated into another project or facility. Other similar terms including “manufactured units”, “equipment” and “accessories”, are synonymous with “products”.
54. **Provide:** Furnish and install, complete and in-place, ready for operation and use. Whenever the terms “furnish”, “install” or “provide” are not explicitly stated, the term “provide” is implied.
55. **Regulation:** A law, ordinance, statute, or lawful order issued by authorities having jurisdiction, and rules, conventions, or agreements within the construction industry that prescribe performance of the work.
56. **Related Trades:** Installers, applicators, erectors, constructors and fabricators whose work will come into contact with, will penetrate, is directly adjacent to, or is otherwise integral to or materially impacted by the work of a given scope.
57. **Roof Surface:** Top cover of a building having a slope of 60 degrees or less from the zero-degree horizontal plane.
58. Samples:
- a. **Design Reference Sample:** Samples of appearance (color, texture, sheen and finish), pre-approved by **the Architect**.
 - b. **Sample:** Samples of appearance (color, texture, sheen and finish), submitted to **the Architect** for review and approval.
 - c. **Field Sample:** Physical examples illustrating proposed finishes, coatings, or finish such as concrete, brick, or stone, installed or applied in the field for review by **the Architect**.
 - d. **Sample Panel:** Scaled-down pre-production samples incorporating full-scale details of architectural features, finishes, textures, transitions and repair techniques for review by **the Architect**.
 - e. **Mock-Up:** Full-size assemblies erected for review of construction, coordination of the work specified in several sections, testing, operation, training of the trades and similar activities, and aesthetic or other for review by **the Architect**.
59. **Section:** A numbered and titled portion of these Specifications.
60. **Selected Products:** Materials, products, components and accessories selected by the Contractor from among specified materials, products, components and accessories, or from approved substitution requests, for inclusion into the project. Other **similar** terms including “selected materials”, “selected manufactured units”, “selected equipment”, “selected components”, “selected accessories”, “selected mixes”, **are synonymous with** “selected products”.
61. **Service Condition (SC):** Means a benchmark used to measure a product, assembly or system’s exposure to weather or abrasion expressed by one of the following.
- a. **Very Severe Exposure (SC-4):** Exposed to harsh conditions or subject to frequent exposure to moisture, chemicals, cleaners and saline solutions, plus likely damage by denting, scratching or abrasive wear.
 - b. **Severe Exposure (SC-3):** Exposure to condensation, perspiration, infrequent wetting by rain, and cleaners.
 - c. **Moderate Exposure (SC-2):** Exposure mostly to dry indoor atmospheres but subject to occasional condensation, wear, or abrasion.
 - d. **Mild Exposure (SC-1):** Exposure to indoor atmospheres with rare condensation and subject to minimum wear or abrasion.

62. **Shall:** “Has a contractual obligation or duty to” when used to convey a contractual obligation imposed on the subject of a sentence. See definitions above for “may” and “must”.
63. **Similar:** A portion of work that matches the whole or part, as indicated, of another portion of the work, but has a different geometric configuration.
64. **Submit:** Contractor to prepare and present written or graphic evidence to the Architect for approval, unless otherwise stated.
65. **Substitution:** An unspecified product, system or execution method proposed by a Bidder or the Contractor for incorporation into the work.
66. **Suitable:** Meant or adapted for the purpose indicated or intended by the Contract Documents, as determined by the Architect. Other terms including “reasonable”, “proper”, “correct”, “necessary”, and similar terms, have the same meaning as “suitable”.
67. **Symmetrical:** A portion of work that matches either itself or the whole or part of another portion of the work, as indicated, the geometric configuration of which is reflected about a centerline or axis of a surface or a space; or rotated around a point in space.
68. **System:** A group of many, often diverse parts joined in regular interaction or interdependence, and subject to a common plan or serving a common purpose to form an integral, organic, or organized whole (e.g., a suspended acoustical ceiling system).
69. **Timber:** The wood of trees cut and prepared for use as building material.
70. **Uncontrolled Enclosure:** See definition above for “enclosure”.
71. **Underground:** Location that does not meet the definition above for “aboveground” or “above grade”.
72. **Wall:** One of the sides of a room or building connecting a floor and ceiling or foundation and roof and having a slope less than 30 degrees from the 90-degree vertical plane.
73. **Weather Exposed:** See definition below for “exposed”.
74. **Wet Work:** Materials that need moisture or water added as part of application or installation, which subsequently dry are considered to be wet work (e.g., concrete, plaster, drywall mud, paints and coatings, sealants, etc.)
75. **Work Result:** Results of applying particular skills and techniques to construction materials, products, assemblies and systems.
- a. A work result may pertain to either several manufactured products (e.g., exterior insulation and finish system) or a single product (e.g., a chalkboard).
- b. A work result could also involve only labor and equipment (e.g., a trenching).

1.04 REFERENCE STANDARDS

- A. General: Work specified by reference to a standard or specification published by a government agency, technical association, trade association, professional society or institute, testing agency, or other organization must either meet or exceed the minimum standards of quality for materials and workmanship established by the designated standard or specification.
1. Each entity engaged in construction on the project must be familiar with the specified industry standards applicable to that entity’s construction activity.
 2. In case of conflict between referenced standards and documents and the Contract Documents, or between referenced documents, the document having the most stringent requirements applies. Submit discrepancies to the Architect for a decision before proceeding with the affected work any requirements that are different but apparently equal, and uncertainties as to which quality level is more stringent.
 3. Where both a standard and a brand name are specified for a product in the project Manual, the proprietary product named must conform to or exceed the requirements of the specified reference standard. The listing of a trade name in a Project Manual may not be construed as warranting that such product conforms to the respective reference standard.

B. Applicability:

1. The applicable edition of a reference standard or specification is the latest date of issue (a) (30) thirty days before bids are received; (b) when bids are requested; or (c) if there is no bid, then on the effective date of the Agreement, except:
 - a. Where a specified publication date follows the title of a referenced standard or specification in the body text of the Contract Documents.
 - b. Issues listed in governing building codes and regulations supersede the above requirements.
2. Provisions of any referenced standards or specifications, whether or not specifically incorporated by reference in the Contract Documents, may not change the duties and responsibilities of the Owner, the Architect, **the Contractor**, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor to assign to any of them any responsibility, duty or authority for safety precautions or procedures, or to supervise or direct the performance of the work.

PART 2 - PRODUCTS

2.01 COPIES OF STANDARDS

- A. Copies of applicable referenced standards and specification are not bound in the Project Manual.
- B. Where copies of standards are needed for superintendence and quality control of the work, obtain a copy or copies directly from the publication source and maintain copies in an orderly manner at the project site, available to the Contractor's personnel, subcontractors, the Owner, and the Architect during normal business hours.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 43 00
QUALITY ASSURANCE

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

A. Administrative and Procedural Requirements for::

1. Quality Assurance and Quality Control activities.
2. Testing and inspecting services necessary to verify conformance with indicated or specified requirements.

B. Related Requirements:

1. Section 01 43 39 for administrative and procedural requirements for mockups, laboratory testing specimens, and field samples.

1.02 REFERENCES

A. Abbreviations and Acronyms:

1. CCA: Construction Contract Administration.
2. NIST: National Institute of Standards and Technology.
3. NRTL: Nationally Recognized Testing Laboratory.
4. NVLAP: National Voluntary Laboratory Accreditation Program.
5. QA: Quality Assurance.
6. QC: Quality Control.

B. Definitions:

1. Field Quality Control Testing: Tests and inspections of installed work performed by a qualified testing agency are acceptable to the AHJ at the project site.
2. Pre-Construction Testing: Tests and inspections performed specifically for the project to verify performance or compliance with the specified criteria before products and materials are incorporated into the work
3. Product Testing: Tests and inspections performed by a qualified testing agency acceptable to the AHJ to establish product performance and conformance to specified industry standards.
4. QA Services: Activities, actions and procedures implemented before and during the execution of the work to guard against defects and deficiencies, and result in construction that conforms to the requirements of the Contract Documents.
5. QC Services: Activities, actions and procedures, including tests, inspections, procedures, and related actions that are implemented during and after the execution of the work to measure and evaluate whether in-service items and completed construction conforms to the requirements of the Contract Documents. Services do not include CCA activities performed by the Architect.
6. Required Auxiliary Services:
 - a. Provide access to the work for testing and inspection and furnish incidental labor and facilities necessary to facilitate tests and inspections.
 - b. Take adequate quantities of representative samples of materials required for specified testing or assist the agency in taking samples.

- c. Provide facilities for storage and curing of test samples and deliver samples to testing laboratories.
 - d. Provide testing and inspection agencies with preliminary design mixes proposed for use where mixes require control by a testing agency.
 - e. Provide security and protection of samples and test equipment at the project site.
7. Source Quality Control Testing: Tests and inspections performed by a qualified testing agency acceptable to the AHJ at the source (i.e., the plant, mill, factory, or shop).
8. Testing Agency: Entity appointed to perform specific tests, inspections or both. The term "testing laboratory" is synonymous with "testing agency".
- a. NRTL NRTL conforming to the requirements of 29 CFR 1910.7
 - b. NVLAP Testing agency accredited in conformance with NIST's NVLAP
9. Installer: Contractor or other entity appointed by the Contractor as an employee, subcontractor, or sub-subcontractor to perform a particular construction operation, including installation, erection, application and similar operations. Other terms, including "applicator" and "erector" are synonymous with "installer".

1.03 ADMINISTRATIVE REQUIREMENTS

A. Conflicting Requirements:

- 1.If conformance with (2) two or more requirements or standards is specified, and if requirements or standards appear different or in conflict, the most stringent requirements or standards govern. Promptly submit an RFI to the Architect for interpretation before proceeding with the work.
- 2.Notify the Architect of uncertainties and requirements that are different, but apparently equal for an interpretation before proceeding with the work.

B. Coordination: Coordinate sequence of activities to accommodate required QA and QC services with the least practicable delay, and to avoid removing and replacing construction to accommodate testing and inspecting.

C. Scheduling: Schedule times for testing, inspections, sampling, and similar activities.

1.04 SUBMITTALS [Were indicated for Contractor provided testing]

A. Certificates: Submit copies of permits, licenses, certifications, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for conformance with standards and regulations necessary for the performing the work.

B. Inspection Reports: Submit certified written reports that include the following.

- 1.Date of issue
- 2.Project title and number
- 3.Name, address and telephone number of the testing agency
- 4.Dates and locations of samples, tests and/or inspections
- 5.Names of the individuals performing tests and inspections
- 6.Description of work, testing and inspection methods
- 7.Identification of tested or inspected product and the Specification Section
- 8.Complete test and/or inspection data
- 9.Test and inspection results along with an interpretation of the results

10. A record of the temperature and weather conditions at time of sampling, testing and inspection
11. Comments and/or professional opinions on whether tested or inspected work conforms to the Contract Document requirements
12. Name and signature of inspector
13. Recommendations for re-testing and re-inspection

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Must be an NRTL, NVLAP, or independent agency conforming to the requirements of ASTM E 239 and acceptable to the AHJ, with at least (10) ten consecutive years experience providing testing and inspection services on a weekly basis for projects similar in material, design, complexity, and extent to this project, and whose products have resulted in applications with a record of successful in-service performance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 QUALITY CONTROL {Where indicated for contractor required testing}

A. Quality Control Services:

1. Where the AGENCY requires testing and inspection, such tests and inspections are performed by a qualified independent testing and inspection agency acceptable to the Architect and the AHJ; and must be witnessed by the testing agency's personnel, the applicator, the Contractor, and the AGENCY.
 - a. The Owner furnishes the Contractor with names, addresses, and telephone numbers of testing agencies appointed, and a description of the types of testing and inspecting they are engaged to perform.
 - b. The Contractor shall coordinate with AGENCY inspectors to:
 - 1) Arrange all tests and inspections
 - 2) Coordinate its work and the construction schedule with the specified tests
 - 3) Coordinate the requirements of each required or specified test and inspection with other specified or required tests and inspections
 - 4) Provide all work, facilities, personnel and controls necessary for each test and inspection
 - 5) Notify the testing agency personnel, the applicator, the waterproofing membrane manufacturer's field representative and the **Architect** that the work is ready for inspection
 - 6) Receive all test reports and distribute copies to the applicator and the waterproofing membrane manufacturer's field representative
2. Where quality control services are indicated as the Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. The Contractor may not employ the same entities appointed by the AGENCY, unless agreed to in writing by the AGENCY.

- b. Notify testing agencies at least (24) twenty-four hours in advance when work requiring testing or inspection will be performed.
 - c. Submit a certified written report to the AGENCY of each quality-control service performed.
 - d. Submit additional copies of each written report directly to all authorities having jurisdiction, when so directed.
 - 3. Testing and inspections not explicitly assigned to the AGENCY are the Contractor's responsibility.
 - a. Unless otherwise indicated, provide quality-control services (1) Required by the Contract Documents; and (2) Required by the AHJ.
 - b. Perform quality-control services required of the Contractor by the AHJ, whether specified or not.
 - 4. Testing and inspection requested by the Contractor that are not required by the Contract Documents are the Contractor's responsibility.
 - 5. Contractor to provide quality control services, including re-testing and re-inspection for work to replace construction that failed to comply with the Contract Documents, regardless of whether original testing or inspections were the Contractor's responsibility.
- B. Testing Agency Responsibilities:
- 1. Testing and Inspection Agencies are required to:
 - a. Provide qualified personnel to perform required tests and inspections.
 - b. Notify the AGENCY and Contractor promptly of irregularities or deficiencies observed in the work during performance of its services
 - c. Determine the location from which test samples are taken and in which in-situ tests are conducted
 - d. Conduct and interpret tests and inspections, and state whether tested and inspected work conforms to the specified requirements in each report
 - e. Submit certified written reports of each test, inspection, and similar quality control services to the AGENCY through the Contractor
 - 2. Testing and Inspection Agencies may not:
 - a. Release, revoke, alter, or increase any Contract Document requirements.
 - b. Approve or accept any portion of the work.
 - c. Perform any of the Contractor's duties.
- C. Manufacturer Services: Where specified, the work may be subject to examination by the manufacturer's field representative.
- 1. As the work progresses, the manufacturer's field representative periodically examines for defective materials, defective fabrication and application (workmanship), and conformance to the manufacturer's application instructions and other requirements.
 - a. Verify areas have not been missed.
 - b. Note defects and identify conditions and items that do not conform to the manufacturer's application instructions and other requirements.
 - 2. During each field representative visit, itemize into a punch list all defects, improperly performing items, and nonconforming conditions and items.

3. For each item listed, record the field representative's recommendations for correcting each defect and improperly performing item, or for bringing each nonconforming condition or item into conformance to the manufacturer's application instructions and other requirements.
4. Before final inspection or acceptance, schedule a meeting at the project site with the manufacturer's field representative to review surface preparation and application procedures.
 - a. Invite all parties that were present at the Pre-Installation Meeting to attend.
 - b. Notify invitees at least (10) ten days before the scheduled meeting.
- D. Nonconforming Work: When testing reveals items that are deficient, faulty, do not perform properly, or do not conform to the specified requirements, make corrections acceptable to the AGENCY, then arrange and pay costs for re-testing until it can be demonstrated that all items perform properly and conform to the specified requirements, as determined by the AGENCY.
- E. 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.

END OF SECTION

SECTION 01 45 16
CONTRACTOR QUALITY CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Administrative and procedural requirements for quality control of the work.

1.02 REFERENCES

A. Required Auxiliary Services:

1. Provide access to the work for testing and inspection and furnishing incidental labor and facilities necessary to facilitate tests and inspections.
2. Take adequate quantities of representative samples of materials required for specified testing; or assisting the agency in taking samples.
3. Provide facilities for storage and curing of test samples; and delivery of samples to testing laboratories.
4. Providing testing and inspection agencies with preliminary design mixes proposed for use where mixes require control by a testing agency.
5. Providing security and protection of samples and test equipment at the project site.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Contractor's Quality Control Program:

1. Establish a quality control program to perform sufficient testing and inspection of all items of work, including that of all subcontractors, to ensure conformance with the Contract Document requirements for materials, workmanship, construction, finish, functional performance, and identification.
 - a. Quality control programs must ensure the work conforms to the requirements of the Contract Documents.
 - b. Quality control must be adequate to cover all construction operations.
2. Apply, install, connect, erect, use, clean, adjust, and condition items in compliance with their manufacturer's instructions, unless more restrictive or stringent requirements are stated in the Specifications.
3. In the event of conflicts between the manufacturer's instructions and the Contract Documents, the manufacturer's installation instructions govern. Promptly submit an RFI to the AGENCY for interpretation before proceeding.

B. Contractor Assistance:

1. Cooperate with testing and inspecting agencies, other companies providing similar services, and provide reasonable auxiliary services as requested.

1.04 QUALITY ASSURANCE

- A. Installer's Qualifications: Where the Specifications dictate a certain level of experience or expertise from the installer by requiring a minimum number of years of experience in the successful installation of a product or a minimum number of successful installations for the product specified, it is the Contractor responsibility to
1. verify the installer's competence and track record before signing a subcontract to perform the affected work; and
 2. collect evidence of the specified minimum qualifications and retain such evidence in the event of an audit.

1.05 ADMINISTRATIVE STAFF

- A. Provide competent and adequate staff for administration, coordination, supervision, and superintendence of the work.
1. Key staff members must be full time employees operating full-time at the project site.
 2. Key members of this staff are not to be changed without written consent of the AGENCY, unless such staff members prove to be unsatisfactory to the Contractor and cease to be in employ. If the Contractor intends to change a key staff member, the Contractor shall give the AGENCY written notice at least (15) fifteen business days before the intended change.
- B. The Contractor's Project Administrative Staff must include the following:
1. Project Manager: A person with the responsibility for prosecution of the work; and who has the authority to act in matters of coordination, direction, and technical administration of the work. Provide the AGENCY with name of the Project Manager before commencement of the work. Project Manager shall have a minimum of (5) five years of experience on OSHPD/HCAI and Public Works projects of similar complexity.
 2. Superintendent: A person in attendance at the project site during performance of the work that represents the Contractor. Superintendent shall have a minimum of (5) five years of experience on OSHPD/HCAI and Public Works projects of similar complexity.
 3. For each day work is performed at the site between the start date specified in the contract proposal and the acknowledgement of completion of Work specified in VCSS Section 6-8 for which the above required project superintendent is not at the job site, or each working day the above project manager assigned to this project is not employed by the Contractor, the Contractor will be assessed liquidated damages of \$1,100.00 per day. The project manager can temporarily act in the capacity of the project superintendent in the event of temporary illness, vacation, or emergency to the project superintendent. Alternatively, in the event of illness, vacation, etc., a superintendent may be substituted per the provisions of Section B, below. These liquidated damages are in addition to those specified elsewhere.
 4. Additional Staff {If PM feel required for project site}:
 - a. Provide services of coordinating engineers for HVAC, Plumbing, Fire Protection, and Electrical Work and responsible for the following.
 - 1) Coordination of the mechanical and electrical work with the work of other trades.
 - 2) Review of mechanical and electrical shop drawings.
 - 3) Resolution of conflicts and interferences between trades.
 - 4) Directing adjustments in the work as required to comply with the Contract Documents.
 - 5) Commissioning of mechanical and electrical systems.

- b. Coordinating engineer must have previous experience in coordinating these areas of work on projects similar in material, design, complexity and extent to this project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Before beginning installation of any material, product, component, system, assembly or equipment, verify existing work performed as part of the work of other Sections conforms to the installed item manufacturer's application tolerance requirements; provides application, durability, appearance, and performance.

3.02 INSTALLATION

- A. Proceeding with installation or application stipulates the Installer's or Applicator's acceptance of existing conditions. After starting work, the Installer or Applicator performs remedial work necessary to correct deficient conditions to bring them into conformance with the manufacturer's installation or application requirements.
- B. Where Specifications require items that are subject to examination by the manufacturer's field representative, the manufacturer's field representative periodically examines the work as it progresses for defective materials, defective fabrication and application (workmanship), and conformance to the manufacturer's application instructions and other requirements.

END OF SECTION

SECTION 01 45 23
TESTS AND INSPECTIONS

PART 1 GENERAL

1.01 GOVERNING BUILDING CODES

- A. Governing Codes: California Building Code 2019 Edition.

1.02 SECTION INCLUDES

- A. Provide plant, equipment, transportation, materials, labor and technical services required to perform on- or off-site sampling, identification, certification, testing, special inspections and reporting as specified herein and in the technical specifications, to establish compliance with the Contract Documents, above-referenced Code Regulations and as necessary to properly complete the Contract.

1.03 COOPERATION AND ACCESS

- A. Any required testing and/or inspections shall be in cooperation with and coordinated with the work and installation schedules of the trades specified in the various specifications sections.
- B. Cooperation: Contractor shall cooperate with and provide testing laboratory and Agency's Inspectors opportunity and assistance in taking samples, making field tests and performing required inspections.
- C. The Engineer and Agency's Inspector shall at all times have access for the purpose of inspection, identification or sampling to all parts of the work and to the shops where work is in preparation. Contractor shall at all times maintain proper facilities and safe access for such inspection.

1.04 AGENCY INSPECTOR

- A. See VCSS 2-13.5.

1.05 TESTING AGENCIES

- A. Selection: The Agency will provide or designate the testing and inspection organizations and personnel.

1.06 TEST AND INSPECTION REPORTS

- A. The Testing Agencies shall report the results of tests and inspections performed, in writing and shall furnish the number of copies required herein. The reports shall state that the tests or inspections were made under the responsible charge of a Testing Engineer who holds a license to practice Geotechnical Civil or Quality Engineering in the State of California, and that testing or inspections were performed in accordance with the provisions of the Specifications and the applicable building codes. Test reports shall show specified design strengths,

the corresponding test results and state that the tested material either passed or failed to pass the tests.

- B. Reports shall be executed immediately upon conclusion of each procedure and copies forwarded to: Engineer, Architect, Structural Engineer, Agency's Inspector, Contractor, and the HCAI Inspector of Record.

1.07 SPECIAL REQUIREMENTS

- A. The Engineer and Inspector reserve the right to demand for test or special examination any material, item or assembly, or parts thereof, to assure compliance with the letter or intent of the specifications. They may reject for satisfactory correction or replacement at the sole expense of the Contractor, any material, workmanship or part thereof judged defective or non-conforming as a result of such test or examination.

1.08 PAYMENT

- A. The following testing costs shall be assessed to the Contractor by deductive change order and deducted from amounts due or to become due the Contractor:
 - 1. Testing of unidentified materials.
 - 2. Testing of materials substituted for those specified or previously qualified.
 - 3. Tests, re-tests, re-examinations or special examinations of materials or workmanship found to not comply as specified in Paragraph 1.07 above.
 - 4. Tests or inspections required due to Contractor's error.
 - 5. Excessive costs due to faulty, wasteful or improper scheduling or work practices, failure to conform to accepted schedules or make required notifications.
 - 6. Additional procedures required solely in the interest or convenience of the Contractor, including alternative concrete mix designs.
- B. At any time prior to completion of the Contract, should it be considered necessary by the Agency to make examinations of or test any work in place by removing or tearing out the same, Contractor on request shall promptly furnish all required facilities, labor and materials necessary. If such work is found to be defective or non-conforming due to the fault of the Contractor or his subcontractors, he shall defray the cost of such examinations and satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the additional costs involved in the examination and reconstruction shall be allowed the Contractor.

1.09 HCAI INSPECTION

- A. This project will be subject to review and approval by the Department of Health Care Access and Information (HCAI) for all code compliance and adherence to

the HCAI approved drawings. The Agency's contracted Inspector of Record (IOR) will review all documents for this project as well as perform on-site inspections and observations. The State Fire Life Safety Officer (FLSO), Area Compliance Officer (ACO), and other HCAI field staff shall be given full access to the project site at all times. It is the Contractor's obligation to meet the requirements of the applicable codes and adherence to the HCAI approved drawings. All reviews and meetings with HCAI will be coordinated with the Agency and IOR.

1. Contractor shall allow IOR full access to project at all times Work is in progress.
2. Contractor shall submit Inspection Requests to IOR at least 48 hours in advance to allow for coordination with specialty inspectors in accordance with the Testing, Inspection, and Observation (TIO) program.
3. Acts or omissions of any inspector (including, without limitation, inspector's failure to observe or report deficiencies in Contractor's Work) shall not relieve Contractor from its responsibility to complete Work in accordance with Contract documents.

PART 2 TESTS AND INSPECTION

2.01 REQUIRED TESTS AND INSPECTIONS

- A. Tests and inspections, as set forth in the California Building Code, State Building Code and Titles 22 or 24, specified in detail in the Technical Specifications will be required and paid for by the Agency, except as hereinbefore specified.
- B. Tests and inspections as indicated in the HCAI T.I.O. (Testing, Inspection, and Observation) Program shall be performed and paid for by the contractor and observed by the Inspector of Record.

2.02 FAILED TESTS AND INSPECTIONS

- A. When testing is scheduled by the Contractor and the work is not ready for inspection, the AGENCY will deduct the costs incurred from the monies still due to the Contractor. The Contractor will be notified by the AGENCY prior to the processing of the deduction.
- B. When testing fails due to deficient work by the contractor, requiring retests, the Agency will deduct the costs incurred from the monies still due to the Contractor. The Contractor will be notified by the Agency prior to the processing of the deduction.

END OF SECTION

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for:
 - 1. Temporary utilities.
 - 2. Support facilities.
 - 3. Miscellaneous temporary construction aids.
 - 4. Security and protection facilities installation.

1.02 REFERENCES

- A. Abbreviations and Acronyms:
 - 1. NECA: National Electrical Contractors Association
 - 2. NEMA: National Electrical Manufacturers Association
 - 3. NFPA: National Fire Protection Association
 - 4. UL: Underwriters Laboratories.

1.03 SYSTEM DESCRIPTION

- A. Design Requirements: Provide design and engineering for construction facilities and temporary controls in compliance with the requirements of the AHJ.
- B. Use Charges:
 - 1. Include cost or use charges for temporary facilities and controls in the Contract Sum.
 - 2. Allow other entities to use temporary services and facilities without cost, including the Owner, the AGENCY, the Architect, Testing and Inspection Agencies, and the AHJ.

1.04 SUBMITTALS

- A. At least (2) two business days prior to the preconstruction conference, and before beginning the construction of temporary facilities, submit the following to the AGENCY for information:
 - 1. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
 - a. Indicate proposed activity in each portion of the work area and identify the areas of limited use or non-use.
 - b. Indicate proposed vehicle access routes to and from the project site and expected frequency of use on adjacent streets.
 - 2. Shop drawings: Submit large scale dimensioned shop drawings of site fencing showing gates and site signs.

1.05 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service in conformance with NFPA 70.
- B. Tests and Inspections: Arrange for the AHJ to test and inspect each temporary utility prior to use. Obtain required certifications and permits.

1.06 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Regardless of previously assigned responsibility, the installer of each permanent service assumes the responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before the AGENCY's acceptance.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Unless otherwise specified, materials, facilities, and equipment utilized for temporary facilities and controls are selected by the Contractor.

PART 3 - EXECUTION

3.01 GENERAL

- A. Locate facilities to adequately serve the project and result in minimum interference with performance of the work. Relocate and modify facilities as required by the progress of the work.
- B. Provide each temporary facility in a ready-to-use condition when needed and as required avoiding delay. Do not remove temporary facilities until they are no longer needed; or until they are replaced by the AGENCY-authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

- A. General: Either install temporary service or connect to existing services. Arrange with the utility company, the AGENCY, and existing users for times when services will be interrupted to make temporary service connections.
- B. Sewers and Drainage: Provide temporary utilities to legally remove effluent. Connect temporary sewers as required by AHJ.
- C. Water Service: Install water service and distribution piping in sizes and pressures necessary for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use by construction personnel. Comply with the requirements of the AHJ for the type, number, location, operation, and maintenance of fixtures and facilities.

- E. Heating and Cooling: Provide temporary heating and cooling as required for construction activities for curing and drying of completed installations; or for protecting installed construction from the adverse effects of low temperatures and high humidity. Select equipment that does not have a harmful effect on completed installations or elements being installed.
- F. Ventilation and Humidity Control: Provide temporary ventilation required for construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity.
 - 1. Select equipment that does not have a harmful effect on completed installations or elements being installed.
 - 2. Coordinate ventilation requirements to produce ambient conditions required and to minimize energy consumption.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics to accommodate construction operations.
- H. Lighting:
 - 1. Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions. Comply with the requirements of the AHJ for the minimum footcandle, type, number, location, operation, and maintenance of the lighting.
 - 2. Install and operate temporary lighting that fulfills security and protection requirements without operating the entire system.
- I. Telephone Service:
 - 1. Provide temporary telephone service in common-use facilities for use by all construction personnel. Install at least (1) one telephone line for each field office.
 - 2. At each telephone, post a list of important telephone numbers including police and fire departments, the Contractor's home office, the Architect's office and the Owner's office.
 - 3. Provide each superintendent with cellular telephone or portable two-way radio for use away from the field office.
- J. Electronic Communication Service:
 - 1. Provide temporary electronic communication service in each field office, including electronic mail.
 - 2. Provide WiFi and make network password available to AGENCY and designers.
- K. Sanitary:
 - 1. Contractor shall provide temporary toilet facilities. The Contractor will not be allowed to use the AGENCY restroom facilities whether in existing facilities or those being constructed.
 - 2. Contractor shall submit proposed location of temporary toilet(s) to the AGENCY's Representative for approval.
 - 3. Construction personnel will not be allowed to use VCMC Campus restroom facilities for personal or equipment clean-up.
 - 4. Sanitary Facilities shall be in accordance with OSHA regulations.
- L. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

1. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel office activities and to accommodate project meeting specified in other Division 01 Sections. Keep office clean and orderly.
2. Furnish and equip offices as follows:
 - a. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - b. Conference room of sufficient size to accommodate meetings of (10) ten individuals. Provide electrical power service and 120-V AC duplex receptacles, with not less than (1) one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack board.
 - c. Drinking water and private toilet.
 - d. Coffee machine and supplies.
 - e. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - f. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
3. AGENCY Inspector Office(s): Provide private field office for AGENCY's use in accordance with Section 8 of the VCSS. Private offices are to accommodate (3) three AGENCY representatives and shall be equipped with a plan table, mini-fridge, desks and chairs.
4. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - a. Store combustible materials apart from building.

3.03 SUPPORT FACILITIES INSTALLATION

- A. General: Maintain support facilities until near Substantial Completion and remove them before Substantial Completion. Personnel remaining after Substantial Completion are permitted to use permanent facilities under conditions authorized by the Owner.
- B. Temporary Paved Areas: Construct and maintain temporary paved areas adequate for construction operations.
 1. Locate temporary paved areas in the same location as permanent paved areas.
 2. Extend temporary paved areas as necessary for construction operations, and within the indicated construction limits.
 3. Coordinate elevations of temporary paved areas with permanent paved areas.
 4. Prepare subgrade and install subbase and base layer for temporary paved areas as specified in Division 31 Sections.
 5. Recondition base after temporary use, including removing contaminated material, re-grading, proof rolling, compacting, and testing.
 6. Protect from damage all raised edges and areas around permanent drains, curbs, and similar items located within temporary paved areas.
- C. Traffic Controls:
 1. Determine the routing of construction vehicles before beginning work, based on restrictions indicated on the Drawings and the safeguards and procedures necessary to carry out the work.
 2. Maintain all-weather temporary access to the site and to designated truck unloading area or areas; make access available to all trades.
 3. Control construction traffic within and adjacent to the site.

4. Provide entrances, lifts, and safeguards required or necessary to the progress of the work and control such traffic to limit hazards to the work and all persons.
 5. Route construction equipment, trucks, and similar vehicles via existing public streets to and from the site, as approved by the AHJ.
 6. Obtain and pay for permits and inspections necessary for the use of public streets, sidewalks, curbs, and paving. Post required guarantees and bonds, and repair and make good any damages thereto as required by the AHJ.
 7. Construct and maintain temporary walks and bridges for pedestrians. Keep streets adjacent to the site open to vehicular and pedestrian traffic.
 8. Maintain unfettered access for law enforcement agencies; and for fire and ambulance service.
 9. Provide and maintain proper traffic controls for the safety of all persons.
 - a. Provide necessary barricades, suitable and sufficient lights, reflectors, and danger signals.
 - b. Provide warning and closure signs, directional and detour signs.
 - c. Provide additional measures as necessary.
 10. Indicate restricted and dangerous conditions existing on or adjacent to the site on a 24-hour basis.
 - a. Illuminate barricades, danger signals, warning signs and obstructions at night.
 - b. Keep warning lights burning from one hour before sunset until one hour after sunrise.
 11. Provide adequate traffic control as required for safe delivery.
- D. Parking: Contractor to provide temporary parking areas for construction personnel as specified in Section 01 14 13. Location to be approved by AGENCY.
- E. Project Identification and Temporary Signs: As specified in Section 01 58 13.
- F. Waste Disposal Facilities: Provide waste-collection containers sized to adequately handle waste from construction operations without being piled high or overflowing. Comply with requirements of the AHJ.
- G. Lifts and Hoists:
1. Provide facilities necessary for hoisting materials and personnel.
 2. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and are not temporary facilities.
- H. Temporary Elevator Use: As specified in Section 01 12 19 for the temporary use of permanent elevators.
- I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are inadequate.
- J. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so that finishes are undamaged at time of acceptance.

3.04 MISCELLANEOUS TEMPORARY CONSTRUCTION AIDS

- A. Provide and maintain miscellaneous temporary construction aids necessary for proper execution of the work, including stairs, ladders, ramps, railings, canopies, scaffolds and hoists, chutes, barricades, enclosures, platforms, swing staging, and walks.
- B. Locate in and about the project as practicable and where they will not interfere with the progress of the work. Relocate when necessary during construction and remove promptly when no longer needed.
- C. Provide openings where required for installing large pieces of equipment.
 - 1. Close openings after the equipment is in place.
 - 2. Restore finishes to a condition matching adjacent surfaces in a manner that does not lead to or result in any warranty becoming void, as determined by the Architect.
 - 3. With respect to the acceptance or rejection of corrected work, the Architect's decision is final. Acceptance by the Architect of corrected work is contingent upon .
 - a. Corrections and repairs being performed skillfully.
 - b. Corrective or repaired work resulting in sound, permanent construction that is flush and seamless with adjacent surfaces.
 - c. colors and textures matching adjoining and adjacent surfaces, without differentiation.
 - d. No visible evidence of correction or repair, nor any other apparent distinction or seam between original and corrected or repaired work.

3.05 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in conformance with environmental regulations, and in a manner that minimizes possible air, waterway, and subsoil contamination, pollution, or other undesirable effects.
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff; and to prevent airborne dust migrating to adjacent properties and walkways, in conformance with the requirements of the AHJ.
- C. Storm Water Control: Comply with the requirements of the AHJ. Provide barriers in and around excavations and subgrade construction to prevent flooding by storm water runoff from rain.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage. Protect tree root systems from damage, flooding, and erosion.
- E. Noise Control: Execute the work to minimize noise. Requirements for operations that may result in high levels of noise and vibration, odors, and other disruption are specified in Section 01 14 13.
- F. Pest Control: Engage a pest-control service to recommend practices that minimize attraction and harboring of rodents, roaches, and other pests; and to perform extermination and control procedures at regular intervals so the project is free of pests and their residues at Substantial Completion.
 - 1. Obtain an extended pest control warranty for the Owner.
 - 2. Perform pest control operations legally, using environmentally-safe materials and methods.

- G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fencing in a manner that prevents people and animals from easily entering the project site except by entrance gates.
 - 1. Provide the extent required to enclose the entire project site or portion determined sufficient to accommodate construction operations.
 - 2. Obtain and pay for required permits and inspections.
 - 3. Maintain security by limiting the number of keys and restricting distribution to authorized personnel.
- H. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- I. Barricades, Warning Signs, and Lights: Comply with the requirements of the AHJ for erecting structurally-sound barricades, including warning signs and lighting.
- J. Temporary Enclosures:
 - 1. Provide temporary enclosures to protect in-progress and completed construction from exposure, inclement weather, and other construction operations and activities. Provide temporary weathertight enclosure for building exterior.
 - 2. Insulate temporary enclosures where heating or cooling is required or necessary and a permanent enclosure is not complete.
- K. Temporary Fire Protection:
 - 1. Install and maintain temporary fire-protection facilities as required to protect against reasonably predictable and controllable fire losses. Comply with the requirements of NFPA 241.
 - 2. Provide temporary standpipes and hoses for fire protection.
 - a. Hang hoses with warning signs stating that hoses are for fire-protection purposes only and may not be removed.
 - b. Match hose sizes with outlet sizes and equip hoses with suitable nozzles.
 - 3. Contractor is responsible for maintaining Firewatch when required, at no expense to the AGENCY.

3.06 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: To minimize waste and abuse, limit the availability of temporary facilities to essential and intended uses.
- B. Maintenance:
 - 1. Maintain facilities in good operating condition until removal.
 - 2. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where specified, where required to achieve indicated results, and to avoid damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to using permanent facilities until Substantial Completion.

- D. Termination and Removal: Remove each temporary facility and control when need for its service has ended; when it is replaced by authorized use of a permanent facility or control; or not later than Substantial Completion.
1. Complete or restore permanent construction that was delayed because of interference with a temporary facility or control.
 2. Either remove, reinstall, reapply, replace; or arrange and pay costs for removing, reinstalling, reapplying, or replacing non-conforming work; or items that are deficient, damaged or that cannot be satisfactorily corrected or repaired in a manner that both matches adjacent undamaged areas and shows no evidence of correction, repair, or refinishing, as determined by the manufacturer's field representative and the Architect
 3. Materials and facilities that constitute temporary facilities are property of the Contractor. The AGENCY reserves the right to take possession of project identification signs.
 4. At Substantial Completion, clean permanent facilities used during the construction period in conformance with Section 01 74 00.

END OF SECTION

SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and Procedural Requirements for Temporary Project Signage.

1.02 REFERENCES

- A. Abbreviations and Acronyms:

- 1. APA: American Plywood Association.

- B. Definitions:

- 1. Permanent Project Signage: All informational, directional, specialty, and code-required signs required or necessary for identification, communication, way-finding, and safe and proper operation of the project.
 - 2. Temporary Project Signage: All informational, directional, way-finding, and other signs required by law, code, ordinance, or order of the AHJ, and as required to caution, alert, warn, re-route or redirect pedestrian and vehicular traffic around or away from areas of the Contractor's operations; as necessary to provide a safe and proper job site.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. The Contractor provides permanent and temporary project signage described in this section and elsewhere in the Contract Documents.

- 1. The Contractor is solely responsible for the adequacy, conformance, and trade practices of safety related signage, and all signage required by the AHJ.
 - 2. Temporary project signs must be produced by professional sign painters and be of size and lettering style consistent with use; colors as required by either the AHJ or approved by the AGENCY.
 - 3. Advertising signage and signage identifying subcontractors and materials suppliers are not permitted and may not be displayed.
 - 4. Unauthorized signs are not permitted.

- B. The AGENCY may notify the Contractor either before or after the execution of the Contract that it intends to provide some or all the permanent project signage indicated in the Construction Documents as an Owner-Furnished item. In such event the Contractor shall

- 1. Reduce the amount of the Contract Sum in accordance with a Change Order.
 - 2. Schedule and coordinate the installation of Owner-Furnished signs with the Owner's other contractor or sign installer.
 - 3. Provide structural support for all the Owner-Furnished signs as designed by the Architect, at a point of connection determined by the Owner and the Architect.

4. Provide all utility connections for the Owner-furnished signs, including all electricity, gas, data, and controls, at a point of connection determined by the AGENCY and the Architect.
- C. In addition to the temporary signs required by law, code, ordinance or order of the AHJ, and as required for the safe and proper execution of the work, provide and maintain the following.
 1. A project identification sign identifying the project, donor information, and names, with corporate logos, of the principal parties responsible for design and construction.
 - a. The project identification sign must be painted on a surface at least 4 feet high by 8 feet wide, in not less than (4) four colors.
 - b. The AGENCY will provide camera-ready artwork for the project identification sign, including approved text and graphics. The Contractor may not add to, modify, or delete any artwork information without prior written approval from the AGENCY.
 - c. The project identification sign must be mounted on framework, posts, or other structural supports designed and provided by the Contractor and approved by the AGENCY. Paint all surfaces and edges of sign support structure with one coat of primer and at least one coat of exterior paint, with a semi-gloss finish in a color to be determined by the AGENCY.
 - d. The Contractor shall provide and maintain lighting of the project identification sign from at least dusk to midnight, throughout the duration of the work.
 2. The Contractor shall paint and maintain graphics on temporary plywood construction barricades as directed by the AGENCY.
 - a. The AGENCY will provide camera-ready artwork for the project identification sign, including approved text and graphics. The Contractor may not add to, modify or delete any artwork information without prior written approval from the AGENCY.
 - b. Graphics are painted on the temporary construction barricade, 8-feet high by the length of the barricade as shown in the Contract Documents, in no less than four (4) four colors, and may include text, images, logos and/or other graphics as determined by the AGENCY.
 - c. The Contractor provides and maintains lighting of the temporary construction barricade from at least dusk to midnight, throughout the duration of the work.
 - d. The Contractor shall post signage with Contractor's 24/7 contact information at all site entrances in case of emergency.
- D. The Contractor, including all subcontractors, vendors, fabricators, consultants, and personnel are prohibited from installing any permanent or temporary signs at or around the job site, without prior written approval from the AGENCY.

1.04 SUBMITTALS

- A. Submit installation criteria and a sign erection strategy for approval by the AGENCY.
- B. Submit shop drawings and samples for all fabricated signs describing and detailing all project conditions, including
 1. Layout drawings, including all physical dimensions, material call-outs, notes, typeface, size of lettering and graphics, colors, joints and reveals.
 2. Material samples.
 3. Specifications
 4. Methods of assembly.
 5. Structural design and calculation, when required or necessary.

6. Electrical services, where required or necessary.
7. Mechanical services, where required or necessary.
8. Signage locations, including location plans and schedules, and elevations and sections indicating placement and showing relationship to adjacent elements, including all potential conflicts.
9. Methods of attachment and installation.

1.05 QUALITY ASSURANCE

- A. Sign Painter Qualifications: Must have at least (5) five consecutive years'-experience providing the design, execution, construction, and installation of exterior signs on a weekly basis for projects similar in material, design, complexity, and extent to this project, and whose products have resulted in applications with a record of successful in-service performance.

PART 2 - PRODUCTS

2.01 SIGNAGE MATERIALS

- A. Provide materials for sign faces, framing, structure and systems that are
 1. New, undamaged and unused at time of installation, including the specified finish.
 2. Structurally adequate to support signs as indicated or specified.
 3. Suitable and appropriate for the environmental conditions at the place of installation.
- B. Provide signs that are complete with all accessories, trim, finishes, hardware, safety guards, and other devices and details needed for installation for complete intended use and effect.
- C. Unless otherwise specified, temporary signs must be fabricated from at least 3/4-inch thick exterior grade softwood plywood, with medium or high-density phenolic sheet overlay.
 1. Provide standard large sizes to eliminate joints.
 2. Provide sheet thickness as required to span across framing members, and to provide even, smooth surfaces without waves or buckles.
 3. Connect sign panels to framework or structure with adequate and appropriate framing connectors.
- D. Unless otherwise specified, temporary signs must be shop painted and field installed. Paint back of panels and edges for complete weather resistance and finished appearance.
- E. Unless otherwise specified, anchors and fasteners must be of type, grade and class required for intended use, and sized and spaced as required for loads and substrate.
 1. Use steel fasteners with cadmium-plating or other rust inhibitive coating in all concealed locations, except
 - a. Provide stainless steel fasteners for attaching aluminum.
 - b. Use zinc-coated (galvanized) or stainless steel fasteners in all exterior installations, or where locations are exposed to moisture or humidity.
- F. Unless otherwise specified, and where permitted by the AGENCY, attach signs using construction adhesive adhering to the requirements of APA Performance Specification AFG-01.

- G. Unless otherwise specified, powder-driven fasteners are not permitted, and may not be used in load-bearing installations. Where specified, conform to Fed Spec FF-P-395 or Fed Spec GGG-D-777. Paint all visible surfaces to match adjacent surfaces, as required by the AGENCY.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. For the Contractor-installed signs, employ individuals or companies experienced in the installation of signs to perform installation work for all temporary project signs.
 - 1. Acquire all permits required for installation and operation of all temporary and permanent project signs.
 - 2. Locate the project identification sign on site at a location of high public visibility, adjacent to the main entrance to the site; or as directed by the AGENCY.
 - 3. Locate all other temporary signage for optimum visibility; as required by law, code, ordinance or order of the AHJ as required to caution, alert, warn, re-route or redirect pedestrian and vehicular traffic around or away from areas of the Contractor's operations, and as necessary to provide a safe and proper job site.
 - 4. Temporary signs must be secured using attachment methods that do not leave permanent marks, disfiguration, or discoloration on the surfaces of existing structures or the completed work.

3.02 MAINTENANCE

- A. Throughout the duration of the project, the Contractor shall maintain all signs and supports in a neat and clean condition and must patch, repair, or replace all surfaces, including sign faces, framing, and structural supports that become damaged, marred, scratched, distressed, faded, or weathered.
- B. Remove, relocate, and reinstall all project temporary signs as required by progress of the work.

3.03 REMOVAL

- A. Remove all signs, framing, supports, and foundations when directed by the AGENCY.
- B. Patch, repair, replace, and clean all surfaces impacted by the placement and removal of signage.
- C. Remove all temporary project signs before Substantial Completion.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

Administrative and Procedural Requirements for:

1. Selection of products for use in the project.
2. Product delivery, storage, and handling.
3. Manufacturers' warranties.
4. Special warranties.

1.02 REFERENCES

Definitions:

1. Products: An item obtained for incorporating into the work, whether purchased for the project or taken from previously purchased stock. Other terms, "including "material," "equipment," "system," are synonymous with "product".
 - a. Named Products: Items specified by the manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature current as of date indicated on the Contract Documents.
 - b. New Products: Items not previously incorporated into another project or facility. Products salvaged or recycled from another project are not new products.
 - c. Comparable Products: Items that are demonstrated as having corresponding qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics to those of specified products; and are approved for use through the submittal process.
 - d. Basis-of-Design Product: Items for which a specific manufacturer's product is named to establish the salient properties for a given material, fabrication, product, component, or accessory, for the purposes of evaluating comparable products of additional manufacturers also named in the specification.
2. Salient Properties: Attributes indicated in the Contract Documents that are critical to the design and integral to the original selection of a specified product, including performance, weight, size, durability, visual effect, and similar distinguishing features and requirements.
3. Manufacturer's Warranty: Means a written warranty furnished by an individual manufacturer for a particular product, and specifically endorsed by the manufacturer to the Owner.
4. Special Warranty: Means a written warranty required by the Contract Documents to provide specific rights for the Owner.

1.03 QUALITY ASSURANCE

Compatibility of Options: If the specification allows for the option of selecting between two or more products for use on the project, select the product most compatible with the products previously selected, even if previously selected products were also options.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle products using means and methods that prevent damage, deterioration, and loss, including theft and vandalism. Conform to manufacturer-prepared published and supplemental instructions.

Delivery and Handling:

1. Schedule delivery to minimize long-term storage at the project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation to ensure a minimum amount of holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the 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. Promptly inspect products upon delivery to determine conformance with the Contract Documents, and to determine that products are undamaged and properly protected.

Storage:

5. Store products to allow for inspection and measurement of quantity or counting of units.
6. Store materials in a manner that does not endanger the project structure.
7. Store products subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
8. Protect foam plastic from exposure to sunlight, except to the extent necessary for the period during installation and concealment.
9. Conform to manufacturer-prepared published and supplemental instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
10. Protect stored products from damage and protect liquids from freezing.
11. Provide a secure location and enclosure at the project site for storage of materials and equipment by the Owner's construction forces. Coordinate location with the Owner.

Conform to manufacturer-prepared published and supplemental instructions.

D

1.05 PRODUCT WARRANTIES

Warranties specified in other Sections are 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 the Contractor of obligations under the requirements of the Contract Documents.

Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for 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 indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

Warranty Submittals: As specified in Section 01 78 36.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

General Product Requirements: Provide products that conform to the Contract Documents, are undamaged and, unless otherwise indicated, are new at the 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. If available, and unless custom products or non-standard options are specified, provide standard products of types produced and used successfully in similar situations on other projects.
3. The AGENCY may limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Descriptive, performance, and reference standard requirements in the Specifications establish salient properties of products.
5. Or Equal: For products specified by name, and accompanied by the phrase "or equal," "or approved equal," or similar terms, conform to the requirements in "Comparable Products" Article below to obtain approval for use of an unnamed product.

Product Selection Procedures:

6. Product: Where the Specifications name a single manufacturer and product, provide the named product that conforms to the requirements of the Contract Documents. Comparable products and substitutions for the Contractor's convenience are not permitted.
7. Manufacturer/Source: Where the Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that conforms to the requirements of the Contract Documents. Comparable products or substitutions for the Contractor's convenience are not permitted.
8. Products: Where the Specifications include a list of names of both available manufacturers and products, provide either one of the products listed or an unnamed product that conforms to the requirements of the Contract Documents and the requirements specified in the "Comparable Products" Article below for consideration of an unnamed product.
9. Manufacturers: Where the Specifications include a list of available manufacturers, provide a product manufactured by one of those listed or a product by an unnamed manufacturer that conforms to the requirements of the Contract Documents. Conform to requirements in "Comparable Products" Article below for consideration of an unnamed manufacturer's product.

Visual Matching Specification: Where the Specifications require "match the Architect's design reference (target) sample" or similar phrases, provide a product that conforms to the requirements of the Contract Documents and matches the Architect's sample. The AGENCY's decision is final regarding a proposed product's match.

10. If no product available within specified category matches and conforms to other specified requirements, comply with the requirements of Section 01 25 00 for proposing a product.

Visual Selection Specification: Where the Specifications include the phrase "as selected by the Architect from manufacturer's full range" or similar phrase, select a product that conforms to the requirements of the Contract Documents. The Architect and AGENCY will select color,

gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.02 COMPARABLE PRODUCTS

The AGENCY considers comparable products only when all of the following conditions are satisfied. If the following conditions are not fully satisfied, then the AGENCY returns the incomplete comparable product data without action, except to record nonconformance with these requirements. Each comparable product submittal must include

1. Evidence that the proposed comparable product does not require revisions to the Contract Documents; that it is consistent with the Contract Documents; that it produces the indicated results; and that it is compatible with all other portions of the work.
2. A detailed comparison of salient properties specified versus the proposed comparable products.
3. Evidence that the proposed comparable products offer warranties equal to or better than those named in the Specifications.
4. Lists of similar installations for completed projects, with project names and addresses including the names and addresses of the architects and owners, when requested.
5. Samples, when requested.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 64 00
OWNER-FURNISHED PRODUCTS

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for installing the Owner-furnished or vendor-furnished products, including providing supplementary components and accessories for a complete installation.

1.02 REFERENCES

- A. Abbreviations and Acronyms:

- 1. OCFI: Owner-Furnished Contractor-Installed.
- 2. VFCl: Vendor-Furnished Contractor-Installed.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. OFCI Items: The Contractor coordinates delivery of the Owner-furnished equipment. The Owner furnishes the equipment to coincide with the contractor's construction schedule.
 - 1. The Owner:
 - a. Furnishes manufacturer's literature, shop drawings, or other appropriate information for the Contractor to prepare required shop drawings.
 - b. Furnishes the standard integral parts of the equipment.
 - c. Delivers items to site.
 - 2. The Contractor:
 - a. Verifies mounting and utility requirements for Owner-furnished items.
 - b. Receives and unloads items at the project site and, on a form acceptable to the Owner, gives written receipt for items at the time of delivery, noting visible defects and omissions (if such declaration is not given, the Contractor assumes responsibility for such defects and omissions).
 - c. Stores items until ready for installation, and protects items from loss and damage.
 - d. Uncrates, assemble, and sets items in place.
 - e. Installs items in conformance with the manufacturer's recommendations, instructions, and shop drawings; and under the supervision of the manufacturer's representative, where specified.
 - f. Supplies all labor and material required for installation, and for making mechanical, plumbing, and electrical connections necessary to operate installed items.
 - g. Provides and installs backings for all items that weigh (20) twenty pounds or more.
- B. OFOI and VFVI Items: The Contractor coordinates the delivery of Owner-furnished or vendor-furnished equipment. The Owner or Vendor furnishes the equipment to coincide with the contractor's construction schedule.

1. The Owner or Vendor:
 - a. Furnishes manufacturer's literature, shop drawings, or other appropriate information for the Contractor to prepare required shop drawings.
 - b. Furnishes the standard integral parts of the equipment.
 - c. Delivers items to site, unloads, handles, and stores items.
 - d. Makes connections to roughed-in utilities.
 2. The Contractor:
 - a. Verifies mounting and utility requirements for Owner-furnished items.
 - b. Receives items at the project site and, on a form acceptable to the Owner, gives written receipt for items at the time of delivery, noting visible defects and omissions.
 - c. Provides rough-ins of utility items in conformance with the manufacturer's recommendations, instructions, and shop drawings; and under the supervision of the manufacturer's representative, where specified.
 - d. Provides and installs backings for all items that weigh (20) twenty pounds or more.
- C. Existing Item Relocation:
1. Where indicated, existing equipment shown as remaining and relocated is re-installed by the Contractor, who shall:
 - a. Removes items from their original location.
 - b. Recap and label existing utilities in their original location.
 - c. Stores items until ready for installation and protects items from loss and damage.
 - d. Verify mounting and utility requirements for relocated items.
 - e. Relocates items to their new locations.
 - f. Install items, supply all labor and material required for (1) reinstallation; and (2) make new mechanical, plumbing, data, and electrical connections.
 - g. Patch or repair existing surfaces to match adjacent areas where existing items are removed.
 - h. Provides and installs backings for all items that weigh (20) twenty pounds or more.
- D. Existing Item Removal:
1. Where indicated, the Contractor shall:
 - a. Remove items from their original location.
 - b. Recap and label existing utilities in their original location.
 - c. Remove and dispose of existing items from the project site, unless indicated as being turned over to the Owner.
 - d. Patch or repair existing surfaces to match adjacent areas where existing items are removed.
- E. Provisions for Future Items:
1. Where indicated, the Contractor shall:
 - a. Provide rough-ins of utility items in conformance with the manufacturer's recommendations, instructions, and shop drawings and under the supervision of the manufacturer's representative, where specified.
 - b. Cap and label utilities for future connections.

1.04 PRODUCT HANDLING

- A. Protection: Use necessary means to protect the materials of this Section before, during, and after installation; and to protect the installed work and materials of other trades and equipment installed by others.
- B. Replacements: In the event of damage, promptly repair all damaged and defective work to the satisfaction of the Owner, at no change in Contract Time and Contract Sum.

PART 2 - PRODUCTS

2.01 OWNER-FURNISHED AND VENDOR-FURNISHED ITEMS

- A. Items must conform to the space limitations indicated on the Drawings, and to the mechanical and electrical services indicated and specified in other Sections.
 - 1. The Contractor
 - a. Assembles all necessary information about the Owner-furnished or Vendor-furnished items.
 - b. Coordinates rough-in locations, sizes, and capacities, backings, anchorage, and utility services required for installation of the work.
 - c. Notifies the Architect and the Owner of any discrepancies, conflicts, or omissions discovered.
 - 2. Contractor coordination must be performed in a timely manner to avoid delaying the installation of facility services, concealed supports, and backings during the scheduled installation of that work.
- B. If the Owner substitutes an item similar to that which is indicated or scheduled, there is no change in rough-in cost unless (1) Substitution occurs after rough-in is completed or rough-in involves other mounting requirements. or (2) If different capacity utilities are required other than those required by the originally specified item.
- C. Modify installed work as necessary to meet the space limitations, backing, anchorage, or facility service requirements at no additional cost to the Owner.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Before beginning installation, verify that work performed as part of the work of other Sections (1) Conforms to the manufacturer's installation or application tolerance requirements; (2) provides true, flat, and level surfaces. and (2) Satisfies all other conditions relating to the quality of installation, durability, appearance, and performance.
- B. Evaluation and Assessment: Reject work that does not conform to the manufacturer's installation or application requirements. The Contractor shall either perform or arrange for and pay all costs for remedial work necessary to correct deficient conditions to bring them into conformance with the manufacturer's installation or application requirements.
- C. Discrepancies:

1. In the event of any discrepancy between the Owner- furnished or Vendor-furnished items and the indicated utilities, space limitations, or conflicts with other features of work, promptly notify the Architect for resolution.
2. Do not proceed with installation until all discrepancies are resolved.

3.02 INSTALLATION

- A. Where indicated, relocate and reinstall existing equipment in conformance with the approved shop drawings and the original manufacturer's instructions.
- B. Install Owner-furnished equipment in conformance with the approved shop drawings and manufacturer prepared published instructions.

3.03 ADJUSTING AND CLEANING

- A. Adjust equipment as directed and required.
- B. Clean all new and relocated equipment.
- C. Protect equipment from damage until final acceptance of the work.

END OF SECTION

SECTION 01 73 00
EXECUTION

GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for execution of the work, including:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the work.
 - 4. Coordination of AGENCY-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the work.
- B. Related Requirements:
 - 1. Section 01 73 29 for Cutting and Patching.

2.01 MATERIALS

- A. General: Comply with requirements specified in other Sections.

3.01 EXAMINATION

- A. Existing Conditions: 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 all underground utilities, mechanical and electrical systems, and other construction affecting or impacted by the work.
 - 1. Before beginning work, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to the project performed by public utilities serving the project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the work, examine substrates, areas, and conditions, where indicated, with the installer present. Verify conformance to the Contract Documents for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before beginning equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to the performance of the work is required by other Sections, include the following.
 1. Description of the work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommendations for corrections.
- D. Proceed with installation only after unsatisfactory conditions are corrected. Proceeding with installation stipulates acceptance of existing conditions. After beginning work, the Contractor performs all remedial work necessary to correct deficient conditions to bring them into conformance with the Contract Documents.

3.02 PREPARATION

- A. Existing Utility Information: Furnish information to the local utility and the Owner when necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by the work. Coordinate with the AHJ.
- B. Field Measurements: Take field measurements as required to properly fit the work. Verify field measurements before installing each product. Where portions of the work are indicated to fit to other construction, verify dimensions of the other construction by field measurements before fabrication. Coordinate fabrication schedules 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: Promptly upon discovery of a need for clarification or interpretation of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to the AGENCY in conformance with Section 01 26 13.

3.03 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the work, verify layout information shown on the Drawings relative to the property survey and existing benchmarks. If discrepancies are discovered, promptly notify the AGENCY in writing.

3.04 INSTALLATION

- A. General: Accurately locate the work and components of the work, 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.
 4. Maintain minimum headroom clearance of 96 inches in spaces without a suspended ceiling.

- B. Comply with manufacturer-prepared published and supplemental instructions and recommendations for installing products.
 - 1. Install products at the time and under conditions that will ensure the best possible results.
 - 2. Maintain conditions required for product performance until Substantial Completion.
- C. Conduct construction operations so that no part of the work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- D. Sequence the work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- E. Do not use tools or equipment that produce harmful noise levels.
- F. Obtain and distribute templates for work specified as factory-prepared and field-installed. Check the approved shop drawings of other work to confirm that adequate provisions are made for locating and installing products in conformance with the Contract Documents.
- G. Provide blocking, attachment plates, anchors and fasteners of sufficient size and quantity to securely anchor each component in place to supporting construction, accurately located and aligned with other portions of the work. Where the size and type of attachments are not indicated, verify the size and type required for load conditions.
 - 1. Where mounting heights are not indicated, mount components at heights directed by the 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 embedded in concrete or masonry. Deliver such items to the project site in time for installation.
- H. 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. Use products, cleaners, and installation materials that are not considered hazardous.

3.05 OWNER FURNISHED PRODUCTS

- A. Owner Furnished Owner Installed (OFOI)
 - 1. Site Access – Provide access and support pursuant to VCSS Section 4-1.1.1 (not including installation, which shall be performed by AGENCY.)
 - 2. Coordination – Provide cooperation and coordination in accordance with VCSS Section 7-7.
- B. Owner Furnished Contractor Installed (OFCI)
 - 1. Site Access - Provide access and support pursuant to VCSS Section 4-1.1.1.
 - 2. Coordination – Provide cooperation and coordination in accordance with VCSS Section 7-7.

3.06 PROCESS 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 (7) seven days during normal weather or more than (3) three 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. Dispose of waste to a legal disposal facility.
- 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 is not permitted. Washing waste materials down sewers or into waterways is not permitted. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal".
- 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 and 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.

3.07 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components per spec section.

1. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and the retest.
2. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
3. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Manufacturer's Service: Comply with qualification requirements in Section 01 43 00.

3.08 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-prepared published and supplementary instructions for temperature and relative humidity.

3.09 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "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

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for cutting into existing construction to provide for installation of other components, or for the performance of other construction, and for subsequently patching as required to restore surfaces to their original condition.
- B. Procedural requirements for cutting and patching of pavement for utility tie-ins through existing street improvements.

1.02 REFERENCES

- A. Drawings and General Provisions of the Contract, including Ventura County Standard Specifications (VCSS), General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.
- B. Definitions:
 - 1. Cutting: The removal of existing construction as necessary to permit the installation or performance of other work.
 - 2. Patching: Fitting and repair work required to restore cut or otherwise damaged surfaces to original conditions after the installation of other work.
 - a. Cutting and patching is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations, and for similar purposes.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Furnish all labor, materials, tools, equipment, and services for all cutting and patching as indicated in accordance with provisions of Contract Documents.
- B. Completely coordinate work with other Contract work.
- C. Cutting and Patching: Comply with the requirements for and the limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify the Architect of locations and details of cutting and await direction from the Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that will alter their load-carrying capacity or increase deflection.
 - 2. 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 results in increased maintenance or decreased operational life or safety. Operational elements include the following:

- a. Primary operational systems and equipment.
 - b. Fire separation assemblies, including fire resistive construction and any means of egress component.
 - c. Firestopping assemblies.
 - d. Air or smoke barriers.
 - e. Fire-suppression systems.
 - f. Mechanical systems piping and ducts.
 - g. Control systems.
 - h. Communication systems.
 - i. Fire-detection and -alarm systems.
 - j. Conveying systems.
 - k. Electrical wiring systems.
 - l. Operating systems of special construction.
- 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that will alter their load-carrying capacity which results in reducing their capacity to perform as intended, or results in increased maintenance or decreased operational life or safety. Other construction elements include the following.
 - a. Water, moisture, or vapor barriers.
 - b. Thermal insulation.
 - c. Roofing and waterproofing membranes and flashings.
 - d. Exterior curtain-wall construction.
 - e. Sprayed fire-resistive material.
 - f. Firestopping assemblies.
 - g. Expansion joint assemblies.
 - h. Equipment supports.
 - i. Piping, ductwork, vessels, and equipment.
 - j. Noise- and vibration-control elements and systems.
- 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching.
 - a. Do not cut and patch exposed construction in a manner that reduces the building's aesthetic qualities, as determined by the AGENCY.
 - b. Remove and replace construction that is cut or patched in a manner that reduces the building's aesthetic qualities.
- D. Cutting and Patching Conference: Prior to any cutting or patching, meet at the project site with all parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding with work.
- E. Manufacturer's Installation Instructions: Obtain and maintain on-site the manufacturer-prepared published installation and supplemental instructions for each item or piece of equipment installed.

1.04 SUBMITTALS

- A. Cutting and Patching Plan: Submit a plan detailing proposed cutting and patching procedures at least (10) ten business days before the time cutting and patching is performed. Include the following.
 - 1. Extent: Describe the reason for and extent of each cutting and patching occurrence.

2. Changes to *In Situ* Construction: Describe all anticipated results. Include proposed changes to structural elements and operating components, as well as changes in building appearance and other significant visual elements.
 3. Products: Furnish a list of products proposed for patching, and the companies and personnel proposed for performing patching work.
 4. Dates: Indicate when cutting and patching is scheduled.
 5. Utilities and Mechanical and Electrical Systems: List facility services and systems that cutting and patching procedures might either disturb or affect.
 - a. Provide a list of services and systems that must be relocated along with those that might be temporarily out of service.
 - b. Indicate proposed lengths of time permanent services and systems might be disrupted.
 - c. Describe proposed provisions for temporary services and systems during interruption of permanent services and systems.
- B. Do not begin cutting or patching work until after the Architect's review of the cutting and patching plan is complete; the Architect may have comments that lead to minor changes in the work.

1.05 WARRANTY

- A. Remove, replace, patch, and repair materials and surfaces that are cut or damaged during cutting and patching operations using methods and materials that will not lead to or result in any warranties becoming void.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use materials for patching that are identical to *in situ* materials. For exposed surfaces, use materials that visually match *in situ* adjacent surfaces, as determined by the AGENCY.
- B. If identical materials are unavailable or cannot be used, then furnish materials that, when installed, provide a visual and performance match acceptable to the AGENCY for the visual and functional performance of *in situ* materials.

PART 3 - EXECUTION

3.01 JOB CONDITIONS

- A. Perform preliminary investigations as required to ascertain extent of work.
- B. Prior to any start of cutting and patching work, obtain and pay for all permits required by AHJ relative to specific cutting operations.
- C. Obtain approval of AHJ for work that affects exitways, means of egress, or access to, or exit from any area of work.

3.02 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Promptly proceed with cutting and patching and complete cutting and patching operations without delay.
 - 1. Cut *in situ* 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. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect *in situ* construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the project that might be exposed during cutting and patching operations.
- D. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- E. Cutting: Cut *in situ* construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. Where practicable, review proposed procedures with the original installer, and comply with original installer's written recommendations.
 - 1. General: Use hand or small power tools designed for sawing and grinding, in lieu of those designed for hammering and chopping. Neatly cut holes and slots to minimum sizes required, and with minimum disturbance of adjacent surfaces. Temporarily cover cut 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. Concrete and Asphalt Pavement: Cut using a cutting machine, such as an abrasive saw where cutting passes through concrete sidewalk paving, remove concrete from joint to joint.
 - 5. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 6. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions indicated as being removed. Cap, valve, or plug and seal remaining portions of pipe or conduit to prevent the intrusion of moisture or other foreign matter after cutting.
 - 7. Proceed with patching after construction operations requiring cutting are complete.
- F. Patching: Patch construction by filling, repairing, refinishing, enclosing, and similar operations following performance of other work. Patch with unnoticeable and durable seams, as determined by the Architect, whose decision is final. 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 the 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 minimizes evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions are removed and that extend one finished area into another, patch and repair floor and wall surfaces in the new area. Provide an even surface of uniform finish, color, texture, and appearance, as determined by the Architect, whose decision is final. Remove *in situ* floor and wall coverings and replace with new materials, if necessary, to achieve a uniform color and appearance.
 - a. Where patching occurs on a painted surface, prepare substrates and apply primer and intermediate paint coats appropriate for each substrate over the patch; and then apply at least a final paint coat over the entire unbroken surface containing the patch. Provide additional coats until patching blends with the adjacent surfaces.
4. Ceilings: Patch, repair, or rehang *in situ* ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure assemblies to a weathertight condition, and ensures thermal and moisture integrity of the enclosure assembly.
6. Where patches at asphalt occur, overlay asphalt at a minimum of (1) one foot past the trench opening. Slurry coat the trench area to match existing adjacent pavement.

3.03 CLEANING

- A. Upon completing installation, clean areas and spaces where cutting and patching are performed.
 1. Clean all surfaces to remove dust and other foreign materials.
 2. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.
 3. Clean piping, conduit and similar components prior to painting or other finishing is applied.
- B. Restore damaged areas to a condition matching adjacent areas, as determined by the Architect, whose decision is final.
- C. Remove and replace materials and components that are damaged, loose, chipped, broken, have been stained, corroded, that do not match adjacent surfaces or cannot be satisfactorily cleaned or repaired, as determined and directed by the AGENCY, whose decision is final.

END OF SECTION

SECTION 01 74 00
CLEANING

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for cleaning.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Furnish all labor, materials, tools, equipment and services for all cleaning as indicated in accordance with provisions of Contract Documents.
- B. Completely shall coordinate with all other Contract work.
- C. Contractor shall maintain the job site, the AGENCY's premises, adjacent properties, public areas and all areas of the Contractor's operations free from accumulations of waste, dust, debris, and rubbish generated during the execution of the work, or resulting from the Contractor's operations.
- D. At completion of work, the Contractor shall remove all waste materials, rubbish, tools, equipment, machinery, and surplus materials from the project site and other areas of the Contractor's operations and clean all surfaces for final inspection and acceptance of Substantial Completion by the AGENCY.

PART 2 - PRODUCTS

2.01 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.
 - 1. Use cleaning materials recommended by the manufacturer of product whose surface is cleaned.
 - 2. Use cleaning materials on surfaces recommended by the cleaning material manufacturer.
 - 3. Use cleaning products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.01 GENERAL

- A. Legally conduct cleaning and disposal operations.

1. Do not burn or bury anything anywhere on project site, areas of the Contractor's operations, adjacent properties, public areas, or the AGENCY's premises.
 2. Do not dispose of toxic or volatile waste materials, including mineral spirits, paint thinner, oils, and petroleum-based products in the storm sewer or sanitary drain systems.
- B. Legally store and dispose of hazards materials.
1. Store volatile waste materials in clearly and appropriately marked and covered containers fabricated specifically for the purpose of storing such material.
 2. Remove waste promptly to prevent accumulation of wastes that create hazardous conditions. Containers must be removed daily from the job site and other areas of the Contractor's operations.
 3. Provide adequate ventilation during storage and use of volatile or noxious substances.
 - a. The building's permanent ventilation system may not be used for ventilation of volatile or noxious substances.
 - b. Care must be taken to shield volatile or noxious exhaust discharge from mechanical system air intakes.

3.02 PROGRESS CLEANING

- A. General: Clean the project site and work areas daily, including common areas. Lawfully dispose of materials.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than (7) seven calendar days during normal weather or more than (3) three calendar days if the temperature is expected to rise above 90 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers specially fabricated to hold waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where the Contractor and other contractors are working concurrently.
 5. Leave the Work "broom clean".
- B. Site: Maintain the 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 in conformance with the manufacturer-prepared published instructions for the product installed, using only specifically recommended cleaning materials. 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: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19.
- 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.

3.03 FINAL CLEANING

- A. General: Perform final cleaning. Lawfully conduct cleaning and waste-removal operations in conformance 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 the entire project or for a designated portion of the project:
 - a. Clean the 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 the project site.
 - e. Remove all slip hazards to provide safe access to the 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; clean according to manufacturer's recommendations 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. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.

- l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
- p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- q. Leave the project clean and ready for occupancy.

END OF SECTION

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including Ventura County Standard Specifications (VCSS), General and Supplementary Conditions and other Division 01 Specifications, apply to this Section.

1.02 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for contract closeout, including but not limited to, the following:
 - 1. Completion procedures.
 - 2. Final Completion procedures.
 - 3. Warranties.
 - 4. Final cleaning
 - 5. Repair of the work.
- B. Related Requirements:
 - 1. Section 01 74 00 for Final Cleaning Requirements.
 - 2. Section 01 78 36 for Warranty and Bond Requirements.
 - 3. Section 01 31 23 for Web Based Construction Management.

1.03 SUBMITTALS

- A. Informational Submittals:
 - 1. Contractor's List of Incomplete Items: Initial Submittal at request for Completion.
 - 2. Certified List of Incomplete Items: Final Submittal at Final Completion.
- B. Closeout Submittals:
 - 1. Field Report: For pest control inspection.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.05 COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items that must be completed and corrected (Contractor's Punch List), indicating both the value of each item on the list and the reasons the work is incomplete.

- B. Procedures before Completion: Complete the following at least (20) twenty business days before requesting inspection for determining date of Completion. List items below that are incomplete at time of request.
1. Advise the Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used before Completion.
 5. Instruct the Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00.
 6. Advise the Owner of utilities changeover.
 7. Participate with the Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from the project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch-up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- C. Inspection: Submit a written request for inspection to determine Completion at least (20) twenty business days before date the work is completed and ready for final inspection and tests.
1. On receipt of request, the AGENCY either proceeds with inspection or notifies the Contractor of unfulfilled requirements.
 2. The AGENCY prepares the Final Inspection Report after inspection; or will notify the Contractor of items, either on the Contractor's list or additional items identified by the AGENCY that must be completed or corrected before a certificate is issued.
 3. Reinspection: Request reinspection when the work identified in previous inspections as incomplete is completed or corrected.
 4. Results of the completed inspection form the basis of requirements for final completion.

1.06 FINAL COMPLETION PROCEDURES

- A. Submittals before Final Completion: Complete the following at least (10) ten business days before requesting inspection for determining date of Completion. List items below that are incomplete at time of request.
1. Obtain and submit releases from the AHJ permitting the Owner unrestricted use of the work, and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by the Architect. Label with manufacturer's name and model number where applicable.

- a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain the Architect's signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit changeover information related to the Owner's occupancy, use, operation, and maintenance.
- B. Inspection: Submit a written request for final inspection to determine acceptance at least (10) ten business days before date the work is completed and ready for final inspection and testing. Upon receipt of request, the AGENCY either proceeds with inspection or notifies the Contractor of unfulfilled requirements. The AGENCY either prepares a final Certificate for Payment after inspection or notifies the Contractor of construction that must be completed or corrected before a certificate is issued.
 1. Reinspection: Request re-inspection when the work identified in previous inspections as incomplete, is completed or corrected.
- C. When the project is completed, there are several steps that the Contractor and the AGENCY staff must take. Action by both is necessary for the Contractor to receive final payment promptly. The following are the steps required:
 1. Contractor shall inform the Project Manager that he expects to be ready for final inspection on a certain day for Project Manager to schedule a final inspection.
 2. When the work is completed, Contractor writes a letter to the Project Manager stating that "The Work is Complete". This is required by VCSS §6-8 as a precedent to the Project Manager making the final inspection.
 3. The Project Manager, usually accompanied by other members of the Agency's staff and the Contractor, perform an inspection of the project as a whole and notes exceptions ("punch list") on the final inspection report form. A copy of the report will be given to the Contractor in the field. This is not acceptance of the project.
 4. The next action depends on what is included in the exceptions ("punch list"). If the exceptions are only minor cleanup and minor corrections and are promptly completed, the Project Manager will recommend to the Deputy Director that "field completion" has occurred on the date indicated. If this is not the case, the procedure must start over at Item 1 above.
 5. The Deputy Director of Public Works will review the final inspection report and, if satisfied, will confirm "Field Completion" on the date noted on the Final Inspection Report or as modified. Please Note: When "Field Completion" is certified, the contract time will stop, (liquidated damages, if applicable, will stop accruing), and the Contractor will be relieved of the duty to protect the Work.
 6. After field completion, the semi-final pay estimate and the Release on Contract will be prepared and sent to the Contractor. When the Release has been signed, notarized and returned, and all other work noted on the lower part of the Final Inspection Report completed, the Deputy Director will recommend filing a Notice of Completion.
 7. The Director reviews the recommendation, and upon concurrence that the project is complete, signs the Notice of Completion and directs that it be recorded. The Director's signature on the Notice of Completion is the acceptance of the Work as provided in VCSS §6-8. The acceptance will indicate the date on which work was completed.
 8. The date of recording the Notice of Completion starts the (35) thirty-five day period specified in VCSS §9-3.1.
 9. Final payment will be processed after the (35) thirty-five day waiting period has elapsed. Actual payment is usually made within (10) ten days after processing starts.

1.07 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. The Punch List will be managed with the web-based construction management software; see 01 31 23.
- B. List Organization: Include the names and identification of each space and area affected by construction operations for incomplete items; and items needing correction including, if necessary, areas disturbed by the Contractor that are outside the limits of construction. Use web-based management program to export the list of incomplete items.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Procore.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CORRECTION AND REPAIR

- A. Complete repair and restoration operations before requesting inspection for determination of Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- C. Where damaged or worn items cannot be repaired or restored, provide replacements.
- D. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for preparing operation and maintenance manuals, including:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Manual Content: Operation and Maintenance manual content is specified in individual Specification Sections AND reviewed at the time of each Section's Submittals.
 - 1. Submit reviewed manual content formatted and organized as required by this Section.
 - 2. The Architect and the Commissioning Authority provide comments on whether the content of operations and maintenance submittals are acceptable.
 - 3. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

1.03 SUBMITTALS

- A. Format: Submit Operations and Maintenance manuals in the following format.
 - 1. A single PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to the Architect.
 - a. Name each indexed document file in the composite electronic index with the applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 - 2. Submit (3) three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. The Architect shall return (2) two copies.
- B. Initial Manual Submittal: Submit a draft copy of each manual at least (30) thirty calendar days before beginning demonstration and training. The Architect and the AGENCY shall make comment on whether the general scope and content of manual are acceptable.
- C. Final Manual Submittal: Submit each manual in final form before requesting an inspection for Substantial Completion, and at least (15) fifteen business days before beginning

demonstration and training. The Architect and the Commissioning Authority returns one copy with comments.

1. Correct or revise each manual to address the AGENCY's and the Commissioning Authority's comments. Submit copies of each corrected manual within (15) fifteen business days of receipt of the AGENCY's and the Commissioning Authority's comments, and before beginning demonstration and training.

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, maintenance data and materials, listing items and their location in a manner that facilitates ready-access to desired information. Include a section in the directory for each of the following.
 1. List of documents.
 2. List of system and subsystems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in a separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory, and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with the same designation used in the Contract Documents. If no designation exists, the assign a designation in conformance with ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.02 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- 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 must contain the following materials, in the order listed.
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
 1. Subject matter included in manual.
 2. Name and address of the project.
 3. Name and address of the Owner.
 4. Date of submittal.
 5. Name and contact information for the Contractor.

6. Name and contact information for Construction Manager.
 7. Name and contact information for the Architect.
 8. Name and contact information for the Commissioning Authority.
 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. 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 the Specification Section Number in the Project Manual.
1. If operation or maintenance documentation requires more than (1) one volume to accommodate data, include a comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize the manual contents into manageable-sized sets. Arrange contents alphabetically by system, subsystem, and equipment. Where possible, assemble instructions for subsystems, equipment, and components of (1) one system into a single binder.
- E. Electronic Manual Files: Submit manuals in the form of a multiple-file composite electronic PDF file for each manual type.
1. Electronic Files: Where available, use electronic files prepared by the manufacturer. Where scanning paper documents is required, configure scanned files for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names.
 - a. Name document files to correspond to the system, subsystem, and equipment names used in manual directory and table of contents.
 - b. Group documents for each system and subsystem into individual composite bookmarked files, then create a composite manual. Resulting bookmarks must reflect the system, subsystem, and equipment names in a readily navigated file tree.
 - c. Configure the electronic manual to display the bookmark panel when the file is opened.
- F. Paper Copy Manuals: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Furnish heavy-duty, three-ring, vinyl-covered, loose-leaf or post-type binders, in thicknesses necessary to accommodate contents; and sized to hold 8-1/2-by-11-inch paper; with a clear plastic sleeve on the spine to hold a label describing the contents; and with pockets inside the covers to hold folded oversize sheets.
 - a. If (2) two or more binders are necessary to accommodate system data, organize that data in each binder into groupings by subsystem and related components. Cross-reference other binders as necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on the front and spine with a printed title reading, "OPERATION AND MAINTENANCE MANUAL", Include the project title or name, and subject matter of contents, and indicate Specification Section Number on bottom of spine. Indicate the volume number for multiple-volume sets.
 2. Dividers: Furnish heavy-paper dividers with plastic-covered tabs for each section of the manual. Identify contents on each tab. Include a typed list on each divider of the products

and major components of equipment included in the section, cross-referenced to specification Section number and title of the Project Manual.

3. Protective Plastic Sleeves: Furnish transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Include supplementary text prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on the 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 create foldouts, fold and place drawings in labeled envelopes and the bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of drawing contents, and drawing locations.

2.03 EMERGENCY MANUALS

- A. Content: Organize emergency manual into a separate section for each of the following.
 1. The type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Include emergency instructions and procedures for each system, subsystem, piece of equipment, and component where applicable for each of the following emergencies:
 1. Fire.
 2. Flood.
 3. Earthquake.
 4. Gas leak.
 5. Water leak.
 6. Power failure.
 7. Water outage.
 8. System, subsystem, or equipment failure.
 9. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of the Owner's operating personnel for notification of the installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable.
 1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.04 OPERATION MANUALS

- A. Content: In addition to the requirements of this Section, include operation data required in individual Specification Sections and the following:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if the Contractor delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 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 the following, as applicable.
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- 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.

2.05 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize product maintenance manuals 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 the product maintenance manual, identified by manufacturer's product name and arranged to match the maintenance manual's table of contents. For each product, list the name, address, and telephone number of installer or supplier and maintenance service agent; and cross-reference the specification Section

- number and title in the project manual, and the drawing or schedule designation or identifier, where applicable.
- 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 the following.
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
 6. Recommended Preventative Maintenance schedule for [24-60] months
- 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 negatively affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.06 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- 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 the systems and equipment manual, identified by manufacturer's product name, and arranged to match the system and equipment manual's table of contents. For each product, list the name, address, and telephone number of installer or supplier and maintenance service agent; and cross-reference the specification Section number and title in the project manual, and the drawing or schedule designation or identifier, where applicable.
- C. Manufacturers' Maintenance Documentation: Furnish the manufacturers' maintenance documentation for each component part or piece of equipment, including the following.
1. Standard maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures.

1. Testing and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recordings, if available.
- 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 allotments.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include the manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to the manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with the name and telephone number of service agents.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that negatively affect the validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency manuals, operation manuals, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by the Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the work.
- D. 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.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem as an instructional manual for use by the Owner's operating personnel.

- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only these sheets pertinent to the 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.
 - 1. Prepare supplementary text if the manufacturers' standard printed data are not available, and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing the manufacturers' printed data to illustrate the relationship of component parts of equipment and systems, and to illustrate control sequences and flow diagrams. Coordinate these drawings with the information contained in the record drawings to ensure the correct illustration of completed installations.
 - 1. Do not use original project record documents as part of the operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record drawings in Section 01 78 39.
- G. Comply with the requirements of Section 01 77 00 for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 78 36
WARRANTIES

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for specified warranties, bonds, and service and maintenance contracts.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Organize warranty and bond documents into an orderly sequence based on the project manual table of contents.
 - 1. Bind warranties and bonds into a heavy-duty, commercial-quality 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, sized to receive 8-1/2-inch by-11-inch paper with a clear plastic sleeve on the spine to hold labels describing the contents; and with pockets inside covers to hold folded oversize sheets.
 - 2. Provide a title page enclosed in a transparent plastic sleeve. Include the following information.
 - a. Name and address of the project.
 - b. Name and address of the Owner.
 - c. Date of submittal.
 - d. Name, address, and telephone number of the Contractor.
 - e. Name and address of the Architect.
 - 3. Provide a typed table of contents, cross-referenced to the Specifications Section number in the project manual, with the complete information for each warranty item as follows:
 - a. The product name or assembly description.
 - b. The installer name, address, and telephone number.
 - c. The scope of each warranty.
 - d. The beginning date of each warranty, bond or service and maintenance contract.
 - e. The duration of the warranty period, bond, or service and maintenance contract.
 - f. Information for the proper procedure followed in the case of failure; and for instances that may affect the validity of warranty or bond.
 - g. Name, address, and telephone number of the Contractor's responsible party.
 - 4. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark each tab to identify product or installation.
 - 5. Identify each binder on the front and spine with the typed or printed title "WARRANTIES AND BONDS", the project name, and Contractor name. Indicate each volume number and the total number of volumes for multiple-volume sets.

1.03 SUBMITTALS

- A. Submit (2) two original written and signed warranties and scanned PDFs for the designated portions of the work where commencement of warranties other than date of Substantial Completion is indicated.
 - 1. For equipment, or component parts of equipment put into service during construction, submit documents within (10) ten business days after final inspection and acceptance.
 - 2. For items whose acceptance is delayed materially beyond the date of Substantial Completion, provide updated submittal within (10) ten business days after acceptance, listing date of acceptance as start of warranty period.

- B. Submit (2) two original, written and signed warranties and scanned PDFs within (15) fifteen business days of completion of designated portions of the work that are completed and occupied or used by the Owner during the construction period by separate agreement with the Contractor.

PART 2 - PRODUCTS

2.01 DISCLAIMERS AND LIMITATIONS

- A. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the Contractor.
- B. The Owner may refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work, or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.

2.02 OWNER'S RECOURSE

- A. Written warranties made to the Owner are in addition to implied warranties, and do not limit the duties, obligations, rights and remedies otherwise available under the law; nor may warranty periods be interpreted as limitations on obligations, rights, or remedies.
- B. The Owner may reject warranties and may limit product selections to products with warranties conforming to the requirements of the Contract Documents.

PART 3 - EXECUTION

3.01 REPLACEMENT OF WORK

- A. Upon determination that work covered by a warranty has failed, replace or rebuild the affected work to an acceptable condition conforming to the original Contract Documents.
- B. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of that work through a portion of its anticipated useful service life.
- C. When correcting warranted work that has failed, remove and replace other work that is damaged as a result of such failure, or that must be removed and replaced to provide access for correction of warranted work.
- D. When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty must be equal to the original warranty, with an equitable adjustment for depreciation.

END OF SECTION

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for project record documents, including:
 - 1. Record drawings.
 - 2. Record specifications.
 - 3. Record submittals.

1.02 DEFINITIONS

- A. Documents required for construction: A complete set of all documents required by the Contract Documents, including but not limited to:
 - 1. Contract drawings.
 - 2. Project manual/specifications.
 - 3. Addenda.
 - 4. Shop drawings.
 - 5. Product data.
 - 6. Project data.
 - 7. Change orders.
 - 8. Modifications.
 - 9. Field test records.
 - 10. Warranties.
 - 11. Samples and mock-ups.
 - 12. Deferred Approval Shop Drawings.
- B. Field Documents: Complete set of all documents required for construction (defined above).
 - 1. To be used for construction of project.
- C. Project Record Documents: Complete separate set of all documents required for construction (defined above) except samples and mock-ups.
 - 1. To be used only for recording periodic changes to Contract Documents.
 - 2. Do not use these documents for construction of project. Maintain Project Record Documents in a neat, clean condition.

1.03 SUBMITTALS

- A. Record Drawings: Comply with the following.
 - 1. Number of Copies: Submit (1) one set of marked-up record prints.
 - 2. Submit PDF electronic files.

- B. Record Specifications: Submit annotated PDF electronic files of the project's specifications, including addenda and contract modifications.
- C. Record Submittals: Submit PDF electronic files of the project's final approved submittals.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

- A. Record Prints: Maintain (1) one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as RFIs and modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from what is originally shown. Require the individual or entity who obtained record data, whether the individual or entity is an installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that are difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as practicable after obtaining it.
 - d. Record and check markups before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 - 2. Content: Types of items requiring marking include the following.
 - a. Dimensional changes to the Drawings.
 - b. Revisions to details shown on the Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Modifications made as part of responses to RFIs.
 - k. Changes made by Change Order or Construction Change Directive.
 - l. Changes made following the Architect's written orders.
 - m. Details not on the original Contract Drawings.
 - n. Field records for variable and concealed conditions.
 - o. Record information on the work that is shown only schematically.
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information for producing marked-up record prints.
 - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the work at same location.
 - 5. Mark important additional information that was either shown schematically or omitted from the original Drawings.
 - 6. Note RFI numbers, Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

- B. Record Digital Data Files: Promptly before inspection for the Certificate of Substantial Completion, review marked-up record prints with the Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows.
 - 1. Format: Annotated PDF electronic file with comment function enabled.
 - 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - 3. Refer instances of uncertainty to the 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.
 - 2. Format: Annotated PDF electronic file with comment function enabled.
 - 3. Record Digital Data Files: Organize digital data 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 digital data file.
 - 4. Identification: Include the following.
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of the Architect.
 - e. Name of the Contractor.

2.02 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 and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of the 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.

1. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss.
2. Provide access to project record documents for the AGENCY's reference during normal working hours.

END OF SECTION

SECTION 01 78 43
SPARE PARTS AND MAINTENANCE MATERIALS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work includes:

1. Furnish all labor, materials, tools, equipment and services for all spare parts and maintenance materials as indicated in accordance with provisions of Contract Documents.

1.02 SUBMITTALS

A. Requirements for submittal:

1. Provide transmittal letter to Engineer containing: Date, project title, Contractor's name and address, Title, description and quantity submitted.
2. Provide products, spare parts, maintenance and extra materials in quantities specified in the individual specification sections.

PART 2 - PRODUCTS

2.01 SPARE PARTS AND TOOLS

A. Contractor shall package in clearly identified boxes all spare parts and tools required in the individual specifications sections.

1. Indicate manufacturer's name, part name and stock number, the piece of equipment by equipment number that each part or tool is for, and the name, address and phone number of closest supplier of the spare part or tool.

2.02 MAINTENANCE MATERIALS

A. Contractor shall package in clearly identified boxes in accordance with manufacturer's recommendations, all maintenance materials required in the individual specifications sections.

1. Indicate material trade name and stock number, which item material is to be used with, and the name, address and phone number of closest supplier.

2.03 EXTRA MATERIALS

A. Contractor shall package in clearly identified containers, or install where indicated. In accordance with manufacturer's recommendations, all extra materials required to be provided in the individual specification sections.

1. Indicate trade name, stock number, size, and color, where product is to be used, and the name, address and phone number of closest supplier.

PART 3 - EXECUTION

3.01 DELIVERY

- A. Deliver spare parts and materials at least 30 calendar days prior to final Acceptance.
- B. Deliver to a location at the project site and place in a location as directed by Engineer.

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 SUMMARY

This Section Includes:

- A. Administrative and procedural requirements for instructing the VCMC's personnel, including
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the instruction schedule with the VCMC's operations. Adjust schedule as necessary to minimize disrupting VCMC's operations and to ensure availability of the VCMC's personnel.
 - 2. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
 - 3. 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 the AGENCY.
- B. Pre-instruction Conference: Conduct conference at the project site in conformance with requirements in Section 01 31 00. Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize the instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.03 SUBMITTALS

- A. Informational Submittals:
 - 1. Instruction Program: Submit an outline of the instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time; and the instructors' names for each training module. Include learning objectives and outlines for each training module.
 - a. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recordings of live instructional modules.

2. Attendance Record: For each training module, submit a list of participants and the length of instruction time.
 3. Evaluations: For each participant and for each training module, submit results and documentation of required performance-based tests.
- B. Closeout Submittals:
1. Demonstration and Training Video Recordings: Submit (2) two copies within (7) seven calendar days of end of each training module.
 - a. Identification: On each copy, provide an applied label with the following information.
 - 1) The name of the project.
 - 2) The name and address of the videographer.
 - 3) The name of the Architect.
 - 4) The name of the Construction Manager.
 - 5) The name of the Contractor.
 - 6) The date of the video recording.
 2. Transcript: Provide prepared and bound transcripts in a format matching operation and maintenance manuals.
 - a. Mark appropriate identification on the front and spine of each binder.
 - b. Include a cover sheet with the same label information as the corresponding video recording.
 - c. On each page, include the name of the project and the date of the video recording.
 3. At completion of training, submit complete training manuals for the AGENCY's use in PDF electronic file format.

1.04 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 experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced in photographing demonstration and training events or similar to those required.

PART 2 - PRODUCTS

2.01 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that each participant is expected to master. For

each module, include instruction for the following, as applicable to the system, equipment, or component.

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if the Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
 - h. Schedules for routine preventative maintenance.
8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23.
- B. Set up instructional equipment at the instruction location.
- C. Do not begin instruction until component, assembly or system has been tested as specified and is in correct operating condition.

3.02 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to
 1. prepare instruction program and training modules;
 2. coordinate instructors; and
 3. coordinate between the Contractor and the AGENCY for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct VCMC's personnel to adjust, operate, and maintain systems, subsystems, and equipment that is not part of a system.
- 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 the AGENCY with at least (7) seven calendar days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At the conclusion of each training module, assess and document each participant's mastery of module by use of a performance-based test.
- F. Cleanup: Collect used and leftover educational materials and remove from the project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

B. Related Requirements:

1. Section 01 10 00 "Summary of Work" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 01 14 01 "Instructions to Contractors Working at VCMC" for ICRA and ILSM requirements.
3. Section 01 73 00 "Execution" for general protection and work procedures for alteration projects.
4. Section 01 73 29 "Cutting and Patching" for cutting and patching procedures.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review structural load limitations of existing structure.

3. Review Contractor's work plan for scanning, locating and recording existing steel reinforcement and steel tendons in concrete floor slab prior to any demolition, or coring of concrete slab.
4. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
5. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
6. Review areas where existing construction is to remain and requires protection.
7. Review roof areas where existing roof membrane is removed and procedures for protecting occupied spaces below from water intrusion.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 1. Before selective demolition, Owner will remove the following items:
 - a. Furnishings and equipment.
 - b. Interior signage.
 - c. Artwork.

- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:
 - 1. Existing roofing system.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.9 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- B. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 51 01 "Construction Facilities and Temporary Controls."

- B. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

- B. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."
- F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 07 54 19 "Polyvinyl-Chloride (PVC) Roofing" for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.
 - 3. At end of each work shift, provide temporary roof membrane tied into existing roofing system to provide a watertight and weathertight roof.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 03 11 00
CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section Includes: Furnishing, installing, and removing of forms for cast-in-place concrete.
- B. Related Requirements: Section 13 49 25 "Radio Frequency (RF) Shielding – Copper" for requirements for shielding flooring depressions in concrete slab.

1.2 REFERENCES:

- A. The editions of the specifications and standards reference herein, published by the following organizations, apply to the formwork only to the extent specified by the reference.

American Concrete Institute (ACI)
Corps of Engineers
U.S. Dept. of Commerce Product Standard (PS)
Western Wood Products Association (WWPA)
West Coast Lumber Inspection Bureau (WCLIB)

1.3 SUBMITTALS:

- A. Samples: Submit samples of form ties and spreaders.
- B. Product Data: Submit manufacturer's specifications for cylindrical column forms, form ties, spreaders and coating.

1.4 REGULATORY REQUIREMENTS:

- A. Except as modified by the requirements specified herein or the details on the drawings, formwork shall conform to the California Code of Regulations (CCR), Title 24, Part 2, and the California Building Code, Chapter 19A.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Forms for Unexposed Concrete: Form concrete surfaces which will not be exposed in the finished structure with plywood, lumber, metal or other acceptable material.
 - 1. Lumber: Standard or better grade Douglas fir, meeting the requirements of WCLIB "Standard Grading Rules No. 17", 2004 Edition, 2006 Supplement XIV, or WWPA "Western Lumber Grading Rules G-5 2005". Use boards which are surfaced on at least 2 edges and one side for a tight fit.
 - 2. Plywood: High Density Overlay Plyform, Class I, Exterior grade meeting the requirements of PS 1-09, 5/8 inch minimum thickness for 12 inch stud spacing and 3/4 inch minimum thickness for 16 inch stud spacing.

- B. Forms for Exposed Finish Concrete: Construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practical sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
 - 1. Where a cast surface finish is indicated, provide High Density Overlay Plyform Class I Exterior plywood meeting the requirements of PS 1-09.
 - 2. Where sacked, rubbed or sandblasted surface finish is indicated, provide B-B Plyform Class I Exterior plywood meeting the requirements of PS 1-09.
- C. Cylindrical Columns: Form round section members with paper or fiber tubes, constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Tubes for columns to be exposed in the finish construction shall be seamless. Provide units with sufficient wall thickness to resist loads imposed to wet concrete without deformation.
- D. Form Liners: Form architectural finish concrete surfaces with PVC or ABS plastic, fiber glass reinforced plastic or elastomeric urethane form liners of face design indicated.
- E. Framing, Studding and Bracing: "Standard" or "Construction" grade Douglas fir, rough or S4S, meeting the requirements of the WCLIB "Standard Grading Rules No. 17", or WWPA "Western Lumber Grading Rules G-5.
- F. Form Ties and Spreaders: Standard metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face. Inner tie rod shall be left in concrete when forms are removed. Wire ties or wood spreaders will not be permitted.
- G. Form Coating: Nongrain raising and nonstaining type that will not leave residual matter on surface of concrete or adversely affect proper bonding of subsequent application of other material applied to concrete surface. Coatings containing mineral oils or other nondrying ingredients will not be permitted. Form coating for use with form liners shall be of type recommended by form liner manufacturer.
- H. Nails: Common wire, steel.

PART 3 - EXECUTION

3.1 DESIGN OF FORMWORK:

- A. Carry out the engineering and construction of all formwork, shoring and bracing, by and under the direction of the Contractor. The Contractor shall be held responsible for the engineering, construction, maintenance, and safety of all formwork during the entire construction period.
- B. The formwork shall be designed for the loads and lateral pressures outlined in Part 3, Section 102, of ACI 347R-14, and lateral forces as specified by the ICC.

3.2 CONSTRUCTION:

- A. Earth Forms: Earth forms may be used for footings only where the soil is firm and stable and the concrete will not be exposed to view. Where earth forms are to be used, excavations shall be cut neat and accurately to size for placing of concrete directly against the excavation. Except for bottom of footings, allow for one-inch additional concrete beyond the dimensions or profiles shown on the drawings. Construct wood edge strips at each side of trench at top to secure reinforcing and prevent trench from sloughing. Form sides of footings where earth

sloughs more than six inches. Earth forms shall be tamped firm and cleaned of all debris and loose material before depositing concrete.

- B. Wood forms: Construct forms of sound material to the correct shape and dimensions, mortar tight, and of sufficient strength, and so braced and tied together that the movement of men, equipment, materials, or placing and vibrating the concrete will not throw them out of exact shape under imposed loads. The forms shall be so constructed that they may be easily removed without damage to the concrete. Before concrete is placed in forms, carefully verify the horizontal and vertical position of the form and correct inaccuracies. Complete wedging and bracing in advance of placing of concrete.
- C. Form Liners: Position liners on the forms so that grooves and joints are aligned with tie slots. Attach form liners to plywood forms with staples and to metal forms with sheet metal screws or pop rivets. Space fasteners not to exceed 4 inches on centers around the perimeter of each sheet. Place staples perpendicular to the edges. Install staples using a power staple with pressure regulated so that staple heads are driven flush with the surface. Seal joints between liners and joints at top and bottoms of liners with foam tape placed on the backside of liners.
- D. Framing bracing, supporting members, and centering shall be of ample size and strength to safely carry, without deflection, dead and live loads to which forms may be subjected, and shall be spaced sufficiently close to prevent bulging or sagging of forms. Concrete out of line, level, or plumb will be cause for rejection of the whole construction affected.
- E. Tolerances: Formwork shall be constructed so as to ensure that the concrete surfaces will conform to the tolerances of Section 203.1, ACI 347R-14. Camber formwork where necessary to compensate for anticipated deflections due to fresh concrete and construction loads.
- F. Chamfered Corners: Chamfer exposed corners 3/4 inch, unless otherwise indicated. Provide molding in forms for all chamfering required.
- G. Form Ties: Use ties of sufficient strength and in sufficient quantities to prevent spreading of the forms. Place ties at least 1 inch away from the finished surface of the concrete.
- H. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- I. Joints: Install construction joints, isolation joints, shrinkage control joints and expansion joints as approved. Coordinate location of construction joints, particularly those exposed to view to walls and columns, in advance of concrete placement.
- J. Embedded Piping and Rough Hardware:
 - 1. Coordinate with other trades who are required to fasten materials to formwork, or who are required to insert piping, boxes, bolts, anchors, inserts, or other rough hardware, within the forms.
 - 2. Locate conduits or pipes so as not to reduce the strength of the construction, and in no case place in a slab less than 4 inches thick except for local offsets. Do not bury conduit in a concrete slab with an outside diameter greater than 30 percent of the thickness of the slab, and do not place conduit under slab reinforcing steel, except for slab mesh. Place conduits parallel to roof slab span.
- K. Frame openings in slabs for floor hinges where indicated or scheduled. Accurately frame openings to template furnished by floor hinge manufacturer for type of floor hinge specified. Chipping of concrete floors for installation of floor hinges will not be permitted.

- L. Coating of Forms: Thoroughly clean forms and coat with specified form coating before each use. Do not reuse forms for exposed construction which cannot be reconditioned to "like new" condition. Apply form coating to forms in accordance with the manufacturer's specifications. Apply form coating to forms before placing reinforcing steel.
- M. Inspection: Before placing of concrete, and after placement of reinforcing steel in the forms, provide notification to the Owners, Inspector of Record (IOR) so that proper inspection can be made. Make such notification at least 2 working days in advance of placing concrete.
- N. Rejection of Defective Work: Any movement or bellying of forms during construction or variations in excess of the tolerances specified will be considered just cause for the removal of such forms and, in addition, the concrete construction so affected. Reconstruct forms, place new concrete and required reinforcing steel at no additional cost to the Owner.

3.3 REMOVAL OF FORMS:

- A. Formwork for walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations, particularly when form ties will be bent by the removal operations, but not sooner than 24 hours after placing concrete.
- B. Formwork for girder and beam soffits and above grade slabs and other parts that support the weight of concrete, shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.
- C. When shores and other vertical supports are so arranged that the form facing material may be removed without loosening or disturbing the shores and supports, the facing material may be removed at an earlier age as specified or permitted. The shores and supports shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.
- D. Whenever the formwork is removed during the curing period, cure the exposed concrete by one of the methods specified in Section 03 30 00.
- E. Construction loads exceeding the design loads shall not be imposed on any member unless it is properly shored and braced.
- F. Use softwood wedges to release form faces from concrete. Do not pry with metal tool.

3.4 RESHORING:

- A. When reshoring is permitted or required the operations shall be planned in advance and shall be subject to review.
- B. Perform reshoring for the purpose of early form removal so that at no time will large areas of new construction be required to support their own weight. While reshoring is under way, no live loads shall be permitted on the new construction. Tighten reshores to carry their required loads but do not overtightened so that the new construction is overstressed. Reshores shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.
- C. Floors supporting shores under wet concrete shall have at least one-half the load capacity of the shores above and shall be distributed in approximately the same pattern as those above. These reshores shall remain in place until the freshly placed concrete has reached 75 percent of its specified 28-day strength, unless otherwise specified or permitted.

END OF SECTION 03 11 00

SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section Includes:
 - 1. Reinforcing steel for cast-in-place concrete.
 - 2. Powder Actuated Fasteners
 - 3. Drilled-In Anchors
- B. Related Requirements: Section 13 49 25 "Radio Frequency (RF) Shielding – Copper" for requirements for shielding flooring depressions in concrete slab.

1.2 REFERENCES:

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the concrete reinforcement only to the extent specified by the reference.
 - American Concrete Institute (ACI)
 - American Society for Testing and Materials (ASTM) /Latest Edition)
 - Concrete Reinforcing Steel Institute (CRSI)
 - American Welding Society (AWS)
 - American Iron and Steel Institute (AISI)

1.3 SUBMITTALS:

- A. Product Data: Submit mill affidavits, stating the grades and physical and chemical properties of the reinforcing steel, and conformance with ASTM Specifications, before delivery of the steel to the project site.
- B. Submittal procedures and quantities are specified in Section 01 33 23.
- C. Product Data: Submit product data for all manufactured stock items specified under this Section, including the following:
 - 1. Drilled-In Anchors

1.4 REGULATORY REQUIREMENTS:

- A. Except as modified by the requirements specified herein or the details indicated, concrete reinforcing shall conform to the California Code of Regulations (CCR), Title 24, Part 2, Chapter 19A, (2016 California Building Code).

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver: Deliver reinforcement bundled and tagged to identify placement and certify testing.
- B. Transport reinforcing steel to the construction site, store and cover in a manner which will insure that no damage occurs to it from moisture, dirt, grease, or other cause that might impair

bond to concrete. Store a sufficient supply of approved reinforcing steel on the construction site at all times to insure that there will be no delay of the construction. Maintain identification of steel after bundles are broken.

1.6 COORDINATION:

- A. Review architectural, structural, mechanical, and electrical drawings for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, and other items which are required to be cast in concrete, and make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Drilled-In Anchors shall have current published ICC ES Evaluation Reports indicating ICC Evaluation Service as an acceptable method of construction under the ICC. Comply with all limitations on use of anchors stipulated in Evaluation Report.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Reinforcing Bars: New, deformed, billet steel bars, meeting the requirements of ASTM A 615/A 615M, grades as indicated. Deliver bars new and free from rust and mill scale in original bundles with mill tags intact. The carbon equivalent (C.E) of reinforcing bars or splice material shall be calculated from the chemical composition as shown in the mill report by the following formula:

$$C.E = \%C + \%Mn/6 + \%Cu/40 + \%Ni/20 + \%Cr/10 - \%Mo/50 - \%V/10$$

1. If mill test reports are not available, chemical analysis shall be made of bars representative of the bars to be welded. ASTM A 706/A 706M-01 bars may be assumed to have a C.E. = 0.55. Bars with a C.E. above 0.75 shall not be welded. No welds shall be made at bends in reinforcing bars.
 2. Deliver bars new and free from rust and mill scale in original bundles with mill tags intact.
- B. Welded Wire Fabric: New welded steel wire fabric, meeting the requirements of ASTM A 185, of gage and center-to-center spacing as indicated.
 - C. Accessories: Provide reinforcement accessories, consisting of spacers, chairs, ties, and similar items as required for spacing, assembling, and supporting reinforcement in place. Provide accessories fabricated from galvanized steel or approved plastic accessories, conforming to the applicable requirements of the CRSI "Manual of Standard Practice".
 - D. Tie Wire: 16 gage or heavier, where indicated or specified, black or galvanized steel wire, meeting the requirements of ASTM A 82.
 - E. Welding Electrodes: AWS A5.1-2012, grade E70XX for welding grade 40 reinforcing steel, and AWS A5.5-R2014, grade E90XX for welding grade 60 reinforcing steel.
 - F. Drilled-In Anchors:
 1. Expansion Anchors: Wedge type, complete with required nuts, washers and manufacturer's installation instructions. Type and size as indicated on Drawings.

- a. Interior Use: For use in conditioned environments free from potential moisture provide carbon steel anchors conforming to ASTM A510 with zinc plating in accordance with ASTM B633.
 - b. Exposed Use: In exposed or potentially wet environments provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 or Type 316 stainless steel bolts, nuts and washers.
 - c. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Architect, provide one of the following:

Hilti, Inc. Kwik Bolt TZ, conforming to ICC Report ESR-1917.
Simpson Wedge All, conforming to ICC Report ESR-1306.
Approved substitute in accordance with Section 01 25 00.
2. Adhesive Anchors: Threaded steel rod or inserts, complete with nuts, washers, epoxy, ester-based or hybrid mortar adhesive system and manufacturer's installation instructions. Type and size as indicated on Drawings.
- a. Interior Use: For use in conditioned environments free from potential moisture provide threaded carbon steel rods or inserts conforming to ASTM A36.
 - b. Exposed Use: In exposed or potentially wet environments provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 or Type 316 stainless steel threaded rods or inserts with Type 304 stainless steel nuts and washers.
 - c. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Architect, provide one of the following:
 - i. Hilti, Inc. HIT threaded rods with HIT-HY 200 Adhesive Anchorage System for anchorage to concrete, conforming to ICC Report ESR-3187.
 - ii. Simpson SET-XP epoxy, conforming to ICC Report ESR-2508.
 - iii. Approved substitute in accordance with Section 01 25 00.
- G. Powder Actuated Fasteners:
1. Stone Aggregate Concrete: Fastener must have 0.177 inch diameter, with a minimum penetration of 1-7/16 inch. Fastener shall have a ballistic point. Required Allowable Loads: 100 lbs. or 80 percent of values listed in ICC-ES Report whichever is less: ICC-ES No. ESR-1663.
 - a. Type DS, by Hilti Fastening Systems, Inc., Tulsa, OK, ESR-1663
 - b. Type X-AL, by Hilti Fastening Systems, Inc., Tulsa OK, ESR-1663
 - c. 3300 Series, by ITW Ramset, City of Commerce, CA, ESR-1799.

PART 3 - EXECUTION

3.1 FABRICATION:

- A. Fabricate steel reinforcement in accordance with the details indicated. Where specific details are not indicated or noted, comply with the applicable requirements of CCR Title 24, Chapter 19A, ACI 318-14, Chapter 25 and ACI SP-66.
- B. Bend, cut, and place bars accurately, as indicated. Bend bars cold; heating of bars will not be permitted. Do not bend or straighten bars in any manner that will injure the material.

3.2 PLACING:

- A. General: Place reinforcing steel in accordance with the drawings and the applicable requirements of CCR Title 24, Part 2, and ACI 315. Install reinforcement accurately and secure against movement, particularly under the weight of workmen and placement of concrete.
- B. Reinforcing Supports: Support bars and welded wire fabric larger than 8 gage on metal chairs or spacers on metal hangers, accurately placed and securely fastened to steel reinforcement in place. Support legs of accessories in forms without embedding in form surface. Space chairs and accessories in conformance with CRSI's "Recommended Practice for Placing Bar Supports". No wood will be permitted inside forms. Precast concrete cubes may be used to support reinforcing for footings and slabs on grade.
- C. Placing and Tying: Set reinforcing in place, space, and securely tie at splices and at crossing points and intersections in the new position indicated, or as directed. Point ends of wire away from forms.
- D. Spacing: Space bars as indicated. Where not indicated, the clear spacing for main longitudinal column reinforcement shall be not less than 1.5 times the nominal bar diameter, or 1-1/2 inches, or 1-1/3 times the maximum size aggregate, whichever is greater. For other parallel bars, where spacing is not indicated, the minimum clear spacing shall not be less than the nominal bar diameter, or one inch, or 1-1/3 times the maximum size aggregate, whichever is less. The clear distance limitations above also apply between the bars being spliced at a contact lap splice and adjacent bars.
- E. Splices: Except for temperature bars in slabs and horizontal wall reinforcing no splicing will be allowed for reinforcing bars unless detailed locations are indicated, or approval is given. Stagger lapped splices for horizontal wall reinforcing and slab temperature bars by the required minimum lap splice length. Wherever possible, stagger splices of adjacent bars.
- F. Welded Wire Fabric: Furnish wire fabric in as long lengths as practical and wire at laps and splices. Laps shall be one full spacing of the cross wires plus 2 inches at splices. Supply welded wire fabric in flat sheets.
- G. Dowels: Securely tie dowels in place before concrete is deposited. In the event there are no bars in position to which dowels may be tied, add a No. 3 minimum to provide proper support and anchorage. Bending of dowels after placement of concrete will not be permitted. Protect dowels extended for future construction from weather exposure. Compliance with safety law requirements for extended dowels is required.
- H. Cleaning: At time of concrete placement reinforcement shall be free of coatings that would impair bond to concrete, otherwise clean reinforcing by sandblasting as required.
- I. Welding: Welding of reinforcing steel will not be permitted except as specifically approved or detailed. Welding shall comply with ACI-318-14: 26.6.4 as modified by CBC Section 1903A.8. Prior to welding determine weldability of reinforcing bars by a laboratory chemical analysis, or use ASTM, A 706 reinforcing bars.

3.3 FIELD QUALITY CONTROL:

- A. Notify the District Inspector at least 2 working days ahead of each concrete pour and do not place any concrete until all reinforcing steel has been installed and approved by the Inspector. Complete all reinforcing in every way by the end of the working day before concrete placing. Testing and inspections are specified in Section 01 45 00.

3.4 INSTALLATION OF POWDER ACTUATED FASTENERS:

- A. Operator, tool and fastener shall be prequalified by the Project Inspector.
- B. Tools shall conform to ANSI A10.3 safety requirements for Powder Actuated Fastening Systems and to all OSHA requirements.
- C. When installing powder driven pins in reinforced concrete, use care and caution to avoid cutting or damaging reinforcing bars. When required by the architect, locate the reinforcing by using a non-destructive method prior to installation.

3.5 DEFECTIVE WORK:

- A. The following reinforcing steel construction will be considered defective and shall be removed and replaced at no additional cost to the Owner.
 - 1. Bars with kinks or bends not indicated.
 - 2. Bars damaged by bending or straightening.
 - 3. Bars heated for bending.
 - 4. Reinforcement not placed in accordance with the drawings or specifications.

END OF SECTION 03 20 00

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section Includes: Cast-in-place concrete for structures.
- B. Related Requirements: Section 13 49 25 "Radio Frequency (RF) Shielding – Copper" for requirements for shielding flooring depressions in concrete slab.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the cast-in-place concrete only to the extent specified by the reference.
- B. American Concrete Institute (ACI).
- C. American Society for Testing and Materials (ASTM)

1.3 SUBMITTALS

- A. Product Data:
 - 1. Submit certificates of compliance for portland cement.
 - 2. Submit manufacturers technical literature for admixtures, curing compounds, expansion joint filler, sealer and chemical hardener.

1.4 REGULATORY REQUIREMENTS

- A. Except as modified by the requirements specified herein or the details indicated, concrete construction shall conform to the California Code of Regulations (CCR), Title 24, Chapter 19A.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portland Cement:
 - 1. Cement shall conform to ASTM C150, type II, low alkali. The cement used in the work shall correspond to that on which the selection of concrete proportions was based.
- B. Regular Weight Concrete Aggregates: ACI 318-14: 26.4.2.1(a)(1) as modified by CCR Title 24 Part 2, Sec. 1903A.5. Use ASTM C 227 to determine alkali reactivity of the aggregates as specified therein, the alkali reactivity shall be "innocuous" as determined by ASTM C 289.
 - 1. Fine Aggregate: Washed clean, uniformly screen graded, and containing not more than 2 percent by weight of deleterious materials such as shale, schist, alkali, clay, lumps, earth, loam, mica, or similar materials. Uniformly grade fine aggregate from fine to coarse.
 - 2. Coarse Aggregate: Clean, hard, crushed rock or washed grave, free from organic materials or soft or friable materials, containing not more than 2 percent by weight of shale or cherty material and not more than 15 percent by weight of elongated fragments.

- C. Lightweight Concrete Aggregates: ASTM C 330.
- D. Admixtures: ACI 318-14: 26.4.1.4 of a type that increases workability and reduces water demand of concrete, but will not increase shrinkage. Admixture shall be subject to acceptance by the Architect and Division of the State Architect as to type and amount used. Admixtures shall contain not more than one percent chloride ions.
- E. Air-Entraining Agent: ASTM C 260, subject to acceptance.
- F. Water Used in Mixing Concrete: Potable, clean and free from deleterious amounts of acid, alkalis, organic or other materials.
- G. Fly ash and natural pozzolans used in concrete: Mixes utilizing Fly ash or natural pozzolans shall be per (CCR), Title 24, Part 2, section 1903A.6.
- H. Curing Membrane: Nonstaining paper meeting the requirements of ASTM C 171, or 6 mil thick polyethylene film.
- I. Curing Compound: ASTM C 309, liquid membrane forming, with fugitive dye for identification. Compound shall be compatible with finishes to be applied to concrete. Curing Compound and areas receiving it are subject to acceptance by the Architect. Where a concrete sealer is scheduled on the drawings, use sealer material specified as the curing compound.
- J. Expansion Joint Filler: Premolded, of sizes and thicknesses indicated, meeting the requirements of ASTM D 1751.
- K. Expansion Joint Sealing Compound: Expansion joint sealant and backer rod is specified in Section 07 92 00.
- L. Vapor Barrier: See Section 07 26 00.
- M. Vapor Control Sealer: Water based, resin compound containing not less than 36 percent solids, designed to cure, seal and restrict water vapor emission for interior slabs to receive resilient, carpet, wood, rubber and sheet flooring products. Flooring products shall be warranted for a period of 15 years warranty. Acceptable products:
 - 1. Bostik; D250
 - 2. Diamond Stone; MTP
 - 3. Synthetics International; Syn10
 - 4. Floor Seal; Vapor Seal 309
- N. Clear Sealer Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 pounds of fluosilicates per gallon. Acceptable products or equal:
 - 1. Nox-Crete Chemicals Inc.; Harbeton
 - 2. Sonneborn Building Products: Lapidolith
 - 3. Protex Industries; Lithoplate
- O. Abrasive Aggregate: Factory graded and packaged fused aluminum oxide grits or crushed emery containing not less than 40 percent aluminum oxide and not less than 25 percent ferric oxide. Material shall be rust-proof, nonglazing and unaffected by freezing, moisture and cleaning materials.

2.2 MIXES

A. Concrete Proportions and Properties:

1. Minimum Concrete Strengths at 28 Days: As indicated, or 2500 psi, minimum, at 28 days where not indicated.
2. Maximum Slumps: 4 inches for beams, pipe caps, slabs, footings and other horizontal member, 5 inches for walls, columns and other vertical members.
3. Water to Cement Ratio:
 - a. Interior slabs to receive floor coverings: 0.45 w/c
 - b. Footings and other areas: 0.50 w/c
4. Maximum Size Aggregate: In no case shall the maximum aggregate size used exceed one fifth of a member's thickness, one third of the depth of slabs, nor three fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars. In columns and piers it shall not exceed 2/3 of the clear distance between reinforcement. In addition, it shall never exceed the size indicated for the following:
 - a. Slabs 6" and less in thickness: 1 inch.
 - b. Walls less than 8" in thickness: 1 inch.
 - c. Other members: 1-1/2 inch.
5. Lightweight Structural Concrete: Maximum air-dry density as indicated. Use lightweight coarse aggregates. When the density requirements can be attained by the full or partial use of natural fine aggregates, such fine aggregate shall be used. Limit shrinkage to 0.03 percent at 28 days.

B. Fly ash and natural pozzolans used in concrete: Mixes utilizing fly ash or natural pozzolans per ASTM C618 Class F as modified by the (CCR), Title 24, Part 2, Sec. 1903A.6.

C. Grout: One part portland cement and 2 parts fine aggregate, by volume. Grout shall be of a consistency suitable for the intended purpose and shall be used immediately after mixing. Grout used under minor bearing plates shall be "drypack" and shall be rammed into place. Small quantities of grout may be mixed by hand, but grout requiring 1/2 sack of cement, or more, per batch shall be machine mixed.

D. Mixing:

1. Use ready mixed concrete, mixed and transported in accordance with ASTM C 94.
2. Retempering: Mix concrete only in quantities for immediate use. Discard concrete which has set, do not retemper.
3. Indiscriminate addition of water to increase slump is prohibited. When concrete arrives at the project slump below that suitable for placing, water may be added only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. Incorporate the water by additional mixing equal to at least half of the total mixing required. Accompany addition of water above that permitted by the limitation of water-cement ratio by a quantity of cement sufficient to maintain the proper water-cement ratio. Obtain approval.

2.3 SOURCE QUALITY CONTROL

A. General: Submit mill tests and manufacturer's certification of compliance with ASTM

Specifications to the Inspector in lieu of testing of cement and aggregate analysis.

B. Mix Designs:

1. Mix designs shall be made under the supervision of a California Registered Civil Engineer, who shall determine mix proportions to fulfill the specified requirements for strength, aggregate size and workability of concrete, and such designs shall be used in proportioning all structural concrete. Mix designs shall bear the signature and seal of the California Registered Engineer. Two copies of the mix designs shall be filed with the Architect for record purposes only, not for review or approval.
2. Make mix designs in accordance with ACI 318-14: 26.4.3 and Title 24 Part 2, Section 1904A. Mix design requirements will be provided by engineer.
3. Cover and clear distances between reinforcing bars shown on the drawings shall be considered in determining the aggregate size for mix designs, which may result in an aggregate size smaller than the maximum aggregate size stipulated elsewhere in this specification.
4. A list specifying the intended usage of each mix design shall be clearly shown as part of the designs.

PART 3 - EXECUTION

3.1 MIXING

- A. Concrete shall be ready-mixed concrete and shall be mixed and delivered in accordance with the requirements of "Specifications for Ready-Mixed Concrete", ASTM C 94. In the event concrete is mixed at a central batching plant, the delivery shall be arranged so that intervals between batches are kept at a minimum, and in any event not more than 30 minutes. Trucks shall be in first class condition and kept in constant rotation during delivery. No water shall be added during transit or at the job without specific instructions from the civil engineer responsible for the mix design. Concrete shall be placed within 90 minutes after addition of water and admixtures.

3.2 CONVEYING AND PLACING CONCRETE

- A. Notify the Owner's Inspector and Division of the State Architect at least 2 working days in advance in the placing of any concrete.
- B. Soil bottoms for footings and slabs shall be inspected by the Geotechnical Engineer before placing concrete.
- C. Before placing concrete, forms shall be thoroughly inspected. Remove wood chips, dirt, etc., take out temporary bracing and cleats, box openings for pipes, etc., secure forms in their correct position and make tight, secure reinforcement, anchors, and embedded items in their proper places. Concrete which may be on the forms or reinforcement, and which is set and dry, shall be cleaned off and the forms and steel washed off before proceeding. Remove water and all foreign matter from forms and excavations.
- D. Subgrade Preparations: Before concrete floor slabs on grade are poured, place vapor barrier over prepared subgrade per Section 07 26 00.
- E. Surface Preparation: Before new concrete is deposited against hardened concrete, and before masonry is placed on concrete remove all incrustations and laitance from forms, reinforcing, and surface of hardened concrete. If the surface mortar and laitance of the first concrete pour has not been completely removed by water blasting, the hardened concrete surface shall

receive a sandblast treatment exposing the coarse aggregate, to 1/4 inch amplitude. Surfaces which are to receive drypack shall also be prepared as herein specified.

F. Handling and Depositing:

1. Concreting, once started, shall be carried on as a continuous operation until the section of approved size and shape is completed.
2. Handle concrete as rapidly as practicable from the mixer to the place of final deposit by methods which prevent the separation or loss of ingredients. Deposit concrete as neatly as practicable, in its final position to avoid rehandling or flowing.
3. Concrete shall not be dropped freely where reinforcing will cause segregation, nor shall it be dropped freely more than 4 feet. Concrete shall be deposited to maintain plastic surface approximately horizontal.
4. Do not deposit concrete that has partially hardened in the work. Concrete shall not be retempered nor used after having stood 15 minutes after leaving the truck or mixer.
5. At interior slabs with moisture sensitive toppings, place concrete directly on vapor barrier surface without the use of sand in accordance with ACI 302.R1 flow chart.

G. Vibrating and Compacting:

1. Thoroughly consolidate all concrete and compact by suitable means during the operation of placing and depositing. Thoroughly work all concrete around reinforcement, embedded items, and into the corners of the forms. Concrete against forms shall be thoroughly vibrated. Use internal vibrators under experienced supervision and keep out of contact with reinforcement and wood forms.
2. Vibrate close to the forms but do not continue at one spot to the extent that large areas of grout are formed or the heavier aggregates are caused to settle. Take care not to disturb concrete which has taken its initial set.

3.3 CONSTRUCTION JOINTS

- A. When construction joints are necessary they shall be made and located as indicated and detailed on the drawings and as specified under paragraph 3.2.5 of this Section.

3.4 TEMPERATURE REQUIREMENTS

A. Cold Weather Requirements:

1. Concrete shall not be mixed or placed when the temperature is below 40 degrees F or when conditions indicate that the temperature will fall below 40 degrees F within 72 hours.
2. Concrete temperature shall be maintained, when deposited at not less than 60 degrees F. In cold weather, the reinforcement, forms, and ground which will contact must be completely free of frost.
3. The concrete and formwork must be kept at a temperature of not less than 50 degrees F for not less than 72 hours after placing.

- B. Hot Weather Requirements: The maximum placing temperature of the concrete, when deposited, shall not exceed 90 degrees F without the use of special procedures. If the weather causes the placing temperature to exceed 90 degrees F, the mix shall be cooled by wetting the

aggregate or other appropriate method as directed by the Architect.

3.5 PROTECTION AND CURING

- A. General: Protect freshly deposited concrete from premature drying and excessively hot or cold temperatures, and maintain without drying at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete.
- B. Initial Curing: Initial curing shall immediately follow the finishing operation. Keep concrete continuously moist at least overnight. Use one of the following materials or methods:
 - 1. Ponding or continuous sprinkling.
 - 2. Absorptive mat or fabric kept continuously wet.
 - 3. Sand or other covering kept continuously wet.
 - 4. Curing Compounds: Apply compounds in accordance with the recommendations of the manufacturer, do not be use on surfaces against which additional concrete or other cementitious finishing materials are to be bonded, nor on surfaces on which such curing is prohibited by these specifications.
 - 5. Vapor Control Sealer: Apply in accordance with manufactures recommendations.
- C. Final Curing: Immediately following the initial curing and before the concrete has dried, accomplish additional curing by one of the following materials or methods:
 - 1. Continuing the method used in initial curing.
 - 2. Waterproof paper covering.
 - 3. Other moisture-retaining coverings as approved.
- D. Duration of Curing: Continue the final curing until the cumulative number of days or fraction thereof, not necessarily consecutive, during which temperature of the air in contact with the concrete is below 50 degrees F has totaled 7 days. If high early strength of concrete has been used, continue the final curing for a total of 3 days. Rapid drying at the end of the curing period shall be prevented.
- E. Formed Surfaces: Kept steel forms heated by the sun and all wood forms in contact with the concrete during the final curing period wet. If forms are to be removed during the curing period, immediately employ one of the above curing materials or methods. Continue such curing for the remainder of the curing period.
- F. Protection from Mechanical Injury: During the curing period, protect the concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration. Protect finished concrete surfaces from damage caused by construction equipment, materials, or methods, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.
- G. Cure surfaces to receive resilient flooring and ceramic tile by covering with waterproof paper coverings.

3.6 PATCHING

- A. Any concrete which is not formed as shown on the drawings, or for any reason is out of alignment, or is not true, or is not plumb or level, or is not in plane, or shows a defective

surface, or is otherwise not in true and continuous form or is structurally defective, shall be considered as not conforming with the intent of this specification.

- B. Contractor shall remove such concrete from the job and replace with new work, at no extra cost to the Owner, unless Architect grants permission to patch defective area in accordance with the following procedures. Do not consider permission to patch any such area as a waiver of Architect's right to require complete removal of defective work if patching does not, in his opinion, satisfactorily produce or restore required quality and appearance of surface. Defects impairing strength of concrete will require special repairs or removal as directed by the Architect.
- C. Patching Appearance Defects:
 - 1. Inspection: After removing entire formwork assemblies, inspect concrete surfaces and patch tie holes, pour joints, voids, stone pockets, and such other defective areas as are permitted by Architect to be patched.
 - 2. Procedure: Where necessary, chip away defective areas to depth of not less than 1 inch with edges perpendicular to surface, with no feather edges. Wet area to be patched and a space at least 6 inches wide entirely surrounding it, to prevent absorption of water from patching mortar. Place grout of equal parts portland cement and sand with sufficient water to produce a brushing consistency. Brush well into surface, then follow immediately with patching mortar.
 - 3. Use patching mortar of same material and of approximately same proportions as used for concrete, except omit coarse aggregate, and do not mix richer than 1 part cement to 3 parts sand. Use as little mixing water as is consistent with requirements of handling and placing.
 - 4. Compact mortar into place and screed off so as to leave patch slightly higher than surrounding surface. Then leave patch undisturbed for a period of 1 to 2 hours to permit initial shrinkage before being finally finished. Finish the patch in such a manner as to match adjoining surface, after striking off the patch with a straightedge spanning the patch and held parallel to direction of form marks.
- D. Patching Structural Defects: Special repairs, or removal and replacement, as directed by the Architect.

3.7 CONCRETE FINISHES

- A. Finishes for Formed Surfaces:
 - 1. As-Cast Surfaces: After surface defects have been repaired, as specified, leave concrete with finish imparted by forms.
 - 2. Sacked Finish: Remove fins, rough spots, stains and hardened mortar by carefully rubbing with a fine abrasive stone to a smooth even surface. Remove excess form sealer by carefully scrubbing surface with 5 to 10 percent solution of muriatic acid. Fill holes or irregular surfaces. Apply a slurry proportioned one part cement to 1-1/2 parts sand, passing a No. 16 sieve, by damp loose volume, mixed with sufficient water to form a grout having the consistency of thick paint. Before applying slurry to surfaces, dampen concrete sufficiently to prevent water absorption. Spread slurry over surfaces with a clean sponge rubber float to completely fill holes and imperfections. Float surface vigorously, and while slurry is still plastic remove excess grout. Allow to dry then rub with burlap to completely remove dry grout so that no visible grout film remains. Complete the entire cleaning operation for any area the day it is started.

3. Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than the cement paste drawn from the concrete by the rubbing process.

B. Finishes for Flatwork:

1. Floated Finish: Provide floated finish for subfloors for ceramic and quarry tile. After concrete has been placed, struck off, consolidated and leveled, do not work concrete further until ready for floating. Begin floating when water sheen has disappeared, or when mix has stiffened sufficiently to permit proper operation of a power-driven float. Consolidate surface with power-driven floats of impact type. Hand float with wood or cork-faced floats in locations inaccessible to power-driven machine. Recheck trueness of surface at this stage with a 10 foot straight-edge applied at not less than two different angles. Cut down high spots and fill low spots during this procedure to produce planes checking true under the straightedge in all directions, with tolerances not exceeding 1/8 inch in 10 feet. Refloat slab immediately to a uniform, smooth, granular texture.
2. Troweled Finish: Provide troweled (non-burnished) finish for interior concrete finish floors and subfloors for resilient flooring and carpet. Finish surface with impact power floats, as specified above where applicable, then with power trowels, and finally with hand trowels. Perform first troweling after power floating with a paper trowel to produce a smooth surface which is relatively free of defects but which may still contain some trowel marks. Perform additional trowelings by hand after surface has hardened sufficiently. Perform final troweling when a ringing sound is produced as trowel is moved over surface. Thoroughly consolidate surface by hand troweling operations. Finished surface shall be free of trowel marks and shall be uniform in texture and appearance. On surfaces intended to support floor covering, remove by grinding, defects of sufficient magnitude to show through floor covering. Particular care shall be taken to finish troweling around the edges of the slabs so finish surface edges shall be at same elevations as the rest of the top surface of the slab. Burnished and over finished surfaces which inhibit bonding of products to concrete shall be sanded or cleaned to expose absorbent concrete by lightly shot blasting or diamond grinding to remove concrete burnished surfaces.
3. Edge and Joint Finish: Use standard tools to produce rounded edge corners and intermediate line scoring.
4. Mark-Off Lines: Form mark-off lines with curved edging tool neat and true to line, uniform throughout. Conform to markings indicated.
5. Concrete Sealer: All concrete floors not indicated in the schedule to receive other finish shall received two coats of sealer specified herein. Spray apply in perpendicular directions. First coat shall be applied as a curing compound. Apply final coat just prior to occupation of buildings. Before applying final coat, remove dirt, dust, oil, grease, asphalt and other foreign matter.
6. Chemical Hardener: Remove dirt, dust, oil, grease, asphalt, paint and other foreign matter from the concrete surface. Damp cure concrete, do not cure with curing compound. Apply hardener using 3 coats allowing 24 hours between coats. Apply first coat at 1/3 strength, second coat at 1/2 strength and final coat at 2/3 strength. Use manufacturer's recommended application rates. After final coat is dry, remove surplus hardener by scrubbing and mopping with water.
7. Abrasive Aggregate Finish: Provide abrasive aggregate at stair treads, ramps, and elsewhere as indicated. Soak aggregate for 10 minutes in clean water, drain off surplus water, sprinkle uniformly by hand at rate of 0.9 pounds per square foot of concrete

surface. Wood float, trowel-tamp or roll into concrete.

8. Finishes for exterior concrete site construction are specified in Section 32 13 13.

3.8 EXPANSION JOINTS

- A. Provide premolded expansion joints to full depth of slabs, where indicated on the drawings. Install with top edge 1/2 inch below the surface and tool adjacent concrete edges to 1/8 inch radius. Use steel pins to hold material in place during placing and floating of concrete. After a minimum of 28 days after slabs have been placed and finished, fill tops of expansion joints with sealer to 1/8 inch below surface of slabs. No traffic shall be permitted to travel over sealed joints until sealer is thoroughly dry.

3.9 DEFECTIVE WORK

- A. Defective concrete work shall be removed and replaced at Contractor's expense.

3.10 FIELD QUALITY CONTROL

- A. Contractor shall examine placement of all reinforcement and embedded items prior to inspection by Owner's Testing Agency to ensure the proper clearances have been maintained and that all reinforcement and inserts are firmly tied to resist displacement.
- B. Contractor shall notify the Owner's Inspector at least 48 hours ahead of each concrete pour, and no concrete shall be placed until all reinforcing steel has been installed and approved by the Inspector. All reinforcing shall be complete in every way by the end of the working day prior to concrete placing. Testing and Inspections are specified in Section 01 45 23.
- C. Compression tests of concrete shall be performed by a qualified testing laboratory in accordance with contract documents.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.
- B. Related Sections:
 - 1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other metal items not defined as structural steel.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 5. Identify members and connections of the seismic-load-resisting system.
 - 6. Indicate locations and dimensions of protected zones.

1.5 QUALITY ASSURANCE

- A. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
- B. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.7 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. Channels, Angles, Shapes: ASTM A 36/A 36M.
- B. Plate and Bar: ASTM A 36/A 36M.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. Unfinished Threaded Fasteners: ASTM A307
 - 1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 4. Finish: Plain.

2.3 PRIMER

- A. Primer: Dunn Edwards Carbozinc 859 epoxy (carboline) prime coat.
- B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.

5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.5 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 1. SSPC-SP 2, "Hand Tool Cleaning."
 2. SSPC-SP 3, "Power Tool Cleaning."
 3. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
 5. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
 6. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 7. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
 8. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
 9. SSPC-SP 8, "Pickling."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.6 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize lintels, shelf angles, and welded door frames attached to structural-steel frame and located in exterior walls.

2.7 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 1. Liquid Penetrant Inspection: ASTM E 165.
 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 3. Ultrasonic Inspection: ASTM E 164.
 4. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- C. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- D. Splice members only where indicated.
- E. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds. RCSC prescribes inspection for snug-tightened joints and testing and inspection for each method of pretensioning joints.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.5 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 05 12 00

SECTION 05 50 00
MISCELLANEOUS METALS

PART 1 - GENERAL

1.1 SUMMARY:

- A. The work includes the furnishing and installing of all miscellaneous metal work and related connections complete as shown and noted on the drawings and specified. The General Conditions and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES:

- A. The editions referenced herein of the standards and specifications published by the following organizations, apply to the work only to the extent specified by the reference.
- B. American National Standards Institute
- C. American Institute of Steel Construction (AISC).
- D. American Society for Testing and Materials (ASTM).
- E. American Welding Society (AWS).
- F. National Association of Architectural Metal Manufacturer's (NAAMM).

1.3 SUBMITTALS:

A. Shop Drawings:

- 1. Submit fully detailed shop drawings of all miscellaneous metal work giving sizes; details of fabrication and construction; methods of assembly and bracing; and locations of hardware, anchors, and all accessories.
- 2. Drawings shall include all shop and erection details, including cuts, copes, connections, holes, bolts and welds. All welds, both shop and field, shall be indicated by standard welding symbols in AWS /Latest Edition. Drawings shall show the size, length and type of each weld. All materials to be brazed or soldered shall have connections indicated by symbols which are industry standards.
- 3. Contractor shall be responsible for all fabrication and for correct fitting of metal members shown on shop drawings. No materials shall be fabricated or delivered to the site until the shop drawings have been approved and returned to the Contractor.

1.4 FIELD MEASUREMENTS AND TEMPLATES:

- A. Secure all field measurements required for proper and adequate fabrication and installation of the work. Furnish templates for exact location of items to be embedded in concrete and masonry and setting instructions required for all installation.

1.5 DELIVERY AND STORAGE OF MATERIALS:

- A. Deliver material in time to insure uninterrupted progress of the work. Materials shall be stored in a manner to preclude damage and permit ready access for inspection and identification of each

shipment. Steel materials, either plain or fabricated, shall be stored above the ground upon platforms, pallets, skids, or other supports. Materials shall be kept free from dirt, grease, and other foreign matter, and shall be protected from corrosion. Materials showing evidence of damage will be rejected and shall be immediately removed from the work.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Steel, Rolled Shapes, Bars and Plates: Standard structural sections, conforming to ASTM A 36/A36M.
- B. Galvanized sheet steel: Conform to ASTM A 653/A653M, Classification SS.
- C. Steel pipe: Conform to ASTM A 53/A 53M, grade B.
- D. Steel tubes: Conform to ASTM A501/A 501M or A500/A 500M, grade B, and shall be seamless tube.
- E. Anchors, Bolts, and Fastenings: Bolts and nuts shall conform to ASTM A307, Grade A and ASTM A563/A 563M.
- F. Electrodes: All arc-welding electrodes shall conform to AWS A5.1 or A5.5 E60XX or E70XX.
- G. Shop primer for steel, other than galvanized, shall meet Federal Specification TT-P-86G, or TT-P645 (zinc chromate).
- H. Treatment for damaged galvanized surfaces shall be Rust-Oleum, Bright Galvanizing Compound or equal.
- I. Pipe Sleeves: Pipe sleeves through concrete walls and footings shall be standard weight, wrought iron, mild steel, or cast iron sleeves with not less than 1/2 inch space all around between the sleeve and pipe.
- J. Steel Grating: Grating shall be smooth surface welded steel grating with 2 inch by 3/16 inch bearing bars. Cross bars shall be spaced 4 inches on center. Grating shall be galvanized. Design grating to support 100 pounds per square foot. Brodhead Steel Products, Blaw-Knox or equal.
- K. Galvanizing: Zinc coating shall conform to ASTM A 123/A 123M-01a. Zinc coating for threaded products shall conform to ASTM A 153/A 153M-01a.
- L. Quick setting hydraulic cement shall be one of the following or equivalent approved by the Architect.
 - 1. "Por-Rok" as manufactured by Hallemite/Lehn and Fink.
 - 2. "Thorogrip" as manufactured by Thoro Systems Products.
 - 3. "Masterflow 713" as manufactured by Master Builders.
- M. Concrete: As specified in Section 03 30 00 – Cast-In-Place Concrete.

2.2 FABRICATION:

- A. Materials shall be fabricated and assembled in the shop to the greatest extent possible. Shearing, flame cutting, and chipping shall be done carefully and accurately. Coordinate all connection details to concrete or masonry. Verify all lines, levels, and dimensions, where possible, just prior to commencing fabrication of connection details. Correct any work that does not fit. Schedule and coordinate work under this section with that specified elsewhere in order to produce a workmanlike installation. When not otherwise shown or specified, comply with all applicable requirements of AISC "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings". Finished surfaces of all exposed members shall be smooth and free of any markings, burrs, or other defects.
- B. Connections shall be bolted, brazed or welded as indicated. One-sided or other types of eccentric connections will not be permitted unless shown in detail and approved on the shop drawings.
- C. Holes shall be cut, drilled, or punched at right angles to the surface of the metal and shall not be made or enlarged by burning. Holes in base or bearing plates shall be drilled. Holes shall be provided in members to permit connecting the work of other trades.
- D. Steel Pipe Handrails:
 - 1. Construct handrails of steel pipe, size as shown on the drawings.
 - 2. Join posts, rails and corners by fitting posts to top rails, fitting intermediate rails to posts, mitering corners, groove welding joints and grinding smooth.
 - 3. Railing splices shall be butted and reinforced by tight interior sleeve not less than 6 inches long.
 - 4. Railings may be bent at corners in lieu of mitering and welding provided bends are made in suitable jugs and pipe is not crushed.
 - 5. Shop fabricate handrails in as large sections as practicable.
 - 6. Shop prime interior handrails and hot dip galvanize exterior handrails.
- E. Miscellaneous rolled steel plates and shapes shall be provided for corner guards, sills dock leveler pit edge angles, mechanical equipment supports and other locations indicated or required to complete the work.
- F. Ladders: Fabricate ladders of 3/4 inch round solid section carbon steel rods fitted into holes drilled in carbon steel side rails, welded and ground smooth. Support brackets shall be fully welded to side rails. Shop prime all exposed steel surfaces. Ladders shall meet the safety requirements of ANSI A14.3-74.
- G. Ladder Cages: Construct ladder cages of carbon steel vertical bars and hoops of sizes indicated. Vertical bars shall be on the inside of hoops and shall be welded to them. The inside of the cage shall be clear of projections. Cages shall conform to safety requirements of ANSI 14.3-74.
- H. Guard Posts (pipe bollard): Guard posts shall be galvanized extra heavy weight (Schedule 80) steel pipe set in a concrete foundation and filled with concrete. Concrete shall be 2000 psi in accordance with Section 03 30 00.
- I. Stairs:
 - 1. Stringers, Columns, and Landing Supports: Carbon steel shapes and plates as shown. Provide closures for exposed ends.

2. Treads and Landings:

- a. Where indicated provide sheet steel pans not lighter than 14 gage, filled with concrete. Reinforce concrete as to support minimum 100 lbs. per square foot live load. Fabricate with steel angle supports attached to pans with rivets or welds and to stringers with welds.
- b. Where indicated provide galvanized steel grate treads with non-slip nosing, as manufactured by Borden Co., McNichols Co., or Klemp. Bearing bar size shall be 1-1/4 inch by 3/16 inch serrated.

3. Risers: Sheet steel not lighter than 14 gage.

4. Weld all connection in accordance with AWS D1.1-00. Provide continuous welds, ground smooth where exposed.
5. Shop prime all exposed steel surfaces of interior stairs. Hot dip galvanize all steel surfaces of stairs exposed to the exterior.

J. Steel Picket Fencing:

1. Construct fencing and gates of steel tubing, sizes as shown on the drawings. All connections shall be welded.
2. Post spacing shall not exceed 6'-0" unless noted otherwise.
3. Shop fabricate picket panels complete for installation between posts.
4. Shop prime all steel for field painting.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS:

- A. General: All steel and miscellaneous metal work shall conform with the applicable requirements of the hereinbefore referenced "Codes and Standards". All details shown are typical. Similar details apply to similar conditions. Drawings shall be checked with the architectural drawings for dimensions, elevation, size, and location of all installations. All miscellaneous metal items shall be supplied in ample time for incorporation in the work. Include all reinforcing angles, plates, straps, brackets, hangers, clips, lugs, holes, sleeves, shims, etc., as shown or required for erection of steel and miscellaneous metal work and as required to complete the work as shown on the drawings.

3.2 WELDED CONNECTIONS:

- A. All welders shall be certified qualified welders. All welders welding light gauge metal shall be qualified for light gauge metal welding.
- B. Welded connection shall be made in strict accordance with AWS D1.1-00. All welding shall be done in the shop unless otherwise shown or specified.
- C. All welds and other connection exposed in the finished work shall be ground and dressed smooth and so that the shape and profile of the item welded is preserved.

3.3 INSTALLATION:

- A. Miscellaneous metal items shall be installed as rapidly as the progress of other work will permit. Splices and field connections shall be made with bolts, except where welding or brazing is indicated or approved on the shop drawings. Fasteners shall be installed as specified hereinafter.
- B. Metal work shall be set accurately at the established lines and levels. Installation shall be in strict accordance with approved drawings and actual condition, true and horizontal or perpendicular as the case may be, level and square with angles and edges parallel with related lines of the building.
- C. Anchor bolts, anchors, block-outs and sleeves shall be properly located and built into connecting work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.
- D. Pipe Handrails: Railings shall be installed in concrete by means of pipe sleeve inserts set and anchored in the concrete. Posts shall be inserted into pipe sleeves, plumbed and aligned. The annular space between pipe posts and sleeve inserts shall be filled with quick setting hydraulic cement.
- E. Wall Supported Items: Attach ladders and handrails and other wall hung items by bolting to metal reinforcing installed behind the finish material and welded to the steel studs or by expansion anchors in concrete and masonry walls.
- F. Picket Fencing: Install fence posts in concrete foundations per plan. Panels rails shall be cut to fit in field. Extensions to rails will not be permitted.

3.4 GALVANIZED FINISH:

- A. Touch up all damaged galvanized finish due to installation, welding, threading or other work with treatment specified herein.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY:

- A. The work includes the furnishing and installing of all rough carpentry work as shown and noted on the drawings and as specified herein. The General Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 QUALITY ASSURANCE:

- A. Requirements of Regulatory Agencies.
 - 1. Rough carpentry shall conform to the California Code of Regulations (CCR) Title 24 Part 2, California Building Code, Chapter 23.
 - 2. Framing anchors shall be furnished and installed in accordance with the manufacturer's current ICC-ES Evaluation Report.
- B. Grade Marks:
 - 1. Identify lumber by the official grade mark of WCLIB, WWPA or RIS.
 - 2. Identify plywood by the official grade mark of APA.
 - 3. Identify pressure treated lumber and plywood with the official grade mark of AWPB.

1.3 REFERENCE STANDARDS:

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference.
- B. American Wood Preservers Bureau (AWPB).
- C. U.S. Department of Commerce (USDC).
- D. West Coast Lumber Inspection Bureau (WCLIB).
- E. Western Wood Products Association (WWPA).
- F. Redwood Inspection Service (RIS).
- G. American Plywood Association (APA)
- H. United States Department of Commerce (USDC), Product Standard (PS)

1.4 SUBMITTALS:

- A. Submit copies of the framing anchor manufacturer's current ICC-ES Evaluation Report.

- B. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
- C. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5664.

1.5 PRODUCT DELIVERY STORAGE AND HANDLING:

- A. Deliver, store and handle materials in a manner to protect them from damage or deterioration due to excessive moisture or other conditions that would adversely affect their serviceability. Stack wood products flat with spacers beneath and between each bundle to provide air circulation.

1.6 COORDINATION:

- A. Cooperate with other trades in coordinating their work with the work of this section. Provide wood grounds, blocking and nailers where indicated or as required for integration of work of other trades into the structure.

PART 2 - PRODUCTS

2.1 LUMBER:

- A. Moisture content at time of placing:
 - 1. Untreated lumber shall not exceed 19 percent.
 - 2. Treated lumber shall not exceed 19 percent after pressure treatment.
- B. Sizing and Surfacing: Sizes indicated are nominal; actual sizes shall be in accordance with USDC PS20-10. Exposed surfaces of wood members shall be surfaced smooth except as indicated otherwise.
- C. Grades and Species: Provide lumber of the grades and species listed below for the various purposes, graded in accordance with WCLIB "Standard Grading and Dressing Rules No. 17", 2004 Edition, (with Supplement XIV and Supplement XV), WWPA "Western Lumber Grading Rules 05" or RIS "Standard Specifications for Grades of California Redwood Lumber" 2000 Edition.
 - 1. Sill Plates, Cants, Roof Nailers and Roof Curbs: Standard or No. 1 grade, any species, pressure preservative treated.
 - 2. Sills on concrete No. 1 Douglas Fir (Pressure preservative treated).
 - 3. Blocking, Nailers, Top Plates and Bracing: No. 2 grade, Douglas Fir or larch.
 - 4. Studs and Headers: No. 1 Douglas Fir, larch.

2.2 PLYWOOD:

- A. Plywood shall conform to DOC PS 1, grades as listed below for various purposes.
 - 1. Plywood sheathing, walls: DOC PS 1, Exterior, Structural I sheathing, fire-retardant-treated.

2. Plywood combination subfloor-underlayment: DOC PS 1, Exterior, Structural I, C-C Plugged single-floor panels, fire-retardant-treated.
3. Backing Board for Electrical and Telephone Equipment: Exterior Type B-D grade, 3/4 inch thick, fire-retardant-treated.

2.3 FIRE-RETARDANT-TREATED LUMBER

- A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 1. Treatment is not to promote corrosion of metal fasteners.
 2. Interior Type A: Treated materials are to have a moisture content of 28 percent or less when tested in accordance with ASTM D3201/D3201M at 92 percent relative humidity.
- B. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.
- C. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency and other information required by authorities having jurisdiction.
- D. Application: Treat all rough carpentry unless otherwise indicated.

2.4 ROUGH HARDWARE:

- A. Furnish items of rough hardware, connections, bolts, required to complete the work. Nails, bolts, nuts, washers and other fasteners exposed to the exterior shall be hot-dipped galvanized.
 1. Nails: Common wire round head. Use ring-shank or spiral shank nails for floor sheathing. See drawings for special nailing requirements.
 2. Bolts: Standard mild steel, square or hexagonal head machine bolts with matching nuts and cut washers as indicated.
 3. Lag Bolts: Meeting the requirements of ANSI/ASME Std. B18.2.1, Sizes shown or noted on drawings
 4. Screws: Meeting the requirements of ANSI/ASME Std. B18.6.1, sizes shown or noted on drawings.
 5. Powder Driven Fasteners: Provide one of the following fastener systems complete with all necessary washers, nuts and other appurtenances.

Powder Power Tool Corp. "Drive-It"
TRW/Ramset Fastening Systems
Hilti Fastening Systems
 6. Framing Connectors: Provide galvanized steel joist hangers and other framing anchors having the minimum design and load capacities shown on the drawings. Load capacities shall be those shown in manufacturer's current ICC-ES Evaluation Report.

Simpson Co. "Strong Tie"
K.C. Metal "Superspeed Connectors"
Silver Metal Products Inc.

2.5 MISCELLANEOUS ITEMS:

- A. Rough carpentry work and miscellaneous items and their related components are not necessarily individually described. The most important features and those requiring detail description are mentioned. Rough carpentry work and miscellaneous items not mentioned or described shall be furnished or installed in accordance with the intent of the drawings and specifications and as required to complete the work.
- B. Moisture Barrier: 6 mil polyethylene sheeting. Provide tape for sealing lapped joints in sheeting and penetrations through sheeting.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Before commencing work, check all lines and levels indicated and such other work as has been completed. Do not proceed until discrepancies have been corrected or adjusted.

3.2 CONSTRUCTION AND WORKMANSHIP:

- A. Install moisture barrier at concrete floor slab. Lap joints in moisture barrier 6 inches and seal with joint tape. Seal penetrations in moisture barrier sheeting with joint tape.
- B. Install wood framing, making proper provisions for work of other trades. Do framing of wood required to accommodate RF shielding, plumbing, heating and ventilating, electrical, and other trades. Fit neatly around exposed items, such as outlet boxes, conduit, pipes, and ducts.
- C. Wall Framing:
 - 1. Plates for furring, partitions and walls shall be single at bottom and double at the top, except as otherwise detailed. Splices in top plates shall be staggered not less than 48" except as otherwise shown on drawings. Where plates are cut for passing pipes and similar items, they shall be reinforced on both sides with 12 ga. x 1-1/2" x 18" steel plates punched for eight 16d nails.
- D. Furring, blocking, and backing shall be furnished and installed where required for reception of RF shielding, wallboard, formation of architectural features, concealment of pipes, conduits, ducts, attachment of supports for toilet room accessories, building specialties, and other fixtures. Consult with the trades concerned and set furring and blocking required. Include fire retardant treated wood blocking for drywall partitions and walls where shown or required.
- E. Openings shall be provided for mechanical and electrical equipment, ducts, and other equipment. Where one or more joists are cut, the joists supporting the trimmers shall be doubled and well spiked. Where continuation of three or more joists is interrupted, the abutting headers and joists shall be reinforced with approved type of joists hangers.
- F. Install wall, floor and roof sheathing as shown on RF shielding drawings and structural drawings. Subflooring and sheathing shall have solid bearing under all edges. Sheets shall laid up with 1/16" space between sheets at ends and 1/8" space at edge joints. Inspect roof sheathing carefully as soon as it is laid to determine its adequacy to support workmen and the normal loads which it will receive. Protect roof sheathing from weather until roofing is installed by applying building paper or polyethylene sheeting.
- G. Secure approval of Architect before cutting, drilling or notching wood members that may weaken the member. Lay out framing so that structural members will not require cutting for openings, pipes, vents or ducts.

3.3 LUMBER FASTENINGS:

- A. Nailing and bolting of wood members shall conform to the minimum requirements of the "Title 24, California Code of Regulations", Chapter 23, and as specified herein and shown on the structural drawings.
- B. Bolting: Bolts shall be stamped stock machine bolts as specified. Bolts shall be all square or hexagonal head with matching nuts. Bolted connections shall be retightened before final acceptance or, in case of bolted connections in concealed locations, immediately before the area is sealed off.
- C. Nailing: Connections shall be as called for on the drawings or in table 2304.10.1 of the CCR, where not shown on drawings. Nails shall be untreated steel for interior work and concealed framing, and galvanized for all exposed work on exterior. Unless connections are detailed or steel connectors indicated, nails shall not be driven closer together than 1/2 of their length no closer to the edge of a member than 1/4 their length. When wood tends to split with size of nail used, predrill holes for nails. Penetration of nails or spikes into pieces shall be not less than one-half the length of the nail or spike.
- D. Washers: Provide all bolts and lag screws bearing on wood with cut washers except where malleable iron or plate washers are shown on structural drawings.
- E. Metal Framing Connectors: Install connectors in accordance with the manufacturer's current ICC-ES Evaluation Report.

3.4 ROUGH HARDWARE:

- A. Furnish and install all stock items of rough hardware as indicated or required, including clips, anchors, hangers, bolts, ties and plates for connecting wood framing members to wood, concrete, steel, except as specified to be provided under other Sections.

END OF SECTION

SECTION 06 41 16
PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Section 12 36 61.19 "Quartz-Agglomerate Countertops."

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Shop Drawings:

1. Submit shop drawings in conformance with the requirements of the North American Architectural Woodwork Standards (NAAWS), latest edition.
2. Include plans, elevations, sections, and attachment details.
3. Show large-scale details.
4. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
5. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
6. Apply Woodwork Institute Certified Compliance Label on the first page of Shop Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

1.6 QUALITY ASSURANCE

- A. Work of this Section shall be in accordance with the Grade or Grades specified of the NAAWS.
- B. Certified Compliance:
 - 1. 1. Before delivery to the job site, provide a Woodwork Institute Certified Compliance Certificate indicating the millwork products being supplied and Certifying that these products fully meet the requirements of the NAAWS Grade or Grades specified.
 - 2. Provide a Woodwork Institute Certified Compliance Label on each elevation of casework.
 - 3. At completion of installation provide a Woodwork Institute Certified Compliance Certificate indicating the products installed, and certifying that the installation of these products fully meets the requirements of the NAAWS Grade or Grades specified.
- C. Manufacturer's Qualifications: Firm with minimum of five (5) years of production experience with projects of similar scope, whose qualifications indicate the ability to comply with the requirements of this section.
- D. Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from WI certification program indicating that woodwork and installation complies with requirements of grades specified.
 - 2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Architectural Woodwork Standards Grade: Custom.
- C. Type of Construction: Frameless.
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Formica Corporation.
 - b. Wilsonart, LLC.
 - c. Or equal.
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. Edges: PVC T-mold matching laminate in color, pattern, and finish.
 - 5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- G. Materials for Semi-exposed Surfaces: Cabinet liner; 0.020 inches thick.
- H. Edge Banding: 3 mm thick PVC or ABS T-mold matching laminate in color, pattern, and finish.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Sides: Seven-ply or nine-ply hardwood plywood with no internal voids.
 - 2. Bottoms: Hardwood plywood of the same species and cut as the drawer sides. Bottoms shall be fully housed into sides, backs and subfronts, and securely glued.
 - 3. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As indicated by laminate manufacturer's designations.
 2. Match Architect's sample.
 3. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. Solid colors, matte finish.
 - b. Solid colors with core same color as surface, matte finish.
 - c. Wood grains, matte finish.

2.2 WOOD MATERIALS

- A. Lumber: In accordance with the NAAWS Grade specified for the product being fabricated. Moisture Content: 6% to 12% for boards up to 2-inch (50.8 mm) nominal thickness, and shall not exceed 19% for thicker pieces.
- B. Composite Wood Products:
1. MDF meeting the requirements of ANSI A 208.2 Grade 155 MR-50. Particleboard is not acceptable.
 2. Veneer core plywood: A non-telegraphing hardwood manufactured with exterior glue.
 3. Softwood Plywood: DOC PS 1, medium-density overlay.
 4. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087100 "Door Hardware."
- B. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 135 degrees of opening, self-closing.
- C. Back-Mounted Pulls: ANSI/BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
- E. Catches: Magnetic catches, ANSI/BHMA A156.9, B03141.
- F. Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081.
- G. Shelf Rests: ANSI/BHMA A156.9, B04013; metal.
- H. Drawer Slides: ANSI/BHMA A156.9.
1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer.
 - a. Type: Full extension.
 - b. Material: Zinc-plated steel with polymer rollers.

2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 4. For drawers more than 3 inches (75 mm) high, but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.
- I. Door Locks: ANSI/BHMA A156.11, E07121.
- J. Drawer Locks: ANSI/BHMA A156.11, E07041.
- K. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.
- L. Tempered Float Glass for Cabinet Doors: ASTM C1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6 mm thick unless otherwise indicated.
- M. Grommets for Cable Passage: 2-inch (51-mm) OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
1. Color: White or Gray.
- N. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.
1. Satin Stainless Steel: ANSI/BHMA 630.
- O. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.5 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
 2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be

removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- D. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual."
 - 1. For glass in frames, secure glass with removable stops.
 - 2. For exposed glass edges, polish and grind smooth.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify the adequacy and proper location of any required backing or support framing.
- B. Verify that mechanical, electrical, plumbing, and other building components affecting work in this section are in place and ready.

3.2 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.3 INSTALLATION

- A. Install all work in conformance with the NAAWS, latest edition.
 - 1. Installation shall conform to the NAAWS grade of the items being installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) using concealed shims.
 - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.4 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through Woodworks Institute's Certified Compliance Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
 1. Inspection entity shall prepare and submit report of inspection.

3.5 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semi-exposed surfaces.

END OF SECTION 06 41 16

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket.
 - 2. Mineral-wool blanket (SAFB).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET

- B. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.2 MINERAL-WOOL BLANKETS (SAFB)

- A. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Thermofiber SAFB by USG
 - 2. Min Wool SAFB by Manville
 - 3. Or equal.

2.3 Z-FURRING CHANNEL:

- A. "Zee" Furring: Cold-formed galvanized steel; 30 mil thickness, unless noted otherwise on drawings, 1-1/4-inch wide flange for screw attachment.

2.4 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
 - 1. Adhesives shall have a VOC content of 70 g/L or less.
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that adjacent materials and surfaces are dry, in a dust free environment, free of obstructions, and ready to receive insulation.
- B. Verify painting, finish woodwork, wiring runs, and flooring is complete prior to acoustic blanket or board installation.
- C. Verify that special standouts and furring for wall trim details or additional wall support items are installed.
- D. Verify wall penetrations have been sealed, where applicable.

3.2 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 54 19
POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Repairs to existing adhered polyvinyl chloride (PVC) roofing system.
2. Roof insulation.
3. Elastomeric Coating.
4. Water Cut-Off.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
3. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.
10. Review water cut-off methods and procedures.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
 - 1. Base flashings and membrane terminations.
 - 2. Tapered insulation thickness and slopes.
 - 3. Water Cut-Off details.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Product Test Reports: For roof membrane and insulation, tests performed by independent qualified testing agency indicating compliance with specified requirements.
- C. Research/Evaluation Reports: For components of roofing system, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

- 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.
- B. Provide temporary protection if weather limitations delays completion of installation.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Utilize roofing products and installers that will not compromise or void the current roofing system warranty.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
 - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.3 POLYVINYL CHLORIDE (PVC) ROOFING

- A. PVC Sheet: ASTM D4434, Type II, Grade I, glass-fiber reinforced, smooth backside surface.
 - 1. Manufacturers: Subject to compliance with requirements, provide listed products by the following:
 - a. Carlisle SynTec Incorporated; Sure-Flex PVC.
 - b. Sika Sarnafil; Sarnafil G410 – 60 EnergySmart.
 - c. Soprema; Sentinel G150.
 - d. Or equal.
 - 2. Thickness: 60 mils (1.5 mm).
 - 3. Exposed Face Color: White.

2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.
 - 1. Carlisle Syntec; Sure-Flex PVC Flashing
 - 2. Sika Sarnafil; PVC Flashing.
 - 3. Soprema Sentinel G150.
 - 4. Or equal.
- A. Bonding Adhesive: Manufacturer's standard, water based bonding adhesive for membrane, and Low VOC solvent-based bonding adhesive for base flashings.
 - 1. Carlisle Syntec ; Flexible FAST Adhesive.
 - 2. Sika Sarnafil; Sarnacol Adhesive.
 - 3. Soprema; Sentinel H2O or Sentinel S Bonding Adhesive.
 - 4. Or equal.
- B. Water Cut-off Mastics/Water Block: As supplied by roofing membrane manufacturer and recommended by the manufacturer's printed data.
- C. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel, vinyl-coated galvanized steel, or aluminum bars, with anchors.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- E. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.5 ELASTOMERIC COATING

- A. Elastomeric Coating shall be liquid-type resin and fabric reinforced flashing material recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 - a. Carlisle Syntec:Liquiseal Liquid Flashing (2-component polyurethane).
 - b. Sika Sarnafil: Liquid Flashing SW (PMMA).
 - c. Soprema; Alsan RS 260 Lo-Flash (PMMA).
 - d. Or equal.

2.6 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C1177, glass-mat, water-resistant gypsum substrate 1/4 inch (6 mm) thick.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation; GlasRoc Roof Board.
 - b. Georgia-Pacific Building Products; DensDeck
 - c. National Gypsum Company; DEXcell Roof Board.
 - d. United States Gypsum Company; Securock Ultralite Roof Board.
 - e. Or equal.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.7 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by PVC roof membrane manufacturer selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.
 - 1. Provide rigid insulation with minimum LTTR R-value of 5.6 per inch ASTM C 1289-2014.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.8 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
- D. Cover Board: ASTM C1289 Type II, Class 4, Grade 1, 2 and 3 high density polyisocyanurate board bonded to mineral surfaced fiber glass facer. 1/4 inch (6 mm) thick, factory primed.

2.9 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, acceptable to roofing system manufacturer.
 - 1. Carlisle Syntec Sure-Flex PVC Heat-weldable Walkway rolls
 - 2. Sika Sarnafil Walkway Pad.
 - 3. Soprema; Sentinel Walkway Pad.
 - 4. Or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 - 4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 5. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Install insulation strips according to acoustical roof deck manufacturer's written instructions.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Confirm all HVAC units and other equipment supported by curbs conform with the following:
 - 1. Curbs are required to provide a minimum 8" base flashing height measured from the surface of the new membrane to the top of the flashing membrane. See drawings for mechanical equipment platform heights.
 - 2. Nail top of flashing and install new metal counterflashing prior to installation of unit.
 - 3. Perimeter nailers must be elevated to match elevation of roof insulation.

3.4 INSTALLATION OF SUBSTRATE BOARD

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29.
 - 2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.5 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
 - 1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
 - 1. Prime surface of concrete deck in accordance with insulation manufacturer, and allow primer to dry.
 - 2. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - 3. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- H. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
- I. Mechanically Fastened and Adhered Insulation: Install each layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten first layer of insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - 3. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.
 - 4. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - 5. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck.
 - 1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
- K. Install slip sheet over cover board and immediately beneath roofing.

3.6 INSTALLATION OF ADHERED ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
 - 1. Install sheet according to ASTM D 5036.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- D. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- G. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- H. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.7 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 INSTALLATION OF ELASTOMERIC COATING

- A. Prepare metal surfaces in accordance with elastomeric coating manufacturer's instructions. Mechanically abrade metal surface to provide a clean and rough surface. Apply metal primer and let dry. Allow metal primer to fully cure. Pre-cut reinforcing fleece prior to mixing resin. Apply reinforcing fleece and resin elastomeric coating at sheet metal cap flashings, and penetrations where indicated. Comply with manufacturer's instructions for number of coats and thickness of coating.

3.9 INSTALLATION OF WALKWAYS

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.10 WATER CUT-OFFS

- A. If work shift ends prior to weatherproofing the entire roof area, seal the membrane to roof substrate. Straighten insulation line using loose-laid cut insulation sheets and seal the terminated edge of the roof membrane using products recommended by roof membrane manufacturer. Seal flutes in metal decking along cut-off edge where occurs. Pull the membrane free or cut to expose the insulation when resuming work and remove the cut insulation sheets used for fill-in. Do not use asphalt or coal-tar products for sealing.
- B. Provide temporary flashing at drains, curbs, walls or other penetrations and terminations of roofing membrane until permanent flashings can be installed. Remove temporary flashing before applying permanent flashing.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.
 - 1. Electric Field Vector Mapping (EFVM): Testing agency shall survey entire roof area for potential leaks using electric field vector mapping (EFVM).
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.12 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.13 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
 - 1. Owner: .
 - 2. Address: .
 - 3. Building Name/Type: .
 - 4. Address: .
 - 5. Area of Work: .
 - 6. Acceptance Date: _____.
 - 7. Warranty Period: .
 - 8. Expiration Date: _____.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
 - 1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning; Insert required wind speed in first subparagraph below.
 - b. peak gust wind speed exceeding 100 mph (m/s);
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and

- g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
 6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
 7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 075419

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manufactured reglets with counterflashing.
 - 2. Formed roof-drainage sheet metal fabrications.
 - 3. Formed low-slope roof sheet metal fabrications.
 - 4. Formed equipment support flashing.
- B. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, and other manufactured roof accessory units.

1.2 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each of the following
 - 1. Underlayment materials.
 - 2. Elastomeric sealant.
 - 3. Butyl sealant.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.
 - 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 - 8. Include details of roof-penetration flashing.
 - 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.

10. Include details of special conditions.
11. Include details of connections to adjoining work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
 1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
 2. Protect stored sheet metal flashing and trim from contact with water.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
 - 1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 (Z275) coating designation or aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); prepainted by coil-coating process to comply with ASTM A755/A755M.
 - 1. Surface: Smooth, flat and mill phosphatized for field painting.
 - 2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
 - b. GCP Applied Technologies Inc.
 - c. Protecto Wrap Company.
 - d. Or equal.
 - 2. Source Limitations: Obtain underlayment from single source from single manufacturer.
 - 3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F (29 deg C) or lower.
- C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
 2. Fasteners for Zinc-Coated (Galvanized) Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.
- C. Solder:
1. For Stainless Steel: ASTM B32, Grade Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.
- H. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- I. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
1. Source Limitations: Obtain reglets from single source from single manufacturer.
 2. Material: Galvanized steel, 0.022 inch (0.56 mm) thick.
 3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 4. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
 5. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
 6. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
 7. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
 8. Finish: Mill.

2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
 - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
 - 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:
 - 1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
 - 2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- G. Seams:
 - 1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Base Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch (0.71 mm) thick.
- B. Counterflashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.022 inch (0.56 mm) thick.
- C. Flashing Receivers: Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick.
- D. Roof-Penetration Flashing: Fabricate from the following materials:
 1. Galvanized Steel: 0.028 inch (0.71 mm) Insert dimension thick.
- E. Roof-Drain Flashing: Fabricate from the following materials:
 1. Stainless Steel: 0.0156 inch (0.396 mm) thick.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Pad Cap Flashing: Fabricate from the following materials:
 1. Stainless Steel: 0.0250-inch (0.635 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.
 1. Install in shingle fashion to shed water.
 2. Lap joints not less than 2 inches (50 mm).
- B. Self-Adhering, High-Temperature Sheet Underlayment:
 1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
 2. Prime substrate if recommended by underlayment manufacturer.
 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
 4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses.
 5. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller.
 6. Roll laps and edges with roller.
 7. Cover underlayment within 14 days.
- C. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
 1. Install in shingle fashion to shed water.

2. Lapp joints not less than 4 inches (100 mm).

3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
 1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
 6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 7. Do not field cut sheet metal flashing and trim by torch.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
 1. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 1. Use sealant-filled joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
 - b. Form joints to completely conceal sealant.
 - c. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way.
 - d. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pretin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pretinning where pretinned surface would show in completed Work.
 2. Do not solder metallic-coated steel sheet.
 3. Do not pretin zinc-tin alloy-coated copper.
 4. Do not use torches for soldering.
 5. Heat surfaces to receive solder, and flow solder into joint.
 - a. Fill joint completely.
 - b. Completely remove flux and spatter from exposed surfaces.
 6. Stainless Steel Soldering:
 - a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
 - b. Promptly remove acid-flux residue from metal after tinning and soldering.
 - c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

- A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

3.5 INSTALLATION OF ROOF FLASHINGS

- A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
 2. Extend counterflashing 4 inches (100 mm) over base flashing.
 3. Lap counterflashing joints minimum of 4 inches (100 mm).
 4. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 INSTALLATION OF MISCELLANEOUS FLASHING

- A. Equipment Pad Cap Flashing:
1. Coordinate installation of equipment pad cap flashing with installation of roofing and equipment.

2. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.9 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 07 62 00

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Equipment supports.
3. Pipe and duct supports.
4. Pipe portals.
5. Preformed flashing sleeves.

B. Related Sections:

1. Section 05 50 00 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.2 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
2. Calculations prepared, stamped and sealed by professional engineer licensed to practice in the State of California, indicating site specific wind and seismic forces acting on pipe and duct supports as defined in ASCE – 7. Based on calculated loads, identify material, size, quantity and type of mechanical fasteners, length of embedment and spacing for each type fastener required for anchorage of pipe or duct support to roof structure or concrete fill. Include required longitudinal and transverse bracing in calculations. Indicate location and type on shop drawings.

- C. Delegated-Design Submittal: For roof curbs equipment supports, pipe and duct supports 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. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
 - 2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 - 4. Required clearances.
- B. Sample Warranties: For manufacturer's special warranties.

PART 2 - PRODUCTS

2.1 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Curbs Plus, Inc.; CPC-1, 2 or 3 Conventional Roof Curb.
 - b. Pate Company (The); PC-1, 2, 3 or 4 Roof Curb.
 - c. Roof Products, Inc.; RPC-1, 2, 3 or 4 Roof Curb.
 - d. Thybar Corporation; TC-1, 2 or 3 Roof Curb.
 - e. Or equal.
- B. .Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: As indicated.
- D. Material: Zinc-coated (galvanized) steel sheet, 0.052 inch (1.32 mm) thick.
 - 1. Finish: Mill phosphatized.
- E. Construction:
 - 1. Curb Profile: Profile as indicated on Drawings compatible with roofing system.

2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
3. Fabricate curbs to minimum height of 12 inches (300 mm) above roofing surface unless otherwise indicated.
4. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
5. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
6. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
7. Liner: Same material as curb, of manufacturer's standard thickness and finish.
8. Nailer: Factory-installed wood nailer along top flange of curb or under top flange on side of curb, continuous around curb perimeter.
9. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch (19-mm) thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
10. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.2 EQUIPMENT SUPPORTS

- A. Equipment Supports: Internally reinforced perimeter metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed structure-mounting flange at bottom.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Curbs Plus, Inc.; CPES 1, 2 or 3.
 - b. Pate Company (The); Equipment Support es-1, es-2, or es-2b.
 - c. Thybar Corporation; TEMS 1, 2 or 3.
 - d. Or equal.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: 600 lbs./ft..
- D. Material: Zinc-coated (galvanized) steel sheet, minimum 0.052 inch (1.32 mm) thickness.
- E. Construction:
 1. Curb Profile: Profile as indicated on Drawings compatible with roofing system.
 2. Fabricate equipment supports to minimum height of 12 inches (300 mm) above roofing surface unless otherwise indicated.
 3. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

2.3 PIPE AND DUCT SUPPORTS

- A. Curb-Mounted Pipe Supports: Galvanized steel support with welded or mechanically fastened and sealed corner joints, straight sides, or stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom; with adjustable-height roller-bearing pipe support accommodating up to 20-inch- (508-mm-) diameter pipe or conduit and with provision for pipe retainer; as required for quantity of pipe runs and sizes.
1. Manufacturers: Subject to compliance with requirements, provide listed products by one of the following:
 - a. Pate Company (The); PRS 1, 2 or 3.
 - b. RPS; Multi Pipe Supports
 - c. Thybar Corp.; Pipe Roller curbs with adjustable roller supports.
 - d. Or equal.
- B. Alternate Pipe Supports: Curb base manufactured of 100% recycled rubber and polyurethane prepolymer with a uniform load capacity of 500 lbs. per linear foot of support. Provide with steel strut galvanized per ASTM A653. Provide with manufacturer's recommended hardware; channel strut legs, support saddle and slides to allow for duct movement, vertical and horizontal adjustment.
1. Manufacturers: Subject to compliance with requirements, provide listed products by one of the following:
 - a. Dura-Blok by Eaton B-Line Division; DB610, DBE10 (elevated) or DBR (adjustable).
 - b. Mifab; C-Port Supports.
 - c. Miro Industries; Supports.
 - d. Or equal.
- C. Duct Supports: Pre-fabricated, 0.052-inch (1.3 mm) minimum thickness, G-90 galvanized steel, unitized construction with internal base plate, continuous welded corner seams, internally reinforced with pressure treated wood nailer, counterflashing cover with sheet metal screws. Provide with manufacturer's recommended hardware; channel strut legs, support saddle and slides to allow for duct movement, vertical and horizontal adjustment. Provide galvanized or stainless steel anchors for mechanical attachment to roof structure or lightweight concrete fill.
1. Manufacturers: Subject to compliance with requirements, provide listed products by one of the following:
 - a. Pate Company (The); DSS 1, 2 or 5.
 - b. RPS; Standard Rectangular Duct Supports; ER-2A, ER-3A or ER-4A.
 - c. Thybar Corp.; TEMS 1, 2 or 3.
 - d. Or equal.
- D. Alternate Duct Supports: Curb base manufactured of 100% recycled rubber and polyurethane prepolymer with a uniform load capacity of 500 lbs. per linear foot of support. Provide with steel strut galvanized per ASTM A653. Provide with manufacturer's recommended hardware; channel strut legs, support saddle and slides to allow for duct movement, vertical and horizontal adjustment.
1. Manufacturers: Subject to compliance with requirements, provide listed products by one of the following:
 - a. Dura-Blok by Eaton B-Line Division; DB-DS series.
 - b. Mifab; C-Port DS or DSW Duct Supports.
 - c. Miro Industries; Stanchioned DS Supports.
 - d. Or equal.

2.4 PREFORMED FLASHING SLEEVES

- A. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
 - 1. Manufacturers: Subject to compliance with requirements, provide listed products by one of the following:
 - a. Custom Solution Roof and Metal Products; Aluminum Stack Flashing
 - b. Pate Company (The); PPS 3,6,12.
 - c. Thaler Metal Industries; Stack Jack Flashings; Sj-35-A (Basis of Design).
 - d. Or equal.
 - 2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
 - 3. Height: Minimum 12 inches (300 mm).
 - 4. Diameter: As indicated on Drawings.
 - 5. Finish: Manufacturer's standard.

2.5 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation and mill phosphatized for field painting where indicated.
 - 1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
 - 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
- B. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.
- C. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.
- D. Steel Tube: ASTM A 500/A 500M, round tube.
- E. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.
- F. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.6 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, thickness as indicated.
- C. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C), thickness as indicated.
- D. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.

- E. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPAC2; not less than 1-1/2 inches (38 mm) thick.
- F. Underlayment:
 - 1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 - 2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
 - 3. Slip Sheet: Building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum, rosin sized.
 - 4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 5. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 6. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
 - 7. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 8. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- H. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- E. Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.
 - 1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
- F. Preformed Flashing-Sleeve and Flashing Pipe Portal Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.
- G. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

SECTION 07 81 00
APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes sprayed fire-resistive materials for repairing damaged fireproofing.

1.2 DEFINITIONS

- A. SFRM: Sprayed fire-resistive materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

1.7 FIELD CONDITIONS

- A. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

- A. Sprayed Fire-Resistive Material: Manufacturer's standard, factory-mixed, dry formulation of gypsum or Portland cement binders, additives and lightweight mineral or synthetic aggregates, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carbolite Company; a subsidiary of RPM International; Pyrolite 15, Pyrolite 15 High Yield, or Retro-Lite 15 Blue.
 - b. GCP Applied Technologies Inc.; W. R. Grace **Monokote** MK-6, or Retro-Guard® RG (Basis of Design).
 - c. Isolatek International; Cafco 300, or Cafco 300 SB.
 - d. Or equal.
 - 2. Application: Designated for exterior use by a qualified testing agency acceptable to authorities having jurisdiction.
 - 3. Bond Strength: Minimum 200-lbf/sq.ft. (9.58 kPa) cohesive and adhesive strength based on field testing according to ASTM E736.
 - 4. Density: Not less than 15 pcf (240kg/m³) dry density specified in the approved fire-resistance design, according to ASTM E605.
 - 5. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E605, whichever is thicker, but not less than 0.375 inch (9 mm).
 - 6. Combustion Characteristics: ASTM E136.
 - 7. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 0.
 - b. Smoke-Developed Index: 0.
 - 8. Compressive Strength: Minimum 1,440 psf (68.9 kPa) according to ASTM E761.
 - 9. Corrosion Resistance: No evidence of corrosion according to ASTM E937.
 - 10. Deflection: No cracking, spalling, or delamination according to ASTM E759.

11. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E760.
12. Air Erosion: Maximum weight loss of 0.005 g/ft² (0.05 g/sq. m) in 24 hours according to ASTM E859.
13. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G21.
14. Finish: Spray-textured finish.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
 1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E736.
- C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written instructions. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
 1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.

- B. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Metal Decks:
 - 1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, is completed.
 - 2. Do not apply fireproofing to underside of metal roof deck until roofing is completed; prohibit roof traffic during application and drying of fireproofing.
- E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended

use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

- F. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- G. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.
- J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.
- K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- L. Cure fireproofing according to fireproofing manufacturer's written instructions.
- M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- N. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
 - 2. Spray-Textured Finish: Finish left as spray applied with no further treatment.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by Chapter 17 of CBC.
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07 81 00

SECTION 07 84 13
PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Penetrations in fire-resistance-rated walls.
 2. Penetrations in horizontal assemblies.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system

manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) ICBO
 - 3) California State Fire Marshal listing number.

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Manufacturers:
 - 1. 3M
 - 2. Bio FireShield, Inc. by Rectorseal
 - 3. Dow Corning Corp.
 - 4. Hilti
 - 5. Or equal.
- B. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

- C. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- D. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 - 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- E. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.
- F. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 - 1. Permanent forming/damming/backing materials.
 - 2. Substrate primers.
 - 3. Collars.
 - 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

- F. Intumescent Putty Pads: Moldable firestop putty designed to help protect electrical outlet boxes. Size of putty pads to match size of electrical outlet boxes.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.

- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 84 13

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Nonstaining silicone joint sealants.
 - 3. Architectural Urethane Joint sealants.
 - 4. Mildew-resistant joint sealants – 100% Silicone.
 - 5. Butyl joint sealants.
 - 6. Latex joint sealants.
 - 7. Siliconized Acrylic Latex.
 - 8. Non-Halogenated Latex-Based Elastomeric Sealant.
- B. Related Requirements:
 - 1. Section 07 92 19 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Sealant Installation Execution Plan: The Execution Plan shall indicate the responsible party for installing all sealants, including their experience and qualifications.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- C. Field-Adhesion-Test Reports: For each sealant application tested.
- D. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range. Color shall be white in laboratory and clean room spaces.
- C. VOC Content: Sealants and sealant primers shall comply with the following:
 - 1. Architectural sealants and sealant primers shall have a VOC content of 250 g/L or less.

2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonstaining, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation; 790 or 795 Silicone Building Sealant.
 - b. GE Construction Sealants; SCS2700 Silpruf LM.
 - c. Pecora Corporation; 890 (NST).
 - d. Sika Corporation; Sikasil WS-290.
 - e. Tremco Incorporated; Spectrem 1.

- f. Or equal.
- B. Silicone, S, NS, 50, NT: Single-component, nonstaining, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation; 756 SMS Building Sealant.
 - b. GE Construction Sealants; Silpruf NB.
 - c. Pecora Corporation; 864 (NST) or 895 (NST).
 - d. Sika Corporation; Sikasil WS-295.
 - e. Tremco Incorporated; Spectrem 2.
 - f. Or equal.

2.3 ARCHITECTURAL URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 35, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation - Construction Systems; MasterSeal NP 1 (formally Sonneborn Sonolastic NP 1)
 - b. Bostik, Inc.; 915
 - c. Sika Corporation; Sikaflex 1a or Sikaflex 201
 - d. Tremco Incorporated; Vulkem 116.
 - e. Or equal.
 - 2. Color: White
- B. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation - Construction Systems; MasterSeal NP 2 (formally Sonneborn Sonolastic NP 2)
 - b. Pecora Corporation; DynaTrol II for traffic applications, install per manufacturer's technical bulletin.
 - c. Tremco Incorporated.; Dymeric 240 or Dymeric 240 FC
 - d. Or equal.
- C. Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Uses T and NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pecora Corporation; DynaTrol II for traffic applications, install per manufacturer's technical bulletin.
 - b. Tremco Incorporated.; Dymeric 240 or Dymeric 240 FC
 - c. Or equal.

2.4 MILDEW-RESISTANT SILICONE JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT, G, and A.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation; 999-A Silicone Building & Glazing Sealant or 786 Mildew Resistant Sealant.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; GE SCS1700 Sanitary.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.; Bondaflex Sil 100 WF.
 - d. Tremco Incorporated; Tremsil 200 Sanitary.
 - e. Or equal.

2.5 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.; Chem-Calk 300.
 - b. Pecora Corporation; BC-158
 - c. Tremco; General Purpose Butyl Sealant
 - d. Or equal.

2.6 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
 - 1. Latex plus silicone is not an acceptable product.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Basf; MasterSeal NP 520.
 - b. Pecora Corporation; AC-20 + Silicone Acrylic Latex Caulking Compound.
 - c. Sherwin-Williams Company (The); White Lightning 3006 Siliconized Acrylic Latex Caulk, or 950A Siliconized Acrylic Latex Caulk.
 - d. Tremco Incorporated; Tremflex 834.
 - e. Or equal.

2.7 NON-HALOGENATED LATEX-BASED ELASTOMERIC SEALANT ASTM C 920

- A. Designed to provide passive smoke and fire protection in construction joints. This material is also designed to restore sound attenuation properties to sound-rated ceilings and partitions.
- B. The fire protective sealant shall be a water-based, non-halogenated, elastomeric and shall contain no solvents, inorganic fibers, nor asbestos. The sealant shall dry to form a flexible, moisture resistant seal and shall adhere to all common construction surfaces. The sealant shall have demonstrated sound attenuation properties.

- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hilti, Inc.; CP 506 Smoke and Acoustical Sealant.
 2. Specified Technologies, Inc.; SpecSeal ES Elastomeric Sealant, or SNS Smoke "N" Sound Acoustical Sealant.
 3. Tremco Incorporated; TREMstop Smoke & Sound Sealant.
 4. Or equal.

2.8 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Alcot Plastics Ltd.; Soft Backer Rod (non-gassing, pliable bi-cellular)
 - b. Backer Rod Mfg. Inc.; Mile High Foam, or Titan Foam (non-gassing, pliable bi-cellular).
 - c. BASF Corporation; Construction Systems; MasterSeal 920 and 921.
 - d. Construction Foam Products; a Division of Nomaco, Inc.; HBR or SOF Rod (non-gassing, pliable bi-cellular).
 - e. W.R. Meadows; Kool-Rod.
 - f. Or equal.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell polyethylene foam material with a surface skin), reticulated polyethylene backer rod, or Type B (bicellular material with a surface skin)] , and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.9 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Tile control and expansion joints.
 - b. Vertical joints on exposed surfaces of partitions.
 - c. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:
 - a. Perimeter joints between interior wall surfaces and frames of interior doors windows.
 - b. Other joints as indicated on Drawings.
 2. Joint Sealant: Acrylic latex.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Concealed mastics.
1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Butyl-rubber based.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 07 92 19
ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical joint sealants.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for non-acoustical applications.

1.2 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. Acoustical-Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E90.

2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning; QuietZone Acoustic Sealant
 - b. Hilti, Inc.; CP 506 Smoke and Acoustical Sealant.
 - c. Pecora Corporation; AC-20 FTR.
 - d. Specified Technologies, Inc.; SNS Smoke "N" Sound Acoustical Sealant.

- e. USG Corporation; Sheetrock Brand Acoustical Sealant.
 - f. Or equal.
- 2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint

sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 19

SECTION 07 95 13.13
INTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall expansion joint covers.

1.2 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.
 - 1. Wall expansion joint covers.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 WALL EXPANSION JOINT COVERS

- A. Metal-Plate Wall to Corner Joint Cover: Metal cover plate fixed on one side of joint gap and free to slide on other.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Construction Specialties, Inc.; ASMC.
 - b. MM Systems Corporation; X-N-2.
 - c. Nystrom: WJ-200W.
 - d. Or equal.
 - 2. Application: Wall to corner.
 - 3. Joint Width: As indicated on Drawings.
 - 4. Exposed Metal:
 - a. Aluminum: Clear anodic, Class II.

2.3 MATERIALS

- A. Aluminum: ASTM B221 Alloy 6063-T5 for extrusions; ASTM B209 Alloy 6061-T6 for plate, and Alloy 5052-H32 for sheet.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

2.4 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.5 ACCESSORIES

- A. Manufacturer's stainless steel attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
- B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
 1. Repair or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
 2. Install frames in continuous contact with adjacent surfaces.

- a. Shimming is not permitted.
- 3. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
- 4. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
- 5. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
- 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.
- C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
 - 1. Provide in continuous lengths for straight sections.
 - 2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion joint cover assemblies. Reinstall cover plates or seals prior to Substantial Completion.

END OF SECTION

SECTION 08 12 13
HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standard steel frames.
2. Borrowed lites.

B. Related Requirements:

1. Section 13 49 25 "Radio Frequency (RF) Shielding – Copper" for door frames provided as part of RF door assembly at entry to MRI room.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each frame type.
2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
3. Locations of reinforcement and preparations for hardware.
4. Details of each different wall opening condition.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door; ASSA ABLOY.
 2. Curries Company; ASSA ABLOY.
 3. Custom Metal Products.
 4. Republic Doors and Frames.
 5. Steelcraft; an Allegion brand.
 6. Stiles Custom Metal, Inc.
 7. Or equal.

2.2 STANDARD STEEL FRAMES

- A. Construct hollow-metal frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Interior Frames: SDI A250.8.
1. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
 2. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.3 BORROWED LITES

- A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
- B. Construction: Face welded Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.4 FRAME ANCHORS

- A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
 3. Post-installed Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- E. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.6 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- B. Hardware Preparation: Factory prepare hollow-metal frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce frames to receive non-templated, mortised, and surface-mounted door hardware.
 2. Comply with BHMA A156.115 for preparing hollow-metal frames for hardware.
- C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Provide fixed frame moldings on outside of exterior and on secure side of interior frames. Provide loose stops and moldings on inside of hollow-metal frames.
 2. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 3. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap frames to receive non-templated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. General: Install hollow-metal frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions. Comply with SDI A250.11.
- B. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
1. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 2. Install frames with removable stops located on secure side of opening.
- C. Floor Anchors: Secure with post-installed expansion anchors.

1. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
- D. Solidly pack mineral-fiber insulation inside frames. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- E. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Product Schedule: For access doors and frames.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Concealed Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acudor Products, Inc.; DW-5040.
 - b. Babcock-Davis; BNW series.
 - c. JL Industries, Inc.; a division of the Activar Construction Products Group; TMW series.
 - d. Karp; KDW series.
 - e. Or equal.
 2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
 3. Optional Features: Gasketing.
 4. Locations: Ceiling.
 5. Door Size: 24-inches by 24-inches, unless indicated otherwise on Drawings.
 6. Metallic coated Steel Sheet for Door: Nominal 0.040 inch (1 mm), 20 gage, factory primed.
 7. Latch and Lock: Cam latch, screwdriver operated.

2.3 FIRE-RATED ACCESS DOORS AND FRAMES

- A. Fire-Rated, Insulated, Flush Access Doors with drywall bead type frame for a concealed frame application:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acudor Products, Inc.; FW-5050-DW series.
 - b. Babcock-Davis; BIW series.
 - c. JL Industries, Inc.; a division of the Activar Construction Products Group; FDW series.
 - d. Karp Associates, Inc.; KRP-350FR.
 - e. Or equal.
 2. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with drywall bead type frame, self-closing door, and concealed hinge.
 3. Locations: Wall and ceiling.
 4. Door Size: 24-inches by 24-inches unless noted otherwise.
 5. Fire-Resistance Rating: UL Listed 1.5 hr. "B" Label, and may be used in a 2 hour fire rated wall or shaft.
 6. Door: Flush to frame. Self-closing. Nominal 0.0625-inch (16 ga.) , factory primed. Door can be opened from the inside or back of the door with thumb-turn latch.
 7. Frame Material: Same material, thickness, and finish as door.
 8. Hinge: Concealed pivot pins.
 9. Spring: Heavy duty. An extra spring is provided with door size greater than 14-inch by 14-inch for ceiling installation. Both springs must be attached to the door to ensure door will close when installed in horizontal position (ceiling or bottom of shaft).
 10. Insulation: Roxul Rockboard 80. 2-inch (50 mm) thick and fire retardant.
 11. Latch: Flush mounted, interchangeable turn-ring operator and key-operator latch.

2.4 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Frame Anchors: Same material as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.5 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- D. Latch and Lock Hardware:
 - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 - 2. Keys: Furnish two keys per lock and key all locks alike.

2.6 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. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
 - 2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.
 - a. Color: As selected by Architect from full range of industry colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass
 - 2. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Section 13 49 25 "Radio Frequency (RF) Shielding – Copper" for RF view window and glass used at MRI control room.

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Pilkington LOF
 - 2. Vitro (formally PPG Glass Technology)
 - 3. Viracon
 - 4. Or equal.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Glazing Manual."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

- D. Laminated Safety Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fire-resistance rating is based on another product.
 - 2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.
- E. Safety Glazing Labeling: Provide third party Certification Label certifying compliance with 16 CFR 1201, Category II.

2.5 SEALANTS

- A. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks:
 - 1. Neoprene with a Shore A durometer hardness of 85, plus or minus 5.
 - 2. Type recommended by sealant or glass manufacturer.
- D. Spacers:
 - 1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 - 2. Type recommended by sealant or glass manufacturer.
- E. Edge Blocks:
 - 1. Neoprene with a Shore A durometer hardness per manufacturer's written instructions.
 - 2. Type recommended by sealant or glass manufacturer.
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product

manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Presence and functioning of weep systems.
 3. Minimum required face and edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.
- B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.6 MONOLITHIC GLASS SCHEDULE

- A. Glass Type G-1: Clear, tempered glass.
 - 1. Minimum Thickness: 6 mm.

END OF SECTION 08 80 00

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.
- B. Evaluation Reports: For slotted tracks, post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
 2. Protective Coating: ASTM A653/A653M, G60 (Z180), hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C645.
1. Steel Studs and Tracks:
 - a. Minimum Base-Steel Thickness: As indicated on Drawings.
 - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Slotted deflection track: ASTM C645; Grade 50 ksi; minimum thickness 0.054-inch (1.4 mm).
1. Products: Brady Construction Innovations, Inc.; SLP-TRK, ClarkDietrich MaxTrak (SLT), Cemco SLP-TRK, or equal.
- D. Fire Stop Deflection Track: Provides joint protection for up to 1-inch with UL 2079 Class II or III Movement Capabilities.
1. Products: ClarkDietrich; BlazeFrame SL-1, or equal.
- E. Flat Strap and Backing Plate: Galvanized steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Steel Thickness: As indicated on Drawings, or if not indicated then a minimum thickness of 0.0396-inch (1 mm).
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 1-1/2 inches (38 mm).
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C645.
- H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4-inches (32 mm), wall attachment flange of 7/8-inch (22 mm), minimum uncoated-steel thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated.
- J. Backing Track or Plate: Track: ASTM C645; minimum 0.064-inch thickness, by 8-inch wide.
- 2.3 SUSPENSION SYSTEMS
- A. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.062-inch (1.6 mm) diameter wire, or double strand of 0.048-inch (1.2 mm) diameter wire.
- B. Hanger Attachments to Concrete:

1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or AC193 as appropriate for the substrate.
 - a. Uses: Securing hangers to structure.
 - b. Type: Torque-controlled, expansion anchor.
 - c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
 - d. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).
 2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70. Provide silencer equipped tools only.
- C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch (1.367 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: As indicated on Drawings.
- E. Furring Channels (Furring Members):
1. Steel Studs and Tracks: ASTM C645.
 - a. Minimum Base-Steel Thickness: As indicated on Drawings.
 - b. Depth: As indicated on Drawings.
- F. Angle Clips: Not less than 1-1/2 by 2 inches (38 by 50 mm), 0.108-inch- (2.75-mm-) thick, galvanized steel.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
 - 2. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, lead apron hangers, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Install studs so flanges within framing system point in same direction.
- C. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- E. Z-Shaped Furring Members:
1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 16 inches (400 mm) o.c.
 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.
- 3.5 INSTALLING CEILING SUSPENSION SYSTEMS
- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems as indicated.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.

B. Related Requirements:

1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Ceiling and wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396.
- B. Gypsum Ceiling Board: ASTM C 1396.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Hot-dip galvanized-steel sheet, or rolled zinc.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 - 1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
 - 2. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through

perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Sealant shall have a VOC content of 250 g/L or less.
2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with

manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

- H. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:

- 1. Wallboard Type: Vertical surfaces unless otherwise indicated.
- 2. Type X: Where required for fire-resistance-rated assembly.

- B. Single-Layer Application:

- 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
- 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
- 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

- C. Multilayer Application:

- 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. Bullnose Bead: Use where indicated.
 - 3. Curved-Edge Cornerbead: Use at curved openings.

- D. Aluminum Trim: Install in locations indicated on Drawings.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 4: Areas exposed to view that are to receive light-textured finishes, wallcoverings, and flat or eggshell (low sheen) paints.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 - 3. Level 5: Areas where severe lighting conditions exist; hallways, corridors, exam rooms, toilet rooms and areas that are to receive gloss or semi-gloss paint.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 51 13
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings, including MRI Exam Room.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Ceiling suspension-system members.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 - 5. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Access panels.
 - g. Perimeter moldings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E1264.
 - 2. Smoke-Developed Index: 50 or less.
- C. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL or from the listings of another qualified testing agency.
- D. Non-Magnetic: Ceiling grid members within MRI Exam Room shall be non-ferrous material.

2.3 ACOUSTICAL PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. USG Corporation.
 - 2. Armstrong World Industries, Inc.
 - 3. CertainTeed Corporation.
 - 4. Or equal.
- B. ACT-1: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
 - 1. Product: As indicated on Drawings.
 - 2. Surface Texture: Smooth.
 - 3. Composition: Mineral Fiber.
 - 4. Type and Form: ASTM E1264 Classification Type IV, Form 1 and 2, Pattern E, G.
 - 5. Surface Burning Characteristics: Class A, Flame Spread 25, Smoke Developed 50.
 - 6. Color: White.
 - 7. Light Reflectance (LR): Not less than 0.88.
 - 8. NRC: Not less than 0.70.
 - 9. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension system members: Square edge.
 - 10. Thickness: 3/4-inch (19 mm).
 - 11. Modular Size: 24-inch by 24-inch.
 - 12. Recycled Content: Not less than 40%.

13. Location: As indicated on Drawings.
 14. Formaldehyde and VOC Classification: Show Zero or low or none producing concentration levels below the test-chamber background level as defined by CHPS, OEHHA, & LEED for Schools.
- C. ACT-6: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
1. Product: As indicated on Drawings.
 2. Surface Texture: Smooth.
 3. Composition: Glass fiber with membrane-faced overlay.
 4. Type and Form: ASTM E1264 Classification Type XII, Form 2, Pattern E and G.
 5. Surface Burning Characteristics: Class A, Flame Spread 25, Smoke Developed 50.
 6. Color: White.
 7. Light Reflectance (LR): Not less than 0.88.
 8. NRC: 0.90.
 9. CAC: 20-25.
 10. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension system members: Square edge.
 11. Thickness: 1-inch (25 mm).
 12. Modular Size: 24-inch by 24-inch.
 13. Recycled Content: Not less than 40%.
 14. Location: As indicated on Drawings.
 15. Formaldehyde and VOC Classification: Show Zero or low or none producing concentration levels below the test-chamber background level as defined by CHPS, OEHHA, & LEED for Schools.

2.4 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. USG Corporation (Donn Brand DX/DXL).
 2. Chicago Metallic.
 3. Armstrong World Industries, Inc.
 4. CertainTeed Corporation.
 5. Rockfon (Chicago Metallic)
 6. Or equal.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
- C. ACT-1: Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.
1. Structural Classification: Heavy-duty system.
 2. Face Design: Flat, flush.
 3. Face Finish: Painted white.

- D. ACT-6: Wide-Face, Double-Web, Metal Suspension System: Main and cross runners formed from extruded aluminum (non-ferrous only) to produce structural members with 15/16-inch wide flanges.
1. Structural Classification: Heavy-duty system.
 2. Face Design: Flat, flush.
 3. Face Finish: Painted white.

2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B633, Class SC 1 (mild) service condition.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, with a yield stress load of at least 3 times design load, but not less than 12 gauge.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
- F. Hold-Down Clips: Manufacturer's standard hold-down.
- G. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- H. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
- I. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- J. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636, seismic design requirements, and manufacturer's written instructions.
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye

- screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 4. Install hold-down and seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
 - 1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
 - 2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Thermoplastic-rubber base.
 - 2. Rubber molding accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet (3 linear m) for each type, color, pattern, and size of resilient product installed.

1.4 QUALITY ASSURANCE

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE RB-01

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 2. Flexco.
 - 3. Johnsonite; a Tarkett company.
 - 4. Roppe Corporation, USA.
 - 5. Or equal.
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 1. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Cove: Provide in areas with resilient flooring.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: As indicated on Drawings.
- E. Lengths: Cut lengths 48 inches (1219 mm) long or coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Job formed.
- H. Colors: Match Owner's sample.

2.2 RUBBER MOLDING ACCESSORY

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 2. Flexco.
 - 3. Johnsonite; a Tarkett company.
 - 4. Roppe Corporation, USA.
 - 5. Or equal.
- B. Description: Rubber carpet edge for glue-down applications nosing for carpet nosing for resilient floor covering reducer strip for resilient floor covering joiner for tile and carpet transition strips.
- C. Profile and Dimensions: As indicated.

- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors and Patterns: As indicated.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.

- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Use preformed corners at outside corners. Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
 - a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 09 65 16
RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Vinyl sheet flooring.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of resilient sheet flooring.
1. Include sheet flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 2. Show details of special patterns.
- C. Samples: For each exposed product and for each color, texture, and pattern specified, in manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections.
1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.
- D. Product Schedule: For resilient sheet flooring. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.
- B. Warranties:
1. Manufacturer material warranty.
 2. Installer installation warranty.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are experienced in managing commercial flooring projects and provide professional installers, qualified to install the various flooring materials specified. Installer is “qualified” if trained by Tarkett or a certified INSTALL (International Standards & Training Alliance) resilient floor covering installer.

1.7 FIELD CONDITIONS

- A. Ambient Temperature Ranges for Product Installation:
 - 1. Maintain temperatures during installation within range recommended by manufacturer, but not less than 65 deg F (18 deg C) in spaces to receive flooring one week before installation, during installation, and one week after installation.
 - 2. After installation, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).
- B. Close spaces to traffic during resilient sheet flooring installation.
- C. Close spaces to traffic for 48 hours after resilient sheet flooring installation.
- D. Install resilient sheet flooring after other finishing operations, including painting and overhead work, have been completed.

1.8 WARRANTY

- A. Manufacturer's Limited Commercial Warranty: Limited 10 year Commercial Warranty for Manufacturing Defects: Manufacturer warrants from the date of purchase for a period of twenty (10) years of Commercial use that vinyl sheet and/or tile flooring products conform to written specifications and are free of manufacturing defects, subject to the terms and conditions specified herein.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL SHEET FLOORING HSV-01

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong Flooring, Inc.; Medintech with Diamond 10 Technology.
 - 2. Johnsonite (Tarkett).
 - 3. Forbo Industries, Inc.

4. Gerflor.
 5. Mannington Mills, Inc.
 6. Shaw Contract Group; a Berkshire Hathaway company.
 7. Or equal.
- B. Product Standard: ASTM F1913, nonlayered, homogeneous sheet vinyl flooring without backing.
1. Overall Thickness (Wear-Layer): 0.080-inch (2.0 mm) .
 2. Wear Layer Thickness: 31 mil (0.80 mm).
 3. Wearing Surface: Smooth.
 4. Sheet Width: 6 ft. 7-inches (2.0 m).
 5. Seaming Method: Heat-welded.
 6. Installation Method: Glue-down: Full-spread adhesive to completely adhere flooring to substrate.
 7. Colors and Patterns: As indicated.

2.3 VINYL SHEET FLOORING HSV-02 and HSV-03

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong Flooring, Inc.; Medley.
 2. Johnsonite (Tarkett).
 3. Forbo Industries, Inc.
 4. Gerflor.
 5. Mannington Mills, Inc.
 6. Shaw Contract Group; a Berkshire Hathaway company.
 7. Or equal.
- B. Product Standard: ASTM F1913, nonlayered, homogeneous sheet vinyl flooring without backing.
1. Overall Thickness (Wear-Layer): 0.080-inch (2.0 mm) .
 2. Wear Layer Thickness: 31 mil (0.80 mm).
 3. Wearing Surface: Smooth.
 4. Sheet Width: 6 ft. 6-inches (2.0 m).
 5. Seaming Method: Heat-welded.
 6. Installation Method: Glue-down: Full-spread adhesive to completely adhere flooring to substrate.
 7. Colors and Patterns: As indicated.

2.4 INSTALLATION MATERIALS

- A. Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement product that can be applied in minimum uniform thickness of 1/4 inch (6 mm) and that can be feathered at edges to match adjacent floor elevations.
1. Product:
 - a. ARDEX Americas; K 15 Rapid.
 - b. Euclid Chemical Company (The); an RPM company; Flow-Top.
 - c. Laticrete International, Inc.; NXT Level.
 - d. MAPEI Corporation; Ultraplan 1 Plus, or Ultraplan M20 Plus.

- e. Uzin Utz North America, Inc.; UZIN NC 170.
 - f. Or equal.
- 2. Cement Binder: ASTM C150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C219.
- 3. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C109.
- B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
 - 1. Tarkett 925 Resilient Flooring Adhesive
 - 2. Tarkett 975 Two-Part Urethane Adhesive
 - 3. Tarkett 901 SpraySmart Adhesive
 - 4. Tarkett RollSmart Adhesive
 - 5. Cold Weld Liquid
- C. Seamless-Installation Accessories:
 - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Colors: As selected by Architect from manufacturer's full range to contrast with flooring.
- D. Integral-Flash-Cove-Base Accessories:
 - 1. Cove Strip: 1-inch (25-mm) radius provided or approved by resilient sheet flooring manufacturer.
 - 2. Cap Strip: FlashCove Chiklet Cove Cap; 0.024-inch (24 ga.) thickness, stainless steel, type 304, "J" shaped profile with round, or radius top cap for 0.08-inch (2 mm) thickness resilient coved sheet material. Cap extends minimum of 0.25-inch (6 mm) over coved material.. Do not substitute PVC or other plastic cap strip due to disinfectant cleaning products used in pharmacy may cause plastic material to soften, discolor, or otherwise degrade.
 - a. Color/Finish: # 4 satin polished, or as otherwise indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. The area in which the indoor resilient flooring will be installed is dry, weather-tight and in compliance with specified requirements.
 - 2. Permanent heat, lighting and ventilation systems are installed and operable.
 - 3. Other work, including overhead work, that could cause damage, dirt, dust or otherwise interrupt installation has been completed or suspended.
 - 4. No foreign materials or objects are present on the substrate and that it is clean and ready for preparation and installation.
 - 5. Tests to verify that the moisture vapor emission rate or substrate relative humidity is within the specified ranges.
 - 6. The concrete slab surface pH level is within the specified range.
 - 7. The concrete slab surface deviation is no greater than 3/16 inch within 10 feet (4.5 mm within 3 m) as described in AC1117R.

8. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.
- B. Concrete Substrates: Prepare according to ASTM F710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient sheet flooring until materials are the same temperature as space where they are to be installed.
 1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient sheet flooring.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out resilient sheet flooring as follows:
 1. Maintain uniformity of flooring direction.

2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in flooring substrates.
 3. Match edges of flooring for color shading at seams.
 4. Avoid cross seams.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
- J. Integral-Flash-Cove Base: Cove resilient sheet flooring 6-inches up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip.
- K. Cap Strip: Dry-fit cap strip to wall surface to ensure true and level installation of cap strip. Pre-cut inside and outside corners of cap strip. Attach cap strip to wall surface with adhesive. Insert top edge of coved resilient base material into cap strip.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
- B. Perform the following operations immediately after completing resilient sheet flooring installation:
1. Remove adhesive and other blemishes from surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient sheet flooring from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION

SECTION 09 65 36
STATIC-CONTROL RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Static-control, rubber sheet floor covering.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:
 - a. Examination and preparation of substrates to receive static-control resilient flooring.
 - b. Installation techniques required for specified products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of static-control resilient flooring and in each color, pattern, and texture required, in manufacturer's standard size, but not less than 12 by 12 inches (300 by 300 mm).
 - 1. Heat-Welding Bead: Include Samples of each color required, not less than 12 inches (300 mm) long.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For static-control resilient flooring, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of static-control resilient flooring to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sheet Floor Covering: Furnish not less than 10 linear ft. (3 linear m) in roll form and in full roll width for each color, pattern, and type of sheet floor covering installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in installation techniques required by manufacturer for specified static-control resilient flooring.
 1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required for specified products.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended in writing by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).
 1. Sheet Floor Covering: Store rolls upright.

1.9 PROJECT CONDITIONS

- A. Close spaces to traffic during static-control resilient flooring installation.
- B. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

1.10 WARRANTY

- A. Provide manufacturer's standard limited warranty for wear, defect, bond, and conductivity.
 1. Warranty Period: 15 years from date of substantial completion.

PART 2 - PRODUCTS

2.1 STATIC-CONTROL, RUBBER SHEET FLOOR COVERING RF-01 and RF-03

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Nora Systems, Inc.; Noraplan Environcare 3.0 mm. Telephone : 800-332-NORA or 603-894-1021; fax 603-894-6615.
 2. Or equal.
- B. Source Limitations: Obtain floor covering from single source from single manufacturer.
- C. Static-Control Properties: As determined by testing identical products in accordance with test method indicated by an independent testing and inspecting agency.
 1. Electrical Resistance:

- a. To avoid electrostatic discharge problems, the floor must have a resistivity of less than $1 \times 10^9 \Omega$ / square or it must comply with NEN EN IEC 61340-4.
 - 2. Static Generation:
 - a. AATCC TM134: Less than 1000 V when tested at 20 percent relative humidity with static-control footwear.
 - D. Slip Resistance (ASTM D2047): Static coefficient of friction, Neolite dry 0.92 Neolite wet 0.91.
 - E. Hardness (ASTM D2240): Shore "A", 92 achieved.
 - F. Static Load (ASTM F970): Residual compression of 0.003 inches with 800 lbs.
 - G. Rolling Load (ASTM F2753): ≤ 550 lbs./sq. in., with no forklift traffic.
 - H. Critical Radiant Flux: 0.45 W/sq. cm or greater in accordance with ASTM E648 or NFPA 253.
 - I. Construction: ASTM F1859, Type I, homogeneous rubber compound with a random scattered design, without backing. Material shall include environmentally compatible color pigments that are free of toxic heavy metals like lead, cadmium, or mercury.
 - J. Thickness: 0.12 inches (3.0 mm).
 - K. Size: Manufacturer's standard roll width and length.
 - L. Seaming Method: Heat welded.
 - M. Colors and Patterns: As indicated on Drawings.
- 2.2 INSTALLATION MATERIALS
- A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
 - B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.
 - C. Grounding Strips: Copper tape with adhesive backing.
 - D. Seamless-Installation Accessories:
 - 1. Heat-Welding Bead: Solid-strand product of manufacturer for heat welding seams.
 - a. Color: Match floor covering.
 - E. Integral-Flash-Cove Base Accessories:
 - 1. Cove Strip: 1-inch (25-mm) radius support strip provided or approved by manufacturer.
 - 2. Cap Strip: Rubber cap provided or approved by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer and manufacturer's representative present, for compliance with requirements for conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with installation or static-control characteristics of floor coverings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates in accordance with manufacturer's written instructions and with oversight by manufacturer's representative to ensure successful installation of static-control resilient flooring and electrical continuity of floor-covering systems.
- B. Concrete Substrates: Prepare in accordance with ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with floor-covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended in writing by manufacturer. Proceed with installation only after substrate alkalinity is not less than 6 or more than 8 pH unless otherwise recommended in writing by flooring manufacturer.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.
 - 1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.3 INSTALLATION, GENERAL

- A. Install static-control resilient flooring in accordance with manufacturer's written instructions and with oversight by manufacturer's representative.
- B. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.
 - 1. For adhesively installed flooring, embed grounding strips in static-control adhesive.
- C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
 - 1. Extend static-control resilient flooring below built-in items and permanent, but movable, items that allow for a flexible layout where indicated on Drawings.
- D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings.
- E. Extend static-control resilient flooring to center of door openings where flooring or color transitions occur.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install static-control resilient flooring on covers for telephone and electrical ducts, and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of static-control resilient flooring installed on covers. Tightly adhere static-control resilient flooring edges to substrates that abut covers and to cover perimeters.
- H. Adhesive Installation: Adhere static-control resilient flooring to substrates using a full spread of static-control adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
 - 1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor-covering surfaces.
- J. Integral-Flash-Cove Base: Cove static-control flooring to dimension indicated on Drawings up vertical surfaces. Support static-control resilient flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.

3.4 INSTALLATION OF SHEET FLOOR COVERINGS

- A. Unroll sheet floor coverings and allow them to stabilize before cutting and fitting.
- B. Grounding Strip Installation: Apply copper tape directly to a clean, prepared substrate with 2 feet remaining under the flooring and extended to a predetermined grounding point. All surrounding areas not in direct contact with the flooring and adhesive also requires an additional length of copper tape. All grounding points must be pre-defined prior to the flooring installation.

- C. Lay out sheet floor coverings as follows:
 - 1. Maintain uniformity of sheet floor-covering direction.
 - 2. Minimize number of seams and place them in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in floor-covering substrates.
 - 3. Match edges of floor coverings for color shading at seams.
 - 4. Avoid cross seams.
- D. Heat Welding: Groove the seams using a push, power, or hand-grooving tool, ensure all grooves are clean. The depth of the groove must be a minimum of 1.5 mm. If the groove exposes the backing fully, cold weld must be used. The width of the groove must be ~ 1/8 inch (3 mm). Heat welding should not be used for vertical corner seams, these areas require cold weld. Preheat the welding gun to 662°F – 752°F (350°C – 400°C). It is recommended to practice welding on a piece of scrap flooring material first to determine the heat setting and speed, as different heat guns and cable length will affect the temperature.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to test electrical resistance of static-control resilient flooring in accordance with ESD STM7.1 for compliance with requirements.
 - 1. Arrange for testing after the following:
 - a. Static-control adhesives have fully cured.
 - b. Static-control resilient flooring has stabilized to ambient conditions.
 - c. Ground connections are completed.
- B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.
- B. Perform the following operations immediately after completing static-control resilient flooring:
 - 1. Remove static-control adhesive from exposed surfaces.
 - 2. Remove dirt and blemishes from exposed surfaces.
 - 3. Sweep and vacuum surfaces thoroughly.
 - 4. Damp-mop surfaces to remove marks and soil.
- C. Protect static-control resilient flooring from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
 - 1. Do not wax static-control resilient flooring.
 - 2. If recommended in writing by manufacturer, apply protective static-control floor polish formulated to maintain or enhance floor covering's electrical properties. Before polishing, do the following:

- a. Ensure that static-control resilient flooring surfaces are free from soil, static-control adhesive, and surface blemishes.
 - b. Verify that both floor polish and its application method are approved by manufacturer and that floor polish will not leave an insulating film that reduces static-control resilient flooring's effectiveness for static control.
- D. Cover static-control resilient flooring and protect from rolling loads until Substantial Completion.

END OF SECTION 096536

SECTION 09 84 33
SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes sound-absorbing wall panels to match existing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include fabric facing, panel edge, core material, and mounting indicated.

- B. Shop Drawings: For unit assembly and installation.

1. Include plans, elevations, sections, and mounting devices and details.
2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
3. Include details at cutouts and penetrations for other work.
4. Include direction of fabric weave and pattern matching.

- C. Samples: For the following products:

1. Fabric: Full-width by approximately 12 by 12 inches Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
2. Panel Edge: 12-inch- (300-mm-) long Sample(s) showing each edge profile, corner, and finish.
3. Core Material: 12-inch- (300-mm-) square Sample at corner.
4. Mounting Devices: Full-size Samples.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication and indicate them on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall units specified in this Section from single source from single manufacturer.

2.2 SOUND-ABSORBING WALL UNITS

- A. Sound-Absorbing Wall Panel AFB-01: Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.
 - 1. Soundbiance Acoustic Wall Panels by PNC West with Guilford of Maine fabric; Rattan 3087, Sky 051, to match existing sound-absorbing wall panels.
 - a. PNC West, Inc. 255 N. Pasadena Street, Suite 1, Gilbert, AZ 85233. Tel: (480) 917-1999. Toll Free (866) 265-4697. Fax: (480) 926-6755. Email: sales@pncwest.com.
 - 2. Mounting: Edge mounted with splines secured to substrate.
 - 3. Acoustical Performance: Sound absorption NRC 1.0 – 1.05.
 - 4. Nominal Overall Panel Thickness: 2 inches.

2.3 MATERIALS

- A. Core Materials:
 - 1. Glass-Fiber Board: ASTM C612; of type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft. (96 to 112 kg/cu. m), unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- B. Facing Material: Polyester.
- C. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine fabric, fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch (1.6 mm) in 48 inches (1200 mm), noncumulative.
- B. Variation of Joint Width: Not more than 1/16-inch (1.6-mm) variation from hairline in 48 inches (1200 mm), noncumulative.

3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433

SECTION 09 91 23
INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates as noted below:
 - 1. Steel and iron.
 - 2. Galvanized metal.
 - 3. Gypsum board.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Indicate VOC content.
- B. Sustainable Design Submittals:
 - 1. Product Data: For paints and coatings, indicating VOC content.
 - 2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.3 QUALITY ASSURANCE

- A. Products provided under this Section shall not exceed the limits for Volatile Organic Compounds (VOC) found in SCAQMD Rule 1113 Architectural Coatings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Sherwin-Williams Company (The); (used by VCMC for all buildings).
 - 2. Dunn-Edwards.
 - 3. Glidden Professional (PPG).
 - 4. Rust-oleum.
 - 5. Vista Paint.
 - 6. Or equal.

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. VOC Content: Comply with VOC content limits of authorities having jurisdiction.
- C. Colors: As indicated in a color schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Gypsum Board: 12 percent.
 - 2. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 3.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Aluminum Substrates: Remove loose surface oxidation.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
 - 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Steel Substrates:

1. Water based Urethane Alkyd System:

Prime Coat: Primer, water-based, anti-corrosive for metal.

- 1) Dunn-Edwards: Bloc-Rust BRPR00 Ferrous Metal Primer
- 2) Sherwin-Williams: ProCryl Acrylic Metal Primer, B66-310
- 3) Vista: Protec Metal Prime, 9600

b. Intermediate Coat: Water based Urethane Alkyd, matching topcoat.

c. Topcoat: Water based Urethane Alkyd, semigloss.

- 1) Dunn-Edwards: Aristoshield ASHL50 Urethane Enamel (Gloss Level 5) or Aristoshield ASHL70 Urethane Enamel (Gloss Level 6)
- 2) Sherwin-Williams: ProIndustrial WB Alkyd Urethane SG, B53-1150
- 3) Vista: Protec 9800, Semigloss

B. Galvanized-Metal Substrates:

1. Interior Water based Urethane Alkyd System:

a. Prime Coat: Primer, galvanized, water based.

- 1) Dunn-Edwards: Ultrashield Galvanized Metal Primer ULGM00
- 2) Sherwin-Williams: ProCryl Acrylic Metal Primer, B66-310
- 3) Vista: Polytec 8600 Primer

b. Intermediate Coat: Interior Water based Urethane Alkyd, matching topcoat.

c. Topcoat: Interior Water based Urethane Alkyd, semigloss.

- 1) Dunn-Edwards: Aristoshield ASHL50 Urethane Enamel (Gloss Level 5) or Aristoshield ASHL70 Urethane Enamel (Gloss Level 6)
- 2) Sherwin-Williams: ProIndustrial WB Alkyd Urethane SG, B53-1150
- 3) Vista: Protec 9800, Semigloss

C. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Interior Water based Urethane Alkyd System:

a. Prime Coat: Primer for aluminum, water-based.

- 1) Dunn-Edwards: Ultrashield Galvanized Metal Primer ULGM00
- 2) Sherwin-Williams: ProCryl Acrylic Metal Primer, B66-310
- 3) Vista: Polytec 8600 Primer

- b. Intermediate Coat: Water based Urethane Alkyd, matching topcoat.
 - c. Topcoat: Water based Urethane Alkyd, semigloss.
 - 1) Dunn-Edwards: Aristoshield ASHL50 Urethane Enamel (Gloss Level 5) or Aristoshield ASHL70 Urethane Enamel (Gloss Level 6)
 - 2) Sherwin-Williams: ProIndustrial WB Alkyd Urethane SG, B53-1150
 - 3) Vista: Protec 9800, Semigloss
- D. Plastic Substrates:
- 1. High-Performance Architectural Latex or W.B. Alkyd System:
 - a. Prime Coat: Primer, bonding, water based.
 - 1) Dunn-Edwards: Ultra-Grip Premium Multi-Surface Primer, UGPR00-1
 - 2) Sherwin-Williams: Extreme Bond Primer, B51W150
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semigloss.
 - 1) Dunn-Edwards: W.B. Alkyd Duraflo DURA50.
 - 2) Sherwin-Williams: ProIndustrial Acrylic Semigloss, B66-650
- E. Gypsum Board Substrates:
- 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC.
 - 1) Dunn-Edwards: Vinylastic Plus Drywall Sealer, VNPL00, or Vinylastic Select VNSL00.
 - 2) Sherwin-Williams: ProMar 200 Zero VOC Primer, B28W2600Vista 5001 V-Pro Zero VOC Primer
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, velvet, or eggshell.
 - 1) Dunn-Edwards: Spartawall, Low Odor, Zero VOC, velvet SSLL20, or eggshell, SWLL30
 - 2) Sherwin-Williams: ProMar 200 Zero VOC Low sheen Eg-Shel B24-2600, or Eg-shel, B20-2600
 - 3) Vista: V-Pro 5000, Zero VOC, Low Odor, Velvasheen 5200, or Eggshell 5300
 - d. Topcoat: Latex, interior, institutional low odor/VOC, semigloss.

- 1) Dunn-Edwards: Spartawall, Low Odor, Zero VOC, Semigloss, SWLL50
- 2) Sherwin-Williams: ProMar 200 Zero VOC Semigloss, B31-2600
- 3) Vista: V-Pro 5000, Zero VOC, Low Odor, 5400, Semi-Gloss

END OF SECTION

SECTION 101423.16
ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes directional and room-identification signs that are directly attached to the building.

1.2 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.3 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For directional and room-identification signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples : For each type of sign assembly, exposed component, and exposed finish.
- D. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and CBC Chapter 11B, the most stringent requirements shall take precedence.

2.2 DIRECTIONAL AND ROOM-IDENTIFICATION SIGNS

- A. Directional and Room-Identification Sign: Sign system with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ACE Sign Systems, Inc.
 - b. ASI Sign Systems, Inc.
 - c. Mohawk Sign Systems.
 - d. Seton Identification Products; a Brady Corporation company.
 - e. Vomar Products, Inc.
 - f. Or equal.
 2. Sign Types: Match existing sign types in the facility.
 3. Mounting: Manufacturer's standard method for substrates indicated.
 4. Text and Typeface: Match existing at facility.

2.3 SIGN MATERIALS

- A. Aluminum Sheet and Plate: ASTM B209 , alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B221 , alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- D. PVC Sheet: Moderately expanded, closed-cell polyvinyl chloride (PVC) in a homogeneous sheet with a low gloss satin finish. Self-extinguishing; Class A Fire Rating when tested in accordance with ASTM E84; Sintra or equal.
- E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened sign unless otherwise indicated.
 - b. Fastener Heads: Use oval countersunk screws and bolts with tamper-resistant Allen-head or spanner-head slots unless otherwise indicated.
 4. Sign Mounting Fasteners:

- a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
 - b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.
- B. Adhesive: As recommended by sign manufacturer.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.
- D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- C. Subsurface-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.
- D. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
 - 1. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Subsequent changeable inserts are by Owner. Furnish two blank inserts for each sign for Owner's use.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.
- C. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 - 2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 - 3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
 - 4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
 - 5. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.

6. Magnetic Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position.

3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Corner guards
 - 2. Crash rails.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
 - 2. Include Fire Resistance Classification, Flame Spread and Smoke Density.

1.3 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall and door protection products from single source from single manufacturer.
 - 1. Construction Specialties (C/S).
 - 2. Or equal.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and California Building Code Chapter 11B, the most stringent requirements shall take precedence.

2.3 CORNER GUARDS

- A. Surface-Mounted, Plastic-Cover Corner Guards: Manufacturer's standard assembly consisting of snap-on Acrovyn 4000 cover, installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
 - 1. Manufacturers:
 - a. Construction Specialties, Inc.; SM-20 series, or equal.
 - 2. Cover: Extruded rigid plastic, minimum 0.078-inch (2 mm) wall thickness.
 - a. Profile: Nominal 3-inch (75 mm) long leg and 1/4-inch (6 mm) corner radius.
 - b. Height: As indicated on Drawings.
 - c. Color and Texture: As selected by Architect from manufacturer's standard selections. Color and texture to match existing crash rail covers at facility as close as possible.
 - 3. Continuous Retainer: Minimum 0.060-inch (1.5 mm) thick, one-piece, extruded aluminum.
 - 4. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
- B. Stainless Steel Corner Guards:
 - 1. Material: Stainless steel.
 - 2. Manufacturers: Construction Specialties, Inc. CO-8 series, or equal.
 - a. Profile: Nominal 3-1/2-inch (88 mm) long leg and 3/16-inch (5 mm) corner radius.
 - b. Height: As indicated on Drawings.
 - c. Mounting: Construction adhesive and pre-drilled counter sunk holes for #10 stainless steel, flat head sheet metal screws.
 - d. Other angles: Use C/S CO-8M series, or equal, for corner guards requiring angle other than 90 degrees.

2.4 CRASH RAILS

- A. Surface-Mounted, assembly consisting of standard aluminum retainers with snap-on Acrovyn 4000 cover and integral shock absorbing cushion. End caps to be mechanically fastened with concealed fasteners. Color matched end caps and corners shall be removable for ease of replacement. Attachment hardware shall be appropriate for wall conditions, and corrosion resistant.
 - 1. Manufacturers:
 - a. Construction Specialties, Inc.; SCR-40N series, or equal.
 - 2. Cover: Extruded rigid plastic, minimum 0.078-inch (2.0-mm) wall thickness.
 - a. Profile: 4 inch (100 mm) surface mounted with aluminum retainer and continuous cushion material for additional absorption.
 - b. Height: As indicated on Drawings.
 - c. Color and Texture: As selected by Architect from manufacturer's standard selections. Color and texture to match existing crash rail covers at facility as close as possible.

2.5 MATERIALS

- A. Engineered polyethylene terephthalate glycol (PETG): High-impact material, chemical and stain resistance in accordance with ASTM D543.
- B. Aluminum: Extruded aluminum should be 6063-T6 alloy, nominal .085-inch (2.2 mm) thickness. Minimum strength and durability properties as specified in ASTM B221.
- C. Stainless Steel: ASTM A240, 0.063-inch (1.6 mm) thickness, 304 alloy with # 4 satin finish.
- D. Fasteners: All fasteners to be non-corrosive and compatible with aluminum components. All necessary fasteners to be supplied by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
 - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
 - 2. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm) apart.
 - 3. Adjust end and top caps as required to ensure tight seams.
- C. Corner guards:
 - 1. Position corner guards flush with top of integral cove base.

2. See drawings for mounting heights. If not indicated on Drawings, then mount at same height as existing wall protection.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

END OF SECTION

SECTION 12 36 61.19
QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Quartz agglomerate countertops.
 - 2. Quartz agglomerate backsplashes.
 - 3. Quartz agglomerate end splashes.

1.2 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
- C. Samples for Initial Selection: For each type of material exposed to view.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Approved by the countertop manufacturer.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

1.8 WARRANTY

- A. Manufacturer's Commercial 10 year Limited Warranty. Warranty against manufacturer defects when fabricated and installed by a manufacturer certified fabricator/installer.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS SS1

- A. Quartz Agglomerate: Quartz aggregate, resin and color pigments formed into flat slabs.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cambria. www.cambriausa.com.
 - b. Cosentino North America, Inc.; Silestone.
 - c. Or equal.
 2. Colors and Patterns: As indicated on Drawings.
 3. Thickness: 1/2-inch (12 mm).
 4. Material Identification: Manufacturer's markings on the back side of the slab including slab item number, material finish, production batch, and serial numbers.
- B. Material Performance Characteristics:
1. Static Coefficient of Friction: 1.02 dry, 0.51 wet, ASTM C1028.
 2. Water Absorption: ASTM C97 ≤0.03%.
 3. Flexural Strength: ASTM C880 – 5,800 psi.
 4. Compressive Strength: ASTM C170 – 25,000 - 29,000 psi.
 5. Breaking Strength: ASTM C648 – 480 lbf.
 6. Freeze Thaw resistance: ASTM C1026 - No detects after 15 cycles.
 7. Microbial resistance: ASTM D6329-98(2003): Resistant to mold growth.
 8. Resistance to staining: Not affected by 10 percent hydrochloric acid or 10 percent KOH, tested to ASTM C650.
 9. Thermal Shock Resistance: ASTM C484 – Pass 5 cycles.
 10. Flame Spread: Class I, tested to ASTM E84.

2.2 COUNTERTOP FABRICATION

- A. Fabricator: Firm shall be certified by manufacturer and have the ability to present written proof of such certification upon request.
- B. Layout: Layout surfaces (as indicated in shop drawings) to minimize joints and avoid L-shaped pieces of quartz surfacing.
- C. Joints: Fabricate countertops without joints.
- D. Cutouts and Holes:
1. Cutouts shall have a minimum 3/8-inch (10mm) inside radius. Exposed edges of cutouts shall be polished to match surface finish.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Epoxy or polyester adhesive recommended by quartz agglomerate manufacturer for conditions of use.
 - 1. Color: Adhesives shall be tinted to match quartz surfacing for all visible finished work.
- B. Sealant for Countertops: Clear silicone sealant as specified in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Verify that substrate(s) supporting quartz agglomerate surfaces are plumb, level, and flat to within 1/16-inch in 10 feet, and that supports and blocking are in place and secure.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install materials in accordance with manufacturer's recommendations.
- B. Installation:
 - 1. After verification of fit and finish:
 - a. Remove material from preliminary positions.
 - b. Clean substrates of any dust or debris.
 - c. Clean the back side of all quartz surfaces and joint surfaces with denatured alcohol.
 - 2. Apply sufficient amount of mounting adhesive in accordance with manufacturer's recommendations to provide a permanent and secure installation.
 - 3. Verify installation of quartz surface is plumb, level, square and flat within 1/16 inch in feet.
 - 4. Position adjacent pieces of quartz surfaces in the same plane.
- C. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- D. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- E. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION

SECTION 13 49 25 - RADIO FREQUENCY (RF) SHIELDING - COPPER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Furnish design, engineering, documentation, labor, supervision, tooling, equipment, materials and transportation necessary to fabricate, install, test, certify and warrant radio frequency (RF) shielding system in accordance with contract documents.
2. Refer to bid drawings, magnetic resonance imaging (MRI) equipment vendor drawings and site planning documents for size, location, integration, coordination and performance requirements for RF shielding system.

B. Related requirements that are coordinated, but not included in this Section.

1. Construction work in preparation for the RF shielding system installation, including floor, wall and overhead structures, door, window and magnet access apertures.
2. All external connections to shield structure and/or shield components by other trades, including those of a structural, electrical, mechanical or MRI system related items.
3. All internal connections to shield structure and/or shield components by other trades, including furring, electrical, mechanical, finishes and MRI system related items.

C. Related Requirements not included in this Section:

1. Work required by other trades, including work provided by the MRI equipment manufacturer is not detailed in this Section.
2. Trades other than the RF shielding vendor shall provide the following work:
 - a. Site access and delivery path for shielding materials.
 - b. Staging area adjacent to MRI exam room.
 - c. Construction work enveloping and internal to the RF shielding system, including concrete work, structural and partition walls, ceilings, floors, finishes, painting, etc.
 - d. Electrical and communications work and materials, including inside and outside enclosure connections to electrical filters, provided and mounted by the RF shielding vendor.
 - e. Mechanical work and materials, including inside and outside enclosure connections to duct and pipe penetrations provided and mounted by the RF shielding vendor.
3. MRI exam room and staging area shall be weatherproofed, dry (non-condensing) and temperature controlled between 60°F and 80°F. MRI exam room must be free of clutter and/or debris and the floor broom-swept. Floor slab shall be cured and heated to a minimum of 60°F prior to installing floor shield. General Contractor shall verify these conditions before RF shielding vendor delivers RF shielding materials to the project site.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Copper sheet, fasteners, adhesives.
2. RF Door Unit, hardware, compressor, and RF gaskets/seals.
3. RF Window Unit.
4. RF attenuation filters.
5. HVAC RF wave-grillers.
6. Wave-guide shielded fittings.
7. Electrical line filters.
8. Grounding point.

B. Shop Drawings:

1. Shield floor plan, elevation, typical construction, sections, locations of miscellaneous penetrations and any other conditions, which will affect the shielding system structure.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.5 REFERENCE STANDARDS

A. The following codes and standards listed below form a part of this Section and where referred to are applicable to the extent indicated.

1. MIL-STD-285: Methods of Attenuation Measurement for Electromagnetic Shielding Enclosures for Electronic Test Purposes.
2. MIL-STD-220-A: Methods of Insertion Loss Measurements for Radio Frequency Filters.
3. UL 1283: Standards for Safety - Electromagnetic Interference Filters.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturers/Fabricators: Manufacturer/Fabricator with ten (10) years RFI/EMI shielding experience.
2. Installers: Fabricator of products, or entity that employs installers and supervisors who are trained and approved by Manufacturer/Fabricator.

1.7 WARRANTY

A. Shielding system shall be warranted against defective materials and workmanship and to retain the specified RF shielding characteristics for a period of five (5) years from date of acceptance test, filters and door system for a period of one (1) year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The manufacturer shall be MRI Corporation, 3554 Business Park Drive, Ste. B., Costa Mesa, CA 92614, U.S.A., or a prior approved equivalent shielding vendor with a minimum of ten (10) years RFI/EMI shielding experience.

2.2 PERFORMANCE REQUIREMENTS

- A. The function of the RF shielding system is to provide a RF interference-free environment with a single point ground. For this purpose, the interference-free environment must meet the following minimum functional requirements:
 - 1. Magnetic field attenuation: 100 dB between 1 mHz and 100 mHz.
 - 2. Electrical field attenuation: 100 dB between 1 mHz and 100 mHz.
 - 3. Plane wave attenuation: 100 dB between 1 mHz and 100 mHz.
 - 4. Isolation resistance: 1000 Ohms minimum.

2.3 RF SHIELDING SYSTEM ENCLOSURE

- A. Provide complete RF shielding system structure installed within the facility to meet the performance requirements specified, including the following:
 - 1. The RF shielding system shall be electrically isolated from the building system minimum 1000 Ohms.
 - 2. Lightweight pneumatic RF door unit, including frames and hardware with selected plastic laminate or wood veneer finish.
 - 3. High visibility RF view window with dual pane and wood trim finish.
 - 4. Removable magnet access panel.
 - 5. HVAC supply and return system shall have wave-grille type RF air vents for system.
 - 6. Electrical and communications services shall have RF attenuation filters.
 - 7. Pipes penetrating the shielding system shall have necessary wave-guide type shielded fittings.
 - 8. Cavity wall type construction shall be provided for concealed electrical conduit and related equipment as required in other Sections.
 - 9. RF performance test and report by an independent testing agency.

2.4 MATERIALS

- A. The basic RF shielding system shall consist of 3 ounce copper sheeting on walls, ceiling and floor, applied to 1/2" plywood on walls and 3/4" plywood on ceiling, provided by and mounted to a rigid framed box. Plywood and framing provided by the general contractor. Interior 20 gauge metal stud wall furring is provided and mounted by shielding vendor for attachment of drywall. Ceiling furring for attachment of suspended ceiling wires is provided and mounted by shielding vendor.
- B. RF shielded door hardware will consist of the following:
 - 1. Custom-formed copper frame.
 - 2. Brushed stainless pull handles.
 - 3. Two (2) 4-3/4" brushed stainless hinges.
 - 4. Pneumatic RF gasket seal system.
 - 5. One (1) air compressor.
 - 6. Door finish shall be of high quality plastic laminate or wood veneer.

- C. The RF view window will consist of two-layer screen, manufactured to reduce the moiré pattern, and painted a black finish to increase visibility, dual pane and wood trim finish included.
- D. HVAC RF wave-grilles will consist of 1-1/4" aluminum honeycomb. The wave-grilles are designed to provide proper airflow for temperature control and ventilation, and maintain shielding system effectiveness.
- E. Cryogen gas vents will consist of a pipe wave-guide below cut-off type, diameter specified by the MRI equipment vendor. The mechanical contractor shall provide a dielectric separation outside the enclosure for attachment of venting ducts.
- F. Electrical line filters will provide attenuation equal to the effectiveness of the shielding system. UL listed electrical filters shall be provided for each electrical conductor, including neutrals which penetrate the shielding system. This shall include power and signal circuits. Filters shall be designed to attenuate RF energy on the incoming conductor at 100dB from 150 kHz to 10GHz.
- G. Mechanical pipe penetrations of the shielding system will consist of the wave-guide below cut-off type. An insulated break in the pipe on the outside of the shielding structure will be required for isolation.
- H. A single ground point will be provided by means of an electrical ground stud, both inside and outside the enclosure. The ground point will be located at the power line filter panel or as specified by equipment vendor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive RF shielding system installation, including floor, wall and overhead structures, door, window and magnet access apertures.
- B. Examine external connections to shield structure and/or shield components by other trades, including those of a structural, electrical, mechanical or MRI system related items.
- C. Examine internal connections to shield structure and/or shield components by other trades, including furring, electrical, mechanical, finishes and MRI system related items.
- D. Other conditions affecting performance of the RF shielding.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF RF SHIELDING ENCLOSURE

- A. Verify the on-site conditions affecting work of this Section and report any discrepancies between building drawings, shop drawings and field conditions to the Architect and VCMC before commencement of the RF shielding system installation.
- B. Installation shall be performed by the RF shielding manufacturer/fabricator, or by approved installers under the direct field supervision of RF shielding manufacturer/fabricator.

3.3 FIELD QUALITY CONTROL

- A. During construction of the RF shielding system, ground isolation will be monitored at all times to assure that the shielding system is isolated from building ground as specified.
- B. Upon complete installation of the shielding system, the RF shielding vendor will provide for a test of the shielding effectiveness by an independent testing company following the test methods outlined in MIL-STD-285 at 100 mHz (approximate) and at the MRI system's principle sense frequency. A representative of VCMC and Architect, and a representative of the MRI equipment vendor will witness these tests.
- C. The RF certification test will be performed after the shielding system structure is installed and before any other electrical, mechanical and/or interior finish construction is performed within the shielding system.
- D. Final "qualification" RF test shall be performed after the MRI scan room construction is complete and the imaging equipment is in place. VCMC and Architect shall be given 7 day advance notification. Final "qualification" RF test must be performed before the MRI equipment is energized.

END OF SECTION

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Requirements applicable to all Division 22 Sections. Also refer to Division 1 - General Requirements.
- B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 REFERENCES

- A. CCR California Code of Regulation
- B. CBC California Building Code
- C. CFC California Fire Code
- D. CEC California Electric Code
- E. CMC California Mechanical Code
- F. CPC California Plumbing Code
- G. California Title 24 - Building Energy Efficiency Standards

1.3 COORDINATION DRAWINGS

- A. Definitions:
 - 1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.
 - a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
 - b. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
 - c. Maintenance clearances and code-required dedicated space shall be included.
 - d. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.
 - 2. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.
- B. Participation:
 - 1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.

2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process.
 - a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.
 3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. PBS will provide electronic file copies of ventilation drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by PBS. PBS will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.
- C. Drawing Requirements:
1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.
 - a. Scale of drawings:
 - 1) General plans: 1/4 Inch = 1'-0" (minimum).
 - 2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
 - 3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
 - 4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1'-0" (minimum).
 - 5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).
 2. The minimum quantity of drawings will be established at the first coordination meeting and sent to the A/E for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.
- D. General:
1. Coordination drawing files shall be made available to the A/E and Owner's Representative. The A/E will only review identified conflicts and give an opinion, but will not perform as a coordinator.
 2. A plotted set of coordination drawings shall be available at the project site.
 3. Coordination drawings are not shop drawings and shall not be submitted as such.
 4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in the bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
 5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.
 6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
 7. The A/E reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
 8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the A/E.
 9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.
 - a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
 - b. Potential layout changes shall be made to avoid additional access panels.
 - c. Additional access panels shall not be allowed without written approval from the A/E at the coordination drawing stage.
 - d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the A/E and the Owner's Representative.

- e. When additional access panels are required, they shall be provided without additional cost to the Owner.
- 10. Complete the coordination drawing process and obtain sign off of the drawings by all contractors prior to installing any of the components.
- 11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
- 12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.4 QUALITY ASSURANCE

- A. Contractor's Responsibility Prior to Submitting Pricing Data:
 - 1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guidelines, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Design Team any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
 - 2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Design Team will be done at the Contractor's risk.
- B. Qualifications:
 - 1. Only products of reputable manufacturers are acceptable.
 - 2. All Contractors and subcontractors shall employ only workers skilled in their trades.
- C. Compliance with Codes, Laws, Ordinances:
 - 1. Conform to all requirements of the State of California Codes, Laws, Ordinances and other regulations having jurisdiction.
 - 2. Conform to all State Codes.
 - 3. Conform to Federal Act S.3874 requiring the reduction of lead in drinking water.
 - 4. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
 - 5. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
 - 6. All changes to the system made after letting of the contract, to comply with codes or requirements of Inspectors, shall be made by the Contractor without cost to the Owner.
 - 7. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
 - 8. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.
- D. Permits, Fees, Taxes, Inspections:
 - 1. Procure all applicable permits and licenses.

2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
 3. Pay all charges for permits or licenses.
 4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
 5. Pay all charges arising out of required inspections by an authorized body.
 6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
 7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriters' Laboratories, Inc. and approved by FM Global.
 8. Where applicable, all fixtures, equipment and materials shall be approved or listed by Underwriter's Laboratories, Inc.
- E. Examination of Drawings:
1. The drawings for the plumbing work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
 2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts to best fit the layout of the job.
 3. Scaling of the drawings is not sufficient or accurate for determining these locations.
 4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
 5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
 6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
 7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
 8. Where used in mechanical documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.
 - a. Any item listed as furnished shall also be installed, unless otherwise noted.
 - b. Any item listed as installed shall also be furnished, unless otherwise noted.
- F. Field Measurements:
1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.
- G. Electronic Media/Files:
1. Construction drawings for this project have been prepared utilizing AutoCAD MEPRevit.
 2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
 3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by PBS.
 4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
 5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
 6. The drawings prepared by PBS for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.

7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by PBS as to the accuracy or correctness of the information provided. PBS accepts no responsibility or liability for the Contractor's use of these documents.

Referenced Specification Section	Submittal Item
22 05 00	Owner Training Agenda
22 05 03	Fire Seal Systems
22 05 05	Plumbing Demolition For Remodeling
22 05 29	Hangers and Supports
22 05 50	Seismic Restraint Systems
22 05 53	Plumbing Identification
22 10 00	Plumbing Piping Systems and Valves
22 10 30	Plumbing Specialties
22 40 00	Plumbing Fixtures

1.5 CHANGE ORDERS

- A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders with inadequate breakdown will be rejected.
- B. Change order work shall not proceed until authorized.

1.6 EQUIPMENT SUPPLIERS' INSPECTION

- A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:
 1. Fire Seal Systems
 2. Seismic Restraints and Equipment Bracing
- B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to assure each phase of equipment installation and/or connection is in accordance with the manufacturer's instructions.
- C. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's Operation and Maintenance Manuals.

1.7 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

- A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage. Keep materials clean, dry and free from harmful conditions. Immediately remove any materials that become wet or that are suspected of becoming contaminated with mold or other organisms.
- B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.
- C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Mechanical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has

similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.

- D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate the work with other trades.

1.8 NETWORK / INTERNET CONNECTED EQUIPMENT

- A. These specifications may require certain equipment or systems to have network, Internet and/or remote access capability ("Network Capability"). Any requirement for Network Capability shall be interpreted only as a functional capability and is not to be construed as authority to connect or enable any Network Capability. Network Capability may only be connected or enabled with the express written consent of the Owner.

1.9 WARRANTY

- A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures, equipment, materials, and workmanship.
- B. The warranty period for all work in this Division of the specifications shall commence on the date of final acceptance, unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.
- C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from defects or nonconformance with contract documents.

1.10 INSURANCE

- A. Contractor shall maintain insurance coverage as set forth in Division 0 of these specifications.

1.11 CONTINGENCY

- A. The Plumbing Contractor shall include in the Base Bid a contingency of one percent (1%) to be used only by change orders issued by the Architect/Engineer. The unused portion of the contingency shall be deducted from the Contract price before final payment is made.

1.12 MATERIAL SUBSTITUTION

- A. Where several manufacturers' names are given, the manufacturer for which a catalog number is given is the basis for job design and establishes the quality required.
- B. Equivalent equipment manufactured by the other named manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications and fits in the allocated space.
- C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the

drawings and specifications may be used if approval is secured in writing from the Architect/Engineer not later than ten days prior to the bid opening.

- D. This Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on the Contractors part or on the part of other Contractors whose work is affected.
- E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder.
- F. All material substitutions requested later than ten (10) days prior to bid opening must be listed as voluntary changes on the bid form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

- A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 EXCAVATION, FILL, BACKFILL, COMPACTION

- A. General:
 - 1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found at the following website (<https://call811.com/>) or by calling 811.
 - 2. The Contractor shall do all excavating, filling, backfilling and compacting associated with the work.

3.3 ARCHITECT/ENGINEER OBSERVATION OF WORK

- A. The Contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:
 - 1. Covering exterior walls, interior partitions and chases.
 - 2. Installing hard or suspended ceilings and soffits.
- B. The Architect/Engineer will have the opportunity to review the installation and provide a written report noting deficiencies requiring correction. The Contractor's schedule shall account for these reviews and show them as line items in the approved schedule.
- C. Above-Ceiling Final Observation

1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:
 - a. Pipe insulation is installed and fully sealed.
 - b. Pipe wall penetrations are sealed.
 - c. Pipe identification and valve tags are installed.
2. In order to prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to 7 days elapsing, the Architect/Engineer may not recommend further payments to the contractor until such time as full access has been provided.

3.4 PROJECT CLOSEOUT

- A. The following paragraphs supplement the requirements of Division 1.
- B. Final Jobsite Observation:
 1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation.
 2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review.
 3. Upon Contractor certification that the project is complete and ready for a final observation, the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
 4. It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineer's additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.
- C. Before final payment is authorized, this Contractor must submit the following:
 1. Operation and maintenance manuals with copies of approved shop drawings.
 2. Record documents including reproducible drawings and specifications.
 3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representatives.
 4. Start-up reports on all equipment requiring a factory installation inspection or start-up.
 5. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site; receipt by Architect/Engineer required prior to final payment approval.

3.5 RECORD DOCUMENTS

- A. The following paragraphs supplement Division 1 requirements.
- B. Maintain at the job site a separate and complete set of plumbing drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.
- C. Mark drawings to indicate revisions to piping size and location, both exterior and interior; including locations devices, requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned from column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located; Change Orders; concealed control system devices.

- D. Before completion of the project, a set of reproducible plumbing drawings will be given to the Contractor for transfer of all as-built conditions from the paper set maintained at the job site. All marks on reproducibles shall be clear and permanent.
- E. Mark specifications to show approved substitutions; Change Orders, and actual equipment and materials used.
- F. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.
- G. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

3.6 PAINTING

- A. This Contractor shall paint the following items:
- B. All piping in mechanical room
- C. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available.
- D. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, the Contractor shall have the equipment and all its supports, hangers, etc., painted to match the room decor.
- E. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips, etc.
- F. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is specified or is standard to the unit, this Contractor shall, before ordering, verify with the Architect/Engineer the color preference and furnish this color.
- G. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint and enamel need not be painted, provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.
- H. Paint all outdoor uninsulated steel piping the color selected by Owner or Architect/Engineer.
- I. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign matter; paint all pipes and equipment with the following:
 - 1. Bare Metal Surfaces - Apply one coat of primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
 - 2. Insulated Surfaces - Paint insulation jackets with two coats of semi-gloss acrylic latex paint.

3.7 ADJUST AND CLEAN

- A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from all equipment.

- B. Clean all areas where moisture is present. Immediately report any mold, biological growth, or water damage.
- C. Remove all rust, scale, dirt, oils, stickers and thoroughly clean exterior of all exposed piping, hangers, and accessories.
- D. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.8 SPECIAL REQUIREMENTS

- A. Contractor shall coordinate the installation of all equipment, valves, dampers, operators, etc., with other trades to maintain clear access area for servicing.
- B. All equipment shall be installed in such a way to maximize access to parts needing service or maintenance. Review the final field location, placement, and orientation of equipment with the Owner's designated representative prior to setting equipment.
- C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's designated representative will result in removal and reinstallation of the equipment at the Contractor's expense.
- D. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:
 - 1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.
 - 2. South Coast Air Quality Management District Rule 1168 - Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.
 - 3. South Coast Air Quality Management District Rule SCAQMD 1113 - Wet Applied Paints and Coatings. All paints and coatings wet-applied on site must meet the applicable VOC limits of SCAQMD Rule 1113.

3.9 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

- A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:
 - 1. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:
 - a. Minimizing the amount of dust generated.
 - b. Reducing solvent fumes and VOC emissions.
 - c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.
 - d. Protect stored on-site and installed absorptive materials from moisture damage.
 - 2. Request that the Owner designate an IAQ representative.
 - 3. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
 - 4. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
 - 5. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
 - 6. Request copies of and follow all of the Owner's IAQ and infection control policies.

7. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
8. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
9. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction".

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

To prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

1. Penetrations fire sealed and labeled in accordance with specifications.
2. All pumps operating and balanced.
3. All plumbing fixtures installed and caulked.
4. Pipe insulation complete, pipes labeled and valves tagged.

Accepted by:

Prime Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

END OF SECTION

SECTION 22 05 03
THROUGH PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.
- B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

1.2 REFERENCES

- A. UL 263 - Fire Tests of Building Construction and Materials.
- B. UL 723 - Surface Burning Characteristics of Building Materials
- C. ANSI/UL 1479 - Fire Tests of Through Penetration Firestops
- D. UL 2079 - Tests for Fire Resistance of Building Joint Systems
- E. UL Fire Resistance Directory Through Penetration Firestop Systems (XHEZ)
- F. Intertek / Warnock Hersey - Directory of Listed Products
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- H. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops
- I. The Building Officials and Code Administrators National Building Code
- J. NFPA 5000 - Building Construction Safety Code
- K. CBC California Building Code

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer's instructions for storage.
- B. Install material prior to expiration of product shelf life.

1.4 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
 - 1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.

2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
- B. For through-penetration firestop systems exposed to light, traffic, moisture, or physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
- C. For through-penetration firestop systems exposed to view, provide products with flame- spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. For through-penetration firestop systems in air plenums, provide products with flame- spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.
- E. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:
 1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.
 2. South Coast Air Quality Management District Rule 1168 - Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.
 3. South Coast Air Quality Management District Rule SCAQMD 1113 - Wet Applied Paints and Coatings. All paints and coatings wet-applied on site must meet the applicable VOC limits of SCAQMD Rule 1113.

1.5 MEETINGS

- A. Pre-installation meeting: A pre-installation meeting shall be scheduled and shall include the General Contractor, all Subcontractors associated with the installation of systems penetrating fire barriers, Firestopping Manufacturer's Representative, and the Owner.
 1. Review foreseeable methods related to firestopping work.
 2. Tour representative areas where firestopping is to be installed; inspect and discuss each type of condition and each type of substrate that will be encountered, and preparation to be performed by other trades.

1.6 WARRANTY

- A. Provide one year warranty on parts and labor.
- B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, general durability, or appear to deteriorate in any manner not clearly specified by the manufacturer as an inherent quality of the material.

PART 2 - PRODUCTS

Penetrating Item	UL System No.
No Penetrating Item	FC 0000-0999*
Metallic Pipe or Conduit	FC 1000-1999
Non-Metallic Pipe or Conduit	FC 2000-2999
Electrical Cables	FC 3000-3999
Cable Trays	FC 4000-4999
Insulated Pipes	FC 5000-5999
Bus Duct and Misc. Electrical	FC

6000-6999 Duct without Damper and Misc. Mechanical
 FC 7000-7999 Multiple Penetrations FC
 8000-8999

*Alternate method of firestopping is patching opening
 to match original rated construction.

Penetrating Item	UL System No.
No Penetrating Item	WL 0000-0999*
Metallic Pipe or Conduit	WL 1000-1999
Non-Metallic Pipe or Conduit	WL 2000-2999
Electrical Cables	WL 3000-3999
Cable Trays	WL 4000-4999
Insulated Pipes	WL 5000-5999
Bus Duct and Misc. Electrical	WL
6000-6999 Duct without Damper and Misc. Mechanical	
WL 7000-7999 Multiple Penetrations	WL
8000-8999	

*Alternate method of firestopping is patching opening
 to match original rated construction.

Penetrating Item	UL System No.
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Electrical Cables	CAJ 3000-3999
Cable Trays	CAJ 4000-4999
Insulated Pipes	CAJ 5000-5999
Bus Duct and Misc. Electrical	CAJ
6000-6999 Duct without Damper and Misc. Mechanical	
CAJ 7000-7999 Multiple Penetrations	CAJ
8000-8999	

*Alternate method of firestopping is patching opening
 to match original rated construction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose materials. Clean and repair surfaces as required. Remove laitance and form- release agents from concrete.
- B. Ensure substrate and penetrating items have been permanently installed prior to installing firestopping systems. Ensure penetrating items have been properly spaced and have proper clearance prior to installing firestopping systems.
- C. Surfaces to which sealing materials are to be installed must meet the selected UL or Intertek / Warnock Hersey system substrate criteria.
- D. Prime substrates where recommended in writing by through-penetration firestop system manufacturer. Confine primer to area of bond.

3.2 CLEANING AND PROTECTING

- A. Clean excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not cause damage.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.3 IDENTIFICATION

- A. Provide and install labels adjacent to each firestopping location. Label shall be provided by the firestop system supplier and contain the following information in a contrasting color:
 - 1. The words "Warning - Through Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Firestop System Supplier; UL or listed by Intertek / Warnock Hersey system number; date installed; contractor name and phone number; manufacturer's representative name, address, and phone number.

3.4 INSPECTION

- A. All penetrations shall be inspected by the manufacturer's representative to ensure proper installation.
- B. Access to firestop systems shall be maintained for examination by the Authority Having Jurisdiction at their request.
- C. Proceed with enclosing through-penetration firestop system with other construction only after inspection reports are issued and firestop installations comply with requirements.
- D. The contractor shall allow for visual destructive review of 5% of installed firestop systems (minimum of one) to prove compliance with specifications and manufacturer's instructions and details. Destructive system removal shall be performed by the contractor and witnessed by the engineer and manufacturer's factory representative. The engineer shall have sole discretion of which firestop system installations will be reviewed. The contractor is responsible for all costs associated with this requirement including labor and material for removing and replacing the installed firestop system. If any firestop system is found to not be installed per manufacturer's specific instructions and details, all firestop systems are subject to destructive review and replacement at the engineer's discretion and the contractor's expense.

END OF SECTION

SECTION 22 05 05
PLUMBING DEMOLITION FOR REMODELING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Mechanical Demolition.
- B. Cutting and Patching.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be as specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. THE DRAWINGS ARE INTENDED TO INDICATE THE GENERAL SCOPE OF WORK AND DO NOT SHOW EVERY PIPE, DUCT, OR PIECE OF EQUIPMENT THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE AND VERIFY CONDITIONS PRIOR TO SUBMITTING A BID.
- B. Where walls, ceilings, etc., are shown as being removed on general drawings, the Contractor shall remove all mechanical equipment, devices, fixtures, piping, ducts, systems, etc., from the removed area.
- C. Where ceilings, walls, partitions, etc., are temporarily removed and replaced by others, This Contractor shall remove, store, and replace equipment, devices, fixtures, pipes, ducts, systems, etc.
- D. Verify that abandoned utilities serve only abandoned equipment or facilities. Extend services to facilities or equipment that shall remain in operation following demolition.
- E. Coordinate work with all other Contractors and the Owner. Schedule removal of equipment to avoid conflicts.
- F. This Contractor shall verify all existing equipment sizes and capacities where equipment is scheduled to be replaced or modified, prior to ordering new equipment.
- G. Bid submittal shall mean the Contractor has visited the project site and verified existing conditions and scope of work.

3.2 PREPARATION

- A. Disconnect plumbing systems in walls, floors, and ceilings scheduled for removal.

- B. Provide temporary connections to maintain existing systems in service during construction. When work must be performed on operating equipment, use personnel experienced in such operations.
- C. Existing Plumbing System: Maintain service to all plumbing fixtures until new piping is installed. Obtain permission from Owner at least 48 hours before shutting down system for any reason. Make changeover to new piping with minimum outage. Do not disconnect any roof drainage piping until new piping is in place and operational.

3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

- A. Demolish and extend existing plumbing work under provisions of Division 2 and this Section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned piping to source of supply and/or main lines.
- D. Remove exposed abandoned pipes, including abandoned pipes above accessible ceilings. Cut pipes above ceilings, below floors and behind walls. Cap remaining lines. Repair building construction to match original. Remove all clamps, hangers, supports, etc. associated with pipe and duct removal.
- E. Disconnect and remove mechanical devices and equipment serving equipment that has been removed.
- F. Repair adjacent construction and finishes damaged during demolition and extension work.
- G. Extend existing installations using materials and methods compatible with existing installations, or as specified.
- H. Remove unused sections of domestic water piping back to mains and cap. Capped pipe shall be less than 2 feet from main to prevent "dead legs".
- I. Temporarily cap all openings to the sanitary and vent system to prevent odor from entering the work area and building.

3.4 CUTTING AND PATCHING

- A. This Contractor is responsible for all penetrations of existing construction required to complete the work of this project. Refer to Section 22 05 29 for additional requirements.
- B. Penetrations in existing construction should be reviewed carefully prior to proceeding with any work.
- C. Penetrations shall be neat and clean with smooth and/or finished edges. Core drill where possible for clean opening.
- D. Repair existing construction as required after penetration is complete to restore to original condition. Use similar materials and match adjacent construction unless otherwise noted or agreed to by the Architect/Engineer prior to start of work.
- E. Floor slab is post-tensioned. All penetrations shall be x-rayed prior to cutting and/or drilling to avoid any tension cables or utilities encased in floor construction.

- F. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

3.5 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Clean all systems adjacent to project which are affected by the dust and debris caused by this construction.
- C. PLUMBING ITEMS REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED BY THE OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE CONTRACTOR SHALL DISPOSE OF MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN FOR MAINTENANCE PURPOSES.

3.6 SPECIAL REQUIREMENTS

- A. Install temporary filter media over outside air intakes which are within 100 feet of the limits of construction or as noted on the drawings. This Contractor shall complete any cleaning required for existing systems which are affected by construction dust and debris.
- B. Review locations of all new penetrations in existing floor slabs or walls. Determine construction type and review for possible interferences. Bring all concerns to the attention of the Architect/Engineer before proceeding.

END OF SECTION

SECTION 22 05 29
PLUMBING SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Hangers, Supports, and Associated Anchors.
- B. Equipment Bases and Supports.
- C. Sleeves and Seals.
- D. Flashing and Sealing of Equipment and Pipe Stacks.
- E. Cutting of Openings.
- F. Escutcheon Plates and Trim.

1.2 REFERENCES

- A. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.
- B. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
- C. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices
- D. MSS SP-127 - Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application

1.3 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- A. Furnish sleeves and hanger inserts to General Contractor for placement into formwork.

PART 2 - PRODUCTS

2.1 SEISMIC RESTRAINTS

- A. Refer to Section 22 05 50 for additional requirements for seismic restraints.

2.2 HANGER RODS

- A. Hanger rods for single rod hangers shall conform to the following:

Hanger Rod Diameter		
Pipe Size	Column #1	Column #2
2" and smaller	3/8"	3/8"
2-1/2" through 3-5/8"	1/2"	1/2"
4" and 5"	5/8"	1/2"
6"	3/4"	5/8"

1. Column #1: Steel, cast iron.
 2. Column #2: Copper.
- B. Rods for double rod hangers may be reduced one size. Minimum rod diameter is 3/8 inches
- C. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.
- D. All hanger rods, nuts, washers, clevises, etc., in damp areas shall have ASTM A123 hot-dip galvanized finish applied after fabrication.

2.3 PIPE AND STRUCTURAL SUPPORTS

A. General:

1. Pipe hangers, clamps, and supports shall conform to Manufacturers Standardization Society MSS SP-58, 69, 89, and 127 (where applicable).
2. On all insulated piping, provide at each support an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. Refer to insulation specifications for materials and additional information.
 - a. Insulation Couplings:
 - 1) Insulation Coupling: Molded thermoplastic, -65°F to 275°F, sizes up to 4-1/8" OD, and receive insulation thickness up to 1" . Suitable for use indoors or outdoors with UV stabilizers. Vertical insulation riser clamps shall have a 1,000lb vertical load rating. On cold pipes operating below 60°F, cover joint and coupling with vapor barrier mastic to ensure continuous vapor barrier.
3. Copper piping located in an exposed area, including indirect waste piping in janitor's closets, shall use split ring standoff hangers for copper tubing. Support shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, Erico Cushion Clamp or Cooper Vibra-Clamp. Use electro-galvanized or more corrosion resistant and threaded rod for floor applications. Use anchors applicable to the wall type with corrosion resistant threaded rod for wall applications.
 - a. Products:
 - 1) Erico/M-Co Model #456
 - 2) B-Line Fig. 3198HCT
 - 3) Anvil Fig. CT138R
 - 4) Nibco/Tolco Fig. 301CT.

B. Vertical Supports:

1. Support and laterally brace vertical pipes at every floor level in multi-story structures, unless otherwise noted by applicable codes, but never at intervals over 15 feet Support vertical pipes with riser clamps installed below hubs, couplings, or lugs. Provide sufficient

flexibility to accommodate expansion and contraction to avoid compromising fire barrier penetrations or stressing piping at fixed takeoff locations.

a. Products:

- 1) Cooper/B-Line Fig B3373 Series
- 2) Erico 510 Series
- 3) Nibco/Tolco Fig. 82.

C. Hangers and Clamps:

1. Oversize all hangers, clamps, and supports on insulated piping to allow insulation and jacket to pass through unbroken. This applies to both hot and cold pipes.
2. Hangers in direct contact with bare copper pipe shall include plastic pipe insert similar to Unistrut Cush-A-Clamp, Hydra-Zorb, Erico Cushion Clamp or Cooper Vibra-Clamp within their temperature limits of -65°F to +275°F.
3. On all insulated piping, provide a semi-cylindrical metallic shield and vapor barrier jacket.
4. Ferrous hot piping 2-1/2 inches and larger shall have steel saddles tack welded to the pipe at each support with a depth not less than specified for the insulation. Factory fabricated inserts may be used.

a. Products:

- 1) Anvil Fig. 160, 161, 162, 163, 164, 165
- 2) Cooper/B-Line Fig. 3160, 3161, 3162, 3163, 3164, 3165.
- 3) Erico Model 630, 631, 632, 633, 634, 635.
- 4) Nibco/Tolco Fig. 260-1, 261-1 1/2, 262-2, 263-2 1/2, 264-3, 265-4.

D. Upper (Structural) Attachments:

1. Unless otherwise shown, upper attachments for hanger rods or support struts shall be as follows:
 - a. Steel Structure Clamps: C-Type Wide Flange Beam Clamps (for use on top and/or bottom of wide flanges. Not permitted for use with bar-joists.):
 - 1) Products:
 - a) Anvil Fig. 92
 - b) Cooper/B-Line Fig. B3033/B3034
 - c) Erico Model 300
 - d) Nibco/Tolco 68.

2.4 OPENINGS IN FLOORS, WALLS AND CEILINGS

- A. Exact locations of all openings for the installation of materials shall be determined by the Contractor and given to the General Contractor for installation or construction as the structure is built.
- B. Coordinate all openings with other Contractors.
- C. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in or through existing structures, or openings in new structures that were not installed, or additional openings. Repair all spalling and damage to the satisfaction of the Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and uniform opening edges.
- D. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate openings with other Contractors shall not exempt the Contractor from providing openings at Contractor's expense.
- E. Do not cut structural members without written approval of the Architect or Structural Engineer.

2.5 ROOF PENETRATIONS

- A. Seal pipes with surface temperature below 150°F penetrating single-ply roofs with conical stepped pipe flashings and stainless steel clamps equal to Portals Plus Pipe Boots. Material shall match roofing membrane.
- B. Break insulation only at the clamp for pipes between 60°F and 150°F. Seal outdoor insulation edges watertight.

2.6 SLEEVES AND LINTELS

- A. Each Contractor shall provide sleeves and lintels for all duct and pipe openings required for the Contractor's work in masonry walls and floors, unless specifically shown as being by others.
- B. Fabricate all sleeves from standard weight black steel pipe or as indicated on the drawings. Provide continuous sleeve. Cut or split sleeves are not acceptable.
- C. Fabricate all lintels for masonry walls from structural steel shapes or as indicated on the drawings. Have all lintels approved by the Architect or Structural Engineer.
- D. Sleeves through the floors on exposed risers shall be flush with the ceiling, with planed squared ends extending 1" above the floor in unfinished areas, and flush with the floor in finished areas, to accept spring closing floor plates.
- E. Sleeves shall not penetrate structural members or masonry walls without approval from the Structural Engineer. Sleeves shall then comply with the Architect/Engineer's design.
- F. Openings through unexcavated floors and/or foundation walls below the floor shall have a smooth finish with sufficient annular space around material passing through opening so slight settling will not place stress on the material or building structure.
- G. Install all sleeves concentric with pipes. Secure sleeves in concrete to wood forms. This Contractor is responsible for sleeves dislodged or moved when pouring concrete.
- H. Where pipes rise through concrete floors that are on earthen grade, provide 3/4" resilient expansion joint material (e.g., foam, rubber, asphalt-coated fiber, bituminous- impregnated felt,

or cork) wrapped around the pipe, the full depth of concrete, at the point of penetration. Secure to prevent shifting during concrete placement and finishing.

- I. Size sleeves large enough to allow expansion and contraction movement. Provide continuous insulation wrapping.

2.7 ESCUTCHEON PLATES AND TRIM

- A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors, or ceilings of finished rooms.
- B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium plated finish, heavy spring clip, rigid hinge and latch.
- C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and raw construction edges of all rectangular openings in finished rooms. This includes pipe openings.

2.8 PIPE PENETRATIONS

- A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk. Backing material may be used.
- B. Seal fire rated wall and floor penetrations with fire seal system as specified.

2.9 PIPE ANCHORS

- A. Provide all items needed to allow adequate expansion and contraction of all piping. All piping shall be supported, guided, aligned, and anchored as required.
- B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the building.

2.10 FINISH

- A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.1 PLUMBING SUPPORTS AND ANCHORS

- A. General Installation Requirements:
 1. Install all items per manufacturer's instructions.
 2. Coordinate the location and method of support of piping systems with all installations under other Divisions and Sections of the Specifications.
 3. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
 4. Supports shall extend directly to building structure. Do not support piping from duct hangers unless coordinated with sheet metal contractor prior to installation. Do not allow lighting or ceiling supports to be hung from piping supports.

B. Supports Requirements:

1. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel, etc., which attach to it shall be installed prior to application of fireproofing. Repair all fireproofing damaged during pipe installation.
2. Set all concrete inserts in place before pouring concrete.
3. Furnish, install and prime all auxiliary structural steel for support of piping systems that are not shown on the Drawings as being by others.
4. Install hangers and supports complete with lock nuts, clamps, rods, bolts, couplings, swivels, inserts and required accessories.
5. Hangers for horizontal piping shall have adequate means of vertical adjustment for alignment.

C. Pipe Requirements:

1. Support all piping and equipment, including valves, strainers, traps and other specialties and accessories to avoid objectionable or excessive stress, deflection, swaying, sagging or vibration in the piping or building structure during erection, cleaning, testing and normal operation of the systems.
2. Do not, however, restrain piping to cause it to snake or buckle between supports or to prevent proper movement due to expansion and contraction.
3. Support piping at equipment and valves so they can be disconnected and removed without further supporting the piping.
4. Piping shall not introduce strains or distortion to connected equipment.
5. Parallel horizontal pipes may be supported on trapeze hangers made of structural shapes and hanger rods; otherwise, pipes shall be supported with individual hangers.
6. Trapeze hangers may be used where ducts interfere with normal pipe hanging.
7. Provide additional supports where pipe changes direction, adjacent to flanged valves and strainers, at equipment connections and heavy fittings.
8. Provide at least one hanger adjacent to each joint in grooved end steel pipe with mechanical couplings.

D. Provided the installation complies with all loading requirements of truss and joist manufacturers, the following practices are acceptable:

1. Loads of 100 lbs. or less may be attached anywhere along the top or bottom chords of trusses or joists with a minimum 3' spacing between loads.
2. Loads greater than 100 lbs. must be hung concentrically and may be hung from top or bottom chord, provided one of the following conditions is met:
 - a. The hanger is attached within 6" from a web/chord joint.

- b. Additional L2x2x1/4 web reinforcement is installed per manufacturer's requirements.
- 3. It is prohibited to cantilever a load using an angle or other structural component that is attached to a truss or joist in such a fashion that a torsional force is applied to that structural member.
- 4. If conditions cannot be met, coordinate installation with truss or joist manufacturer and contact Architect/Engineer.
- E. After piping and insulation installation are complete, cut hanger rods back at trapeze supports so they do not extend more than 3/4" below bottom face of lowest fastener and blunt any sharp edges.
- F. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (limitation not required with concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.
- G. Do not exceed the manufacturer's recommended maximum load for any hanger or support.
- H. Spacing of Hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the spacing as defined in 2019 CPC, Table 313.3 as applied to each piping system.
- I. Installation of hangers shall conform to MSS SP-58, 69, 89 and the applicable Plumbing Code.

END OF SECTION

SECTION 22 05 50
SEISMIC REQUIREMENTS FOR EQUIPMENT AND SUPPORTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Seismic Requirements.

1.2 QUALITY ASSURANCE

A. General:

1. The contractor shall retain a specialty consultant or equipment manufacturer to develop a seismic restraint and support system and perform seismic calculations in accordance with these specifications, state, and local codes.
2. Items used for seismic restraint of equipment and systems shall be specifically manufactured for seismic restraint.
3. These requirements are beyond those listed in Section 22 05 29 of these specifications. Where a conflict arises between the seismic requirements of this section and any other section, the Architect/Engineer shall be immediately notified for direction to proceed.

B. Manufacturer:

1. System Supports/Restraints: Company specializing in the manufacture of products specified in this Section.
2. Equipment: Each company providing equipment that must meet seismic requirements shall provide certification included in project submittals the equipment supplied for the project meets or exceeds the seismic requirements of the project.

- C. Testing Agency: An independent testing agency, acceptable to Authorities Having Jurisdiction, with experience and capability to conduct the testing indicated.

- D. Installer: Company specializing in performing the work of this Section.

1.3 REFERENCES

- A. International Building Code, 2018.
- B. California Administrative Code, 2019.
- C. California Building Code (CBC)ASHRAE - A Practical Guide to Seismic Restraint.
- D. Technical Manual 5-809-10, NAVFAC P-355, Air Force Manual 88-3, Chapter 13.
- E. ASCE 7-02, Chapter 9.ASCE 7-05, Chapter 13.ASCE 7-10, Chapter 13.ASCE 7-16, Chapter 13.
- F. California Building Code, 2019, Seismic Bracing Systems, OPM No. OPM-0052-13.
- G. NFPA 13 - Installation of Sprinkler Systems.

- H. NFPA 14 - Standpipe and Hose Systems.

1.4 TESTING AND INSPECTION

- A. Special Inspection and Testing shall be done in accordance with Chapter 17 of the International Building Code.
- B. The Contractor shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704 and 1705.
- C. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specifications to the building official and the Architect and Engineer of Record.
- D. The Special Inspection Agency shall furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed and furnished within 48 hours of inspected work. A final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge, in conformance with the approved plans and specifications shall be submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site. Accept material on site in factory containers and packing. Inspect for damage. Protect from damage and contamination by maintaining factory packaging until installation. Follow manufacturer's instructions for storage.

1.6 DESIGN REQUIREMENTS

- A. This project is subject to the seismic bracing requirements of California Building Code. .
- B. The following criteria are applicable to this project:
 - 1. Risk Category: IV
 - 2. Seismic Importance Factor: IE = 1.5Seismic Design Category: D
 - 3. Component Amplification Factors (ap) and Component Response Modification Factors (Rp) shall be taken from Table 13.5-1 in ASCE 7-16 for the individual equipment or system being restrained.
 - 4. Component Importance Factors (Ip) shall be taken from Section 13.1.3 in ASCE 7-16 for the individual equipment or system being restrained.
 - 5. The total height of the structure and the height of the system to be restrained within the structure shall be determined in coordination with architectural plans and the General Contractor.
- C. Forces shall be calculated with the above requirements and Equations 13.3-1, -2, and - 3 of ASCE 7-16, unless exempted by 13.1.4.
- D. Equipment shall meet California Building Code and ASCE 7 seismic qualification requirements in concurrence with ICC ES AC156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.

- E. California Building Code, 2019, Seismic Bracing Systems, OPM No. OPM-0052-13.
- F. All seismic anchorage and bracing shall comply with the Chapter 16A, Part 2, of 2019 California Building Code.
- G. All seismic anchorage and bracing shall comply with FM Global Property Loss Prevention Data Sheet 1-11, Fire Following Earthquakes.

1.7 COORDINATION

- A. Coordinate layout and installation of seismic bracing with building structural systems and architectural features, and with mechanical, fire-protection, electrical and other building features in the vicinity.
- B. Coordinate concrete bases with building structural system.

1.8 WARRANTY

- A. Provide one-year warranty on parts and labor for manufacturer defects and installation workmanship.

PART 2 - PRODUCTS

2.1 SEISMIC DESIGN CRITERIA

- A. This section describes the requirements for seismic restraint of systems and equipment related to continued operation of the facility after a design seismic event.
- B. Definitions

2.2 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

- A. General:
 - 1. Seismic restraint designer shall coordinate all attachments with the Structural Engineer of Record; refer to submittal requirements.
 - 2. The seismic restraint design shall be based on actual equipment data obtained from manufacturer's submittals or the manufacturer. The equipment manufacturer shall verify and provide written certification the attachment points on the equipment can accept the combination of seismic, weight, and other imposed loads.
 - 3. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
 - 4. Analysis shall detail anchoring methods, bolt diameter, embedment, and weld length.
 - 5. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.
- B. Friction from gravity loads shall not be considered resistance to seismic forces.
- C. Fire protection systems shall meet the requirements of NFPA-13 and NFPA-14 for the building seismic requirements.

2.3 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

- A. Strength: Defined in reports by ICC Evaluation Service or another agency acceptable to authorities having jurisdiction.
 - 1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.
- B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type. Comply with IBC, ACI and ICC ES requirements for cracked concrete anchors.
- C. Concrete Inserts: Steel-channel type.
- D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM F3125, Grade A 325.
- E. Welding Lugs: Comply with MSS SP-69, Type 57.
- F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.
- G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.
- H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.4 SEISMIC BRACING COMPONENTS

- A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch-thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.
 - 1. Materials for Channel: ASTM A 1011, GR 33.
 - 2. Materials for Fittings and Accessories: ASTM A 635, ASTM A 576, or ASTM A 36.
 - 3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
 - 4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.
- B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.
- C. Cable-Type Bracing Assemblies: Zinc-coated, high-strength steel wire rope cable attached to steel thimbles, brackets, and bolts designed for cable service.
 - 1. Arrange units for attachment to the braced component at one end and to the structure at the other end.
 - 2. Wire Rope Cable: Comply with ASTM A 603. Use 49- or 133-strand cable with a minimum strength of 2 times the calculated maximum seismic force to be resisted.

- D. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to the applicable code sections and Authority Having Jurisdiction for the exact seismic restraint requirements of piping, ductwork, conduit, equipment, etc.
- B. Layout of transverse and longitudinal bracing shall follow recommendations of approved design standards listed in Part 1 of this specification section.
- C. All rigid floor mounted equipment shall have a resilient media between the equipment mounting hole and the anchor bolt in concrete.
- D. All seismic restraint systems shall be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.
- E. Installation of seismic restraints shall not cause any change in position of equipment, piping, or ductwork, resulting in stresses or misalignment.
- F. No rigid connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.
- G. Do not install any equipment, piping, duct, or conduit that makes rigid connections with the building unless isolation is not specified.
- H. Coordinate work with all other trades to avoid rigid contact with the building. Any conflicts with other trades that will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions shall be brought to the Architect/Engineer's attention prior to specific equipment selection.
- I. Prior to installation, bring to the Architect/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.
- J. Bracing may occur from flanges of structural beams, upper truss cords of bar joists, cast in place inserts, or International Code Council approved seismic anchors for installation in concrete.
- K. Cable restraints shall be installed slightly slack to avoid short-circuiting the isolated suspended equipment, ductwork, piping, or conduit.
- L. Cable assemblies shall be installed taut on non-isolated systems. Solid braces may be used in place of cables on rigidly attached systems only.
- M. Do not install cables over sharp corners.
- N. Brace support rods when necessary to accept compressive loads. Welding of compression braces to the vertical support rods is not acceptable.
- O. Provide reinforced clevis bolts when required.
- P. The vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not acceptable.

- Q. Post-Installed anchors shall be provided to meet seismic requirements.
 - R. Vertical pipe risers flexibly supported to accommodate thermal motion and/or pipe vibration shall be guided to maintain pipe stability and provide horizontal seismic restraint.
 - S. Seismic restraints shall be mechanically attached to the system. Looping restraints around the system is not acceptable.
 - T. Piping crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections, or support connections. Pipe offsets, loops, anchors, and guides shall be installed as required to provide required motion capability and limit motion of adjacent piping.
 - U. Do not brace a system to two different structures such as a wall and a ceiling.
 - V. Provide appropriately sized openings in walls, floors, and ceilings for anticipated seismic movement. Provide fire seal systems in fire-rated walls.
 - W. Positively attach all roof mounted equipment to roof curbs. Positively attach all roof curbs to building structure.
 - X. Exposed seismic supports in occupied areas shall be guarded or covered to protect occupants.
- 3.2 SEISMIC RESTRAINT EXCLUSIONS
- A. Refer to the applicable code sections and Authority Having Jurisdiction for allowable exclusions.

END OF SECTION

SECTION 22 05 53
PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Identification of products installed under Division 22.

1.2 REFERENCES

- A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.
- B. ASTM B-1, B-3, and B-8 for copper conductors.
- C. ASTM D-1248 for Polyethylene Extrusion Materials, ICEA S-70-547 Weatherproof Resistant Polyethylene Conductors, ICEA S-61-402/NEMA WC5 Thermoplastic Insulated Wire & Cable, ICEA S-95-658/NEMA WC70 Non-Shielded 0 " 2kV Cables.
- D. CGA Pamphlet C-9, Standard Color-Marking of Compressed Gas Cylinders for Medical Use.
- E. UL 1581 Standard for Electrical Wires, Cables, and Flexible Cords.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All pipe markers (purchased or stenciled) shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

OD of Pipe or Insulation	Marker Length	Size of Letters
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

- B. Plastic tags may be used for outside diameters under 3/4".
- C. Plastic Nameplates: Laminated three-layer phenolic with engraved black, 1/4" minimum letters on light contrasting background.
- D. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.
- E. Plastic Tags: Minimum 1-1/2" square or round laminated three-layer phenolic with engraved, 1/4" minimum black letters on light contrasting background.
- F. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2" square or 1-1/2" round.

- G. Plastic Pipe Markers: Semi-rigid plastic, preformed to fit around pipe or pipe covering; indicating flow direction and fluid conveyed.
- H. Vinyl Pipe Markers: Colored vinyl with permanent pressure sensitive adhesive backing.
- I. Stencil Painted Pipe Markers: Use industrial enamel spray paint per ANSI Standard A13.1. Indicate fluid conveyed and flow direction.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all products per manufacturer's recommendations.
- B. Degrease and clean surfaces to receive adhesive for identification materials.
- C. Valves:
 - 1. All valves (except shutoff valves at equipment) shall have numbered tags.
 - 2. Provide or replace numbered tags on all existing valves that are connected to new systems or that have been revised.
 - 3. Provide all existing valves used to extend utilities to this project with numbered tags. Review tag numbering sequence with the Owner prior to ordering tags.
 - 4. Secure tags with heavy duty key chain and brass "S" link or with mechanically fastened plastic straps.
 - 5. Attach to handwheel or around valve stem. On lever operated valves, drill the lever to attach tags.
 - 6. Number all tags and show the service of the pipe.
 - 7. Provide one Plexiglas framed valve directory listing all valves, with respective tag numbers, uses and locations. Mount directory in location chosen by the Architect/Engineer.
- D. Pipe Markers:
 - 1. Adhesive Backed Markers: Use Brady Style 1, 2, or 3 on pipes 3" diameter and larger. Use Brady Style 4, 6, or 8 on pipes under 3" diameter. Similar styles by other listed manufacturers are acceptable. Secure all markers at both ends with a wrap of pressure sensitive tape completely around the pipe.
 - 2. Snap-on Markers: Use Seton "Setmark" on pipes up to 5-7/8" OD. Use Seton "Setmark" with nylon or Velcro ties for pipes 6" OD and over. Similar styles by other listed manufacturers are acceptable.
 - 3. Stencil Painted Pipe Markers:
 - a. Remove rust, grease, dirt, and all foreign substances from the pipe surface.

- b. Apply primer on non-insulated pipes before painting.
 - c. Use background and letter colors as scheduled later in this section.
- 4. Apply markers and arrows in the following locations where clearly visible:
 - a. At each valve.
 - b. On both sides of walls that pipes penetrate.
 - c. At least every 20 feet along all pipes.
 - d. On each riser and each leg of each "T" joint.
 - e. At least once in every room and each story traversed.
- 5. Underground Pipe Markers: Install 8" to 10" below grade, directly above buried pipes.

3.2 SCHEDULE

- A. Pipes to be marked shall be labeled with the text as shown in the following table regardless of which method or material is used:
 - 1. SANITARY SEWER: Black lettering; yellow background
 - 2. VENT: Black lettering; yellow background
 - 3. STORM SEWER (PRIMARY AND SECONDARY): White lettering; green background
 - 4. MEDICAL GAS: Oxygen, Medical Air, Medical Vacuum.

END OF SECTION

SECTION 22 10 00
PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe and Pipe Fittings.
- B. Valves.
- C. Check Valves.

1.2 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welders Certification: In accordance with ANSI/ASME Sec 9 or ANSI/AWS D1.1.
- D. Piping, Fittings, Valves, and Flux for Potable Water Systems: All components shall be lead free per Federal Act S.3874, Reduction of Lead in Drinking Water Act.
- E. Pipe hangers and supports shall be spaced per 2019 CPC, Table 313.3, as applied to each pipe system listed. Refer to Section 22 05 29 for hanger and support components. Seismic supports shall be submitted as a deferred approval using OPM guidelines. Shop drawings shall be submitted for review to the AHJ: State, local or agency reviewing the project, DSA, OSHPD. Upon approval, these shop drawings shall be included in the record set.
- F. Potable water piping and fittings shall comply with California Assembly Bill AB1953 limiting lead content. Also described in 2019 CPC: 604.2 Lead Content.
- G. Valves for potable water systems shall comply with California Assembly Bill AB1953 limiting lead content. Also described in 2019 CPC: 604.2 Lead Content.
- H. Hubless clamps shall meet FM 1680 for OSHPD 1, 2 and 3.

1.3 REFERENCES

- A. ANSI/ASME A112.3.1 - Stainless Steel Drainage Systems for Sanitary DWV, Storm, and Vacuum Applications, Above and Below Ground.
- B. ANSI/ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.
- C. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- D. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- E. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.

- F. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.
- G. ANSI/ASME B16.9 - Factory-Made Wrought Steel Butt Welding Fittings.
- H. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.
- I. ANSI/ASTM B32 - Solder Metal.
- J. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- K. ANSI/ASTM D2466 - PVC Plastic Pipe Fittings, Schedule 40.
- L. ANSI/AWS D1.1 - Structural Welding Code.
- M. ANSI/AWWA C110 - Ductile Iron and Gray Iron Fittings 3" through 48", for Water and Other Liquids.
- N. ANSI/AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- O. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- P. ANSI/AWWA C153 - Compact Ductile Iron Fittings 3" through 48", for Water and Other Liquids.
- Q. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- R. ASTM A74 - Hub and Spigot Cast Iron Soil Pipe and Fittings.
- S. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- T. ASTM A312 - Standard for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
- U. ASTM A554 - Standard for Welded Stainless Steel Mechanical Tubing.
- V. ASTM A674 - Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
- W. ASTM A888 - Hubless Cast Iron Soil Pipe and Fittings.
- X. ASTM B88 - Seamless Copper Water Tube.
- Y. ASTM B306 - Copper Drainage Tube (DWV).
- Z. ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.
- AA. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- BB. ASTM C1540 - Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.
- CC. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

- DD. ASTM D1785 - Polyvinylchloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.
- EE. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- FF. ASTM D2661 - ABS DWV Pipe & Fittings.
- GG. ASTM D2665 - PVC DWV Pipe & Fittings.
- HH. ASTM D2846 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems
- II. ASTM D3033 - Type PSP (Polyvinylchloride) (PVC) Sewer Pipe and Fittings.
- JJ. ASTM D3034 - Type PSM (Polyvinylchloride) (PVC) Sewer Pipe and Fittings.
- KK. ASTM F402 - Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.
- LL. ASTM F437 - Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- MM. ASTM F439 - Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- NN. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipes.
- OO. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- PP. ASTM F656 - Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
- QQ. AWS A5.8 - Brazed Filler Metal.
- RR. AWWA C651 - Disinfecting Water Mains.
- SS. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- TT. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.
- UU. FM 1680 - Couplings Used in Hubless Cast Iron Systems.
- VV. NFPA 24 - Private Fire Service Mains and Their Appurtenances.
- WW. NSF - National Sanitation Foundation
- XX. XX. OSHPD - Office of State Wide Health Planning and Development (California)
- YY. CCR - California Code of Regulation
- ZZ. CBC - California Building Code
- AAA. CPC - California Plumbing Code

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers with labeling in place.

1.5 COORDINATION DRAWINGS

- A. Reference Coordination Drawings article in Section 22 05 00 for required plumbing systems electronic CAD drawings to be provided to Coordinating Contractor for inclusion into composite coordination drawings.

PART 2 - PRODUCTS

2.1 CAST IRON PIPE

- A. Cast Iron; Standard Weight; No-Hub Sleeve Gaskets:
 - 1. Pipe: Standard weight no-hub cast iron soil pipe, corrosion protective coating inside and outside, CISPI 301 or ASTM A888, NSF certified, CISPI trademark.
 - 2. Design Pressure: Gravity Maximum Design Temperature: 180°F
 - 3. Joints: Heavy duty, neoprene sleeve gasket, ASTM C-564, 300 Series stainless steel shield, clamp, and screws with at least four screw type clamps, FM 1680 or ASTM C1540.
 - 4. Restraints: Install pipe and fittings per the Cast Iron Soil Pipe Institute's Designation 310. Restrain pipe and fittings using an engineered and tested product manufactured for restraining no-hub cast iron soil pipe. Install per manufacturer's recommendations.
 - 5. Adapters: Transitions from cast iron soil pipe to other pipe materials with manufactured adapters. Heavy duty neoprene sleeve gasket, ASTM C-564, 300 Series stainless steel shield, clamp, and screws with not less than four screw type clamps, FM 1680 or ASTM C1540.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install all products per manufacturer's recommendations.
- B. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- C. Remove scale and dirt, on inside and outside, before assembly.
- D. Remove all scale, rust, dirt, oils, stickers and thoroughly clean exterior of all bare metal exposed piping, hangers, and accessories in preparation to be painted.
- E. Connect to equipment with flanges or unions.
- F. Use only piping materials rated for the maximum temperature of the application, e.g., do not use PVC for dishwasher drainage or piping that receives boiler blowdown.
- G. Vent Flashing:

1. Flash vents with 3# seamless sheet lead of sufficient size to extend 15" into roofing felts for built-up roofs or under shingles for wood sloped roofs.
 2. Flash vents with premolded EPDM pipe flashing cones for single-ply membrane roofs.
- H. Existing building sewers or building drains which are shown on the documents to be reused shall be inspected and recorded by closed circuit television for their condition. Report findings back to the Architect, Engineer, and Owner before proceeding with work so any necessary rework can take place if needed.

3.2 SYSTEM, PIPING AND VALVE SCHEDULE

- A. Sanitary Waste and Vent, Sanitary (Above Ground):
1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes
- B. Storm Drainage (Above Ground):
1. Cast Iron; Standard Weight; Hub and Spigot Joints: All Sizes

3.3 TESTING PIPING

- A. Sanitary Drainage, Sanitary Vent, Storm Drainage:
1. Test all piping with water to prove tight.
 2. Test piping before insulation is applied.
 3. Hydrostatically test all soil, waste, and vent piping inside of building with 10 feet head of water for 15 minutes. Inspect before fixtures are connected. If leaks appear, repair them and repeat the test.
 4. Hydrostatically test interior downspouts with 10 feet head of water for 15 minutes with no leaks.
 5. A smoke/air test at the same pressure may be used in lieu of the hydrostatic water test. Exception: Smoke/air test shall not be performed on plastic piping.
 6. Test force mains with water at 105% of the operating pump discharge pressure for 15 minutes.
 7. Test pressures stated above shall be as listed or as required by the Authority Having Jurisdiction, whichever is most stringent.
 8. Test piping per CPC requirements.
- B. All Other Piping:
1. Test piping at 150% of normal operating pressure.
 2. Piping shall hold this pressure for one hour with no drop in pressure.
 3. Test piping using water, nitrogen, or air as compatible with the final service of the pipe. Do not use combustible fluids.

4. Drain and clean all piping after testing is complete.
5. Test compressed air piping per ASME 31.9 requirements.

3.4 CLEANING PIPING

A. Assembly:

1. Before assembling pipe systems, remove all loose dirt, scale, oil and other foreign matter on internal or external surfaces by means consistent with good piping practice subject to approval of the Architect/Engineer's representative. Blow chips and burrs from machinery or thread cutting operation out of pipe before assembly. Wipe cutting oil from internal and external surfaces.
2. During fabrication and assembly, remove slag and weld spatter from both internal and external joints by peening, chipping and wire brushing.
3. Notify the Architect/Engineer's representative before starting any post erection cleaning in sufficient time to allow witnessing the operation. Consult with and obtain approval from the Architect/Engineer's representative regarding specific procedures and scheduling. Dispose of cleaning and flushing fluids properly.
4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation and equipment, open wide all valves, and be certain all strainer screens are in place.

B. All Water Piping:

1. Flush all piping using faucets, flush valves, etc. until the flow is clean.
2. After flushing, thoroughly clean all inlet strainers, aerators, and other such devices.
3. If necessary, remove valves to clean out all foreign material.

3.5 INSTALLATION

A. General Installation Requirements:

1. Provide dielectric connections between dissimilar metals.
2. Route piping in orderly manner and maintain gradient. Install to conserve building space.
3. Group piping whenever practical at common elevations.
4. Install piping to allow for expansion and contraction without stressing pipe, joints, or equipment.
5. Slope water piping and arrange to drain at low points.
6. Install bell and spigot piping with bells upstream.
7. Where pipe supports are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
8. Seal pipes passing through exterior walls with a wall seal per Section 22 05 29. Provide Schedule 40 galvanized sleeve at least 2 pipe sizes larger than the pipe.

9. All non-potable outlets shall be clearly marked with a permanently affixed laminated sign with 3/8" high lettering saying "Non-Potable Water Not for Human Consumption." Sign shall have black lettering on a yellow background.
 10. All vertical pipe drops to sinks or other equipment installed below the ceiling shall be routed within a wall cavity, unless specifically noted otherwise to be surface mounted. For renovation projects, this Contractor is responsible for opening and patching existing walls for installation of piping. Wall patching shall match existing condition.
- B. Installation Requirements in Electrical Rooms:
1. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment.
- C. Installation Requirements in MRI (Magnetic Resonance Imaging - Healthcare):
1. All piping in MRI rooms shall be non-ferrous regardless of materials described on Part 2.
- D. Valves/Fittings and Accessories:
1. Install shutoff valves that permit the isolation of equipment/fixtures in each room without isolating any other room or portion of the building. Individual fixture angle stops do not meet this requirement. Exception: Back-to-back rooms in no more than two adjacent rooms.
 2. Provide clearance for installation of insulation and access to valves and fittings.
 3. Provide access doors for concealed valves and fittings.
 4. Install valve stems upright or horizontal, not inverted.
 5. Provide one plug valve wrench for every ten plug valves 2" and smaller, minimum of one. Provide each plug valve 2-1/2" and larger with a wrench with set screw.
 6. Install corrugated, stainless steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.
- E. Sanitary and Storm Piping:
1. Install all sanitary and storm piping inside the building with a slope as shown on the drawings.
 2. Install horizontal offset at all connections to roof drains to allow for pipe expansion.
 3. Slope sanitary and storm piping outside the building to meet invert elevations shown on drawings and to maintain a minimum velocity of 2 feet per second.
 4. All sanitary and storm piping shall have at least 36" of cover when leaving the building.
 5. Starter fittings with internal baffles are not permitted.

3.6 PIPE ERECTION AND LAYING

- A. Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be removed from the job immediately.
- B. All pipe, fittings, valves, equipment and accessories shall have factory applied markings, stampings, or nameplates with sufficient data to determine their conformance with specified requirements.
- C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not install any item that is not clean.
- D. Until system is fully operational, all openings in piping and equipment shall be kept closed except when actual work is being performed on that item or system. Closures shall be plugs, caps, blind flanges or other items specifically designed and intended for this purpose.
- E. Run pipes straight and true, parallel to building lines with minimum use of offsets and couplings. Provide only offsets required to provide needed headroom or clearance and to provide needed flexibility in pipe lines.
- F. Make changes in direction of pipes only with fittings or pipe bends. Changes in size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. All fittings shall be of the long radius type, unless otherwise shown on the drawings or specified.
- G. Provide flanges or unions at all final connections to equipment, traps and valves.
- H. Arrange piping and connections so equipment served may be totally removed without disturbing piping beyond final connections and associated shutoff valves.
- I. Use full and double lengths of pipe wherever possible.
- J. Unless otherwise indicated, install all piping, including shutoff valves and strainers, to coils, pumps and other equipment at line size with reduction in size being made only at control valve or equipment.
- K. Cut all pipe to exact measurement and install without springing or forcing except in the case of expansion loops where cold springing is indicated on the drawings.
- L. Underground pipe shall be laid in dry trenches maintained free of accumulated water. Refer to Section 22 05 00 for Excavation, Fill, Backfill and Compaction requirements.
- M. Unless otherwise indicated, branch take-offs shall be from top of mains or headers at either a 45° or 90° angle from the horizontal plane for air lines, and from top, bottom or side for liquids.
- N. Do not use geotextile fabric with footing tile if silt content of soil exceeds 40% or if clay content exceeds 50%. The fabric shall be installed around 1" river rock or 2" limestone.

3.7 DRAINING AND VENTING

- A. Unless otherwise indicated on the drawings, all horizontal water and compressed air lines, including branches, shall pitch 1" in 40 feet to low points for complete drainage, removal of condensate and venting.
- B. Maintain accurate grade where pipes pitch or slope for venting and drainage. No pipes shall have pockets due to changes in elevation.
- C. Provide drain valves at all low points of water piping systems for complete or sectionalized draining.
- D. Provide drip legs at low points and at the base of all risers in compressed air pipes. Drip legs shall be full line size on pipes through 4" and at least 4", but not less than half line size over 4". Drip legs shall be 12" minimum length, capped with a reducer to a drain valve.
- E. Use eccentric reducing fittings on horizontal runs when changing size of pipes for proper drainage and venting. Install compressed air and gravity drain pipes with bottom of pipe and eccentric reducers in a continuous line; all other liquid lines with top of pipe and eccentric reducers in a continuous line.
- F. Provide air vents at high points and wherever else required to eliminate air in all water piping systems.
- G. Install air vents in accessible locations. If necessary to trap and vent air in a remote location, install an 1/8" pipe from the tapping location to an accessible location and terminate with a venting device.
- H. All vent and drain piping shall be of same materials and construction for the service involved.

3.8 PLUMBING VENTS

- A. Vent as shown on the drawings and in accordance with all codes having jurisdiction.
- B. Extend the high side of the soil and waste stacks at least 12" above roof.
- C. Flash pipes at the roof with 3# lead sheet. Extend flashing under roofing 15" in all directions from pipe to be flashed. Extend a lead collar up on the outside of pipe to be flashed and extend 1" beyond the top of the pipe. The 1" excess length of collar shall be turned down into the top of the pipe where it shall fit tight to the inside of the pipe.
- D. Flash pipes at roof with premolded EPDM pipe flashing cones adhered to roof membrane by General Contractor. Secure top of cone with stainless steel clamp and seal watertight.
- E. Increase vent pipes through the roof two pipe sizes with long increasers located at least 12" below the roof.
- F. In no case shall the vent through the roof be less than 4" in diameter.
- G. Vent pipes through the roof shall be located a minimum of 10 feet from any air intake opening on the roof.

3.9 BRANCH CONNECTIONS

- A. Branch connections from headers and mains may be cut into black steel pipe

using forged weld-on fittings.

B. Forged weld-on fittings are limited as follows:

1. Must have at least same pressure rating as the main.
2. Main must be 2-1/2" or larger.
3. Branch line is at least two pipe sizes under main size.

END OF SECTION

SECTION 22 10 30
PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
- B. Perform work in accordance with State of California Plumbing Codes and municipality of local area standards.
- C. Piping, Fittings, Valves, and Flux for Potable Water Systems: All components shall be lead free per Federal Act S.3874, Reduction of Lead in Drinking Water Act.
- D. Valves for potable water systems shall comply with California Assembly Bill AB1953 limiting lead content. Also described in 2016 CPC: 604.2 Lead Content.

1.2 REFERENCES

- A. ANSI A112.21.1 - Floor Drains.
- B. ANSI A112.21.2 - Roof Drains.
- C. ANSI A112.6.3 - Floor Drains; The American Society of Mechanical Engineers.
- D. ANSI A112.6.4 - Roof, Deck, and Balcony Drains; The American Society of Mechanical Engineers.
- E. ANSI 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering.

PART 2 - PRODUCTS

2.1 TRAPS

- A. Provide all individual connections to the sanitary system with P-traps, except where such drains discharge directly into a properly trapped collection basin or sump. Unless otherwise specified or shown, traps shall be:
 - 1. Chromium plated cast brass when used with plumbing fixtures or when installed exposed in finished spaces.
 - 2. Insulated at accessible lavatories.
 - 3. Cast iron, deep-seal pattern where concealed above ceiling, below grade or in unfinished areas.
 - 4. Deep-seal pattern of the same material and/or coating where drainage lines are of special materials or coatings such as polypropylene, PVDF, CPVC, etc.

- B. All traps shall have accessible, removable cleanouts, except where installed on floor drains with removable strainers.
- C. Each trap shall be completely filled with water at the end of construction but before building turnover to the Owner. All floor drains, floor sinks, trench drains, etc. shall be filled with water and a 1/2" minimum layer of mineral oil.

2.2 TRAP PRIMERS

- A. Provide trap seals as specified on the drawings.
- B. Provide trap primers as shown and specified on the drawings.

2.3 FLOOR SINK

- A. Floor drains shall be in the form of a receptor with grate/strainer set flush with the surrounding floor.

PART 3 - EXECUTION

3.1 INSTALLATION AND APPLICATION

- A. Coordinate construction to receive drains at required invert elevations.
- B. Install all items per manufacturer's instructions.
- C. Trap Seals and Primers:
 - 1. Install trap primer on drains not receiving continuous discharge and subject to drying out.
 - 2. Connect trap primer to an active water line 1-1/2" in size or less and which will produce a 10 PSI pressure drop upon fixture operation downstream of the trap primer.
- D. Roof Drains:
 - 1. Roof drains shall have bearing pans.
 - 2. Provide auxiliary support steel under drains as required to prevent movement of the drain.
 - 3. All roof drains shall have underdeck clamps.
 - 4. Drains in built-up roofing systems shall have a 36" x 36", 3 lb density lead sheet flashing.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. All plumbing fixtures.

1.2 REFERENCES

- A. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
- B. The Energy Policy Act (EPA) of 2005.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Installation Requirements:

1. Install each fixture with trap easily removable for servicing and cleaning. Use screwed tailpiece couplings. Connect fixture waste to stack with slip fitting.
2. Provide fixtures with chrome plated rigid or flexible supplies, loose key stops, reducers, and escutcheons.
3. Install components level and plumb.
4. Caulk joint between finish floor and floor mounted fixtures and between finish walls and wall mounted fixtures with silicon caulk. Caulk the joint, between rim and fixture where a fixture builds into a counter top, with caulking compound. Refer to DIVISION 7 for "Caulking" requirements. Color to match fixture.
5. Where there is a possibility of water following pipe brackets, etc., into a wall; caulk escutcheons, space around brackets, etc., to exclude water. Refer to DIVISION 7 for "Caulking" requirements.
6. Refer to architectural drawings for fixture mounting heights.
7. All non-potable outlets shall be clearly marked with a permanently affixed laminated sign with 3/8" high lettering saying "Non-Potable Water Not for Human Consumption." Sign shall have black lettering on a yellow background.

B. Floor-Mounted Fixture Requirements:

1. Where floor mounted fixtures are installed on a sloped floor, the open void below the fixture shall be grouted, leveled, and caulked to eliminate stress on the fixture and to prevent water migration to the floor below.

C. Exposed or Inside Accessible Cabinets Traps, Valve and Pipe Requirements:

1. All traps exposed under fixtures or inside accessible cabinets shall be chrome plated brass.
2. All water or waste piping for plumbing fixtures that is exposed or inside cabinets shall be chrome plated.
3. All exposed flush valves for water closets and urinals shall have a chrome plated hanger to anchor the piping to the wall.
4. All exposed water supply piping and fittings in a finished space to a shower valve, hose bibb, or other water outlet shall be chrome plated.

3.2 ADJUSTING AND CLEANING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- B. At completion, clean plumbing fixtures, equipment, and faucet aerator screens.

3.3 FIXTURE ROUGH-IN SCHEDULE

- A. Rough-in fixture piping connections in accordance with table on plumbing drawings of minimum sizes for particular fixtures.

END OF SECTION

SECTION 22 61 13
COMPRESSED-AIR PIPING FOR LABORATORY AND HEALTHCARE FACILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Medical compressed-air piping, designated "medical air."
2. Dental compressed-air piping, designated "dental air."
3. Gas-powered-tool compressed-air piping, designated "instrument air."
4. Laboratory compressed-air piping, designated "laboratory air."
5. Shape-memory-metal couplings.
6. Pressure-seal fittings.
7. Flexible pipe connectors.
8. Zone valve box assemblies.
9. Ball valves.
10. Check valves.
11. Compressed-air safety valves.
12. Compressed-air service connections.
13. Compressed-air manifolds.
14. Compressed-air cylinder storage racks.

B. Related Requirements:

1. Section 11 53 13 "Laboratory Fume Hoods" for compressed-air outlets in laboratory fume hoods.
2. Section 12 35 53.13 "Metal Laboratory Casework" for compressed-air outlets in laboratory casework.
3. Section 12 35 53.16 "Plastic-Laminate-Clad Laboratory Casework" for compressed-air outlets in laboratory casework.
4. Section 12 35 53.19 "Wood Laboratory Casework" for compressed-air outlets in laboratory casework.
5. Section 12 35 70 "Healthcare Casework" for compressed-air outlets in healthcare casework.
6. Section 22 15 13 "General-Service Compressed-Air Piping" for general-service compressed-air piping and specialties.
7. Section 22 61 19 "Compressed-Air Equipment for Laboratory and Healthcare Facilities" for air compressors and specialties.
8. Section 22 09 63 "Medical Gas Alarms" for combined medical air, vacuum, and gas alarms.

1.2 DEFINITIONS

- A. Compressed-Air Piping Systems: Include medical air, dental air, instrument air, and laboratory air.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer and testing agency.
- B. Seismic Qualification Certificates: For compressed-air manifolds, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Material Certificates: Signed by Installer, certifying that medical compressed-air piping materials comply with requirements in NFPA 99 for positive-pressure medical gas systems.
- D. Brazing certificates.
- E. Field Quality-Control Reports: Brazing certificates.
- F. Source Quality Control Reports:
 - 1. Certificates of Shop Inspection and Data Report for Bulk Gas Storage Tanks: As required by ASME Boiler and Pressure Vessel Code, Section VIII.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Quick-Coupler Service Connections: Furnish complete noninterchangeable medical compressed-air pressure outlets.
 - 2. D.I.S.S. Service Connections: Furnish complete medical compressed-air-pressure outlets complying with CGA V-5.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Medical Air Piping Systems for Healthcare Facilities: In accordance with ASSE Standard #6010 and NFPA 99 for medical-gas-system installers.
 - 2. Shape-Memory-Metal Coupling Joints: An authorized representative who is trained and approved by manufacturer in accordance with ASSE Standard #6040 and NFPA 99.
- B. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the vacuum piping testing indicated, that is a member of the Medical Gas Professional Healthcare Organization or is an NRTL, and that is acceptable to authorities having jurisdiction.

1. Qualify testing personnel in accordance with ASSE Standard #6020 and NFPA 99 for medical-gas-system inspectors and ASSE Standard #6030 and NFPA 99 for medical-gas-system verifiers.
- C. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications," or AWS B2.2/B2.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Medical air operating at 50 to 55 psig.
- B. Dental air operating at 80 to 100 psig.
- C. Instrument air operating at 175 psig.
- D. Laboratory air operating at 50 psig, 100 psig, 125 psig.
- E. All positive-pressure compressed-air products including piping, tubing, fittings, valves, zone valve boxes, manifolds, and service connections for systems serving patients in healthcare facilities are required to be manufacturer cleaned, purged, and sealed as for oxygen service, in accordance with CGA G-4.1.
 1. All are to be delivered plugged or capped by the manufacturer and are to be kept sealed until prepared for installation.
- F. Seismic Performance: Compressed-air manifolds shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. See Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
 1. The term "withstand" means "the manifold will remain in place without separation of any parts when subjected to the seismic forces specified and the manifold will be fully operational after the seismic event."
- G. Comply with NFPA 99.

2.2 PIPES, TUBES, AND FITTINGS

- A. Comply with ASME B31.1 for laboratory air piping operating at more than 150 psig.
- B. Comply with ASME B31.9 for laboratory air piping operating at 150 psig or less.
- C. Copper Medical Gas Tube: ASTM B819, Type K and Type L, seamless, drawn temper. Include standard color marking "MED" or "OXY/MED" in green for Type K tube and in blue for Type L tube.
- D. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type.
- E. Copper Unions: ASME B16.22 or MSS SP-123, wrought-copper or cast-copper alloy.
- F. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150.
 1. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, full-face type.

2. Flange Bolts and Nuts: ASME B18.2.1 carbon steel.

G. Shape-Memory-Metal Couplings:

1. Description: Cryogenic compression fitting made of nickel-titanium, shape-memory alloy.

H. Copper Pressure-Seal Fittings:

1. NPS 2 and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
2. NPS 2-1/2 to NPS 4: Bronze fitting with stainless steel grip ring and EPDM O-ring seal in each end.

I. Flexible Pipe Connectors:

1. Description: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
 - a. Working-Pressure Rating: 200 psig to 250 psig minimum.
 - b. End Connections: Plain-end copper tube.

2.3 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys.

- B. Threaded-Joint Tape: PTFE.

2.4 VALVES

- A. General Requirements for Valves: Manufacturer cleaned, purged, and bagged in accordance with CGA G-4.1 for oxygen service.

- B. Zone-Valve Box Assemblies: Box with medical gas valves, tube extensions, and gauges.

1. Steel Zone-Valve Box with Aluminum Cover:
2. Description: Formed-steel box with cover, anchors for recessed mounting, holes with grommets in box sides for tubing extension protection, and of size for single or multiple valves with pressure gauges and in sizes required to permit manual operation of valves. Medical air tubing, valves, and gauges may be incorporated in zone valve boxes for medical gases.
 - a. Interior Finish: Factory-applied white enamel.
 - b. Cover Plate: Aluminum with frangible or removable windows.
 - c. Valve-Box Windows: Clear or tinted transparent plastic with labeling that includes rooms served, in accordance with NFPA 99.
3. Steel Zone-Valve Box with Stainless Steel Cover:
 - a. Description: Formed-steel box with cover, anchors for recessed mounting, holes with grommets in box sides for tubing extension protection, and of size for single or multiple valves with pressure gauges and in sizes required to permit manual operation of valves. Medical air and medical vacuum tubing, valves, and gauges may be incorporated in zone valve boxes for medical gases.
 - b. Interior Finish: Factory-applied white enamel.
 - c. Cover Plate: Stainless steel with frangible or removable windows.
 - d. Valve-Box Windows: Clear or tinted transparent plastic with labeling that includes rooms served, in accordance with NFPA 99.

- C. Ball Valves:

1. Standard: MSS SP-110.
2. Description: Three-piece body, brass or bronze.
3. Pressure Rating: 300 psig minimum.

4. Ball: Full-port, chrome-plated brass.
 5. Seats: PTFE or TFE.
 6. Handle: Lever type with locking device.
 7. Stem: Blowout proof with PTFE or TFE seal.
 8. Ends: Manufacturer-installed ASTM B819, copper-tube extensions and manufacturer-installed ASTM B819, copper-tube extensions with pressure gage on one copper-tube extension.
- D. Check Valves:
1. Description: In-line pattern, bronze.
 2. Pressure Rating: 300 psig minimum.
 3. Operation: Spring loaded.
 4. Ends: Manufacturer-installed, ASTM B819, copper-tube extensions.
- E. Compressed-Air Safety Valves:
1. Bronze body.
 2. ASME-construction, poppet, pressure-relief type.
 3. Settings to match system requirements.
- F. Pressure Regulators:
1. Bronze body and trim.
 2. Spring-loaded, diaphragm-operated, relieving type.
 3. Manual pressure-setting adjustment.
 4. Rated for 250-psig minimum inlet pressure.
 5. Capable of controlling delivered air pressure within 0.5 psig for each 10-psig inlet pressure.

2.5 MEDICAL COMPRESSED-AIR SERVICE CONNECTIONS

- A. General Requirements for Medical Compressed-Air Service Connections:
1. Suitable for specific medical air pressure and service listed.
 2. Include roughing-in assemblies, finishing assemblies, and cover plates.
 3. Recessed-type units made for concealed piping unless otherwise indicated.
- B. Roughing-in Assembly:
1. Steel outlet box for recessed mounting and concealed piping.
 2. Brass-body outlet block with secondary check valve that will prevent gas flow when primary valve is removed.
 3. Double seals that will prevent air leakage.
 4. ASTM B819, NPS 3/8 copper outlet tube brazed to valve with service marking and tube-end dust cap.
- C. Finishing Assembly:
1. Brass housing with primary check valve.
 2. Double seals that will prevent air leakage.
 3. Cover plate with gas-service label.
- D. Quick-Coupler Pressure Service Connections:
1. Outlets for medical air and instrument air with noninterchangeable keyed indexing to prevent interchange between services.
 2. Constructed to permit one-handed connection and removal of equipment.
 3. With positive-locking ring that retains equipment stem in valve during use.

- E. D.I.S.S. Pressure Service Connections: Outlets, complying with CGA V-5, with threaded indexing to prevent interchange between services, constructed to permit one-handed connection and removal of equipment.
 - 1. Medical Air: D.I.S.S. No. 1160.
 - 2. Instrument Air: D.I.S.S. No. 1160.
- F. Cover Plates:
 - 1. One piece.
 - 2. [Aluminum] [or] [stainless steel].
 - 3. Permanent, color-coded, identifying label matching corresponding service.

2.6 COMPRESSED-AIR MANIFOLDS

- A. Comply with NFPA 99, Ch. "Manifolds for Gas Cylinders without Reserve Supply."
- B. Comply with NFPA 55.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Central Control-Panel Unit:
 - 1. Weatherproof cabinet.
 - 2. Supply and delivery pressure gages.
 - 3. Electrical alarm-system connections and transformer.
 - 4. Indicator lights or devices.
 - 5. Manifold connection.
 - 6. Pressure changeover switch.
 - 7. Line-pressure regulator.
 - 8. Shutoff valves.
 - 9. Safety valve.
- E. Manifold and Headers:
 - 1. Duplex, nonferrous-metal header for number of cylinders indicated, divided into two equal banks.
 - 2. Designed for 2000-psig minimum inlet pressure.
 - 3. Cylinder-bank headers with inlet (pigtail) connections complying with CGA V-1.
 - 4. Individual inlet check valves, shutoff valve, pressure regulator, check valve, and pressure gauge.
- F. Operation: Automatic, pressure-switch-activated changeover from one cylinder bank to the other when first bank becomes exhausted, without line-pressure fluctuation or resetting of regulators and without supply interruption by shutoff of either cylinder-bank header.
- G. Mounting: Wall with mounting brackets for manifold control cabinet and headers. Floor with support legs for manifold control cabinet.
- H. Label manifold control unit with permanent label identifying compressed air and system operating pressure.
- I. Medical and Laboratory Air Air Manifolds: For four or eight cylinders and 55-psig line pressure.
- J. Instrument Air Manifolds: For eight or 12 cylinders and 200-psig minimum line pressure.

- K. Compressed-Air Cylinders: Number and type of compressed-air cylinders required for complete manifold systems furnished by Owner.

2.7 COMPRESSED-AIR-CYLINDER STORAGE RACKS

- A. Wall Storage Racks: Fabricate racks with chain restraints for upright cylinders as indicated, or provide equivalent manufactured wall racks.
- B. Freestanding Storage Racks: Fabricate racks as indicated, or provide equivalent manufactured storage racks.
- C. Anchor holes in base to permit securing to the floor with anchor bolts supplied by the manufacturer.
- D. Rack Support Tubing: Minimum 2-inch by 2-inch by 1/8-inch tube steel finished with baked-on exterior-grade polyurethane powder paint. All joints wrap-welded and polished.
- E. Restraints: Dual minimum 5/16-inch steel welded link chain, electrically zinc-plated rated for 1,900 lb with minimum 5/16-inch zinc-plated carabineer hooks rated for 520 lb.
- F. Comply with NFPA 55.
- G. Comply with NFPA 99.
- H. Comply with OSHPD #OPA-2878-10.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Cleaning of Medical Air Tubing: If manufacturer-cleaned and -capped fittings or tubing is not available or if precleaned fittings or tubing must be recleaned because of exposure, have supplier or separate agency acceptable to authorities having jurisdiction perform the following procedures:
 - 1. Clean medical air tube and fittings, valves, gauges, and other components of oil, grease, and other readily oxidizable materials as required for oxygen service in accordance with CGA G-4.1.
 - 2. Wash medical air tubing and components in hot, alkaline-cleaner-water solution of sodium carbonate or trisodium phosphate in proportion of 1 lb of chemical to 3 gal. of water.
 - a. Scrub to ensure complete cleaning.
 - b. Rinse with clean, hot water to remove cleaning solution.

3.2 INSTALLATION OF PIPING

- A. General Location and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

- B. Install seismic restraints on compressed-air piping. Seismic-restraint devices are specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- C. Comply with NFPA 99 for installation of compressed-air piping.
- D. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- E. 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.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- G. Install piping adjacent to equipment and specialties to allow service and maintenance.
- H. Install piping with 1 percent slope downward in direction of flow.
- I. Install nipples, unions, special fittings, and valves with pressure ratings same as or higher than system pressure rating used in applications specified in "Piping Schedule" Article unless otherwise indicated.
- J. Install eccentric reducers, if available, where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.
- K. Install branch connections to mains from top of main. Provide drain leg at end of each main and branch at low points.
- L. Install piping to permit valve servicing.
- M. Install piping free of sags and bends.
- N. Install fittings for changes in direction and for branch connections.
- O. Install medical air piping to medical air service connections specified in this Section, to medical air service connections in equipment specified in Section 226313 "Gas Piping for Laboratory and Healthcare Facilities," and to equipment specified in other Sections requiring medical air service.
- P. Piping Restraint Installation: Install seismic restraints on compressed-air piping. Seismic-restraint devices are specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- Q. Install service connections recessed in walls. Attach roughing-in assembly to substrate; attach finishing assembly to roughing-in assembly.
- R. Connect piping to air compressors and to compressed-air outlets and equipment requiring compressed-air service.
- S. Install unions in copper tubing adjacent to each valve and at final connection to each machine, specialty, and piece of equipment.
- T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 03 Through Penetration Firestopping."

- U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 03 Through Penetration Firestopping."

3.3 INSTALLATION OF VALVES

- A. Install shutoff valve at each connection to and from compressed-air equipment and specialties.
- B. Install check valves to maintain correct direction of compressed-air flow from compressed-air equipment.
- C. Install valve boxes recessed in wall and anchored to substrate. Single boxes may be used for multiple valves that serve same area or function.
- D. Install zone valves and gauges in valve boxes. Rotate valves to angle that prevents closure of cover when valve is in closed position.
- E. Install pressure regulators on compressed-air piping where reduced pressure is required.
- F. Install flexible pipe connectors in discharge piping and in inlet air piping from remote air-inlet filter of each air compressor.

3.4 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of cleaned tubing and fittings before assembly.
- C. Threaded Joints: Apply appropriate tape to external pipe threads.
- D. Brazed Joints: Join copper tube and fittings in accordance with CDA's "Copper Tube Handbook," Ch. "Brazed Joints." Do not use flux. Continuously purge joint with oil-free dry nitrogen during brazing.
- E. Soldered Joints: Apply ASTM B813, water-flushable flux to tube end. Join copper tube and fittings in accordance with ASTM B828.
- F. Extruded-Tee Outlets: Form branches in copper tube in accordance with ASTM F2014, with tools recommended by tube manufacturer.
- G. Flanged Joints:
 - 1. Copper Tubing: Install flange on copper tubes. Use pipe-flange gasket between flanges. Join flanges with gasket and bolts in accordance with ASME B31.9 for bolting procedure.
- H. Shape-Memory-Metal Coupling Joints: Join new copper tube to existing tube according to procedures developed by fitting manufacturer for installation of shape-memory-metal coupling joints.

3.5 INSTALLATION OF COMPRESSED-AIR SERVICE COMPONENTS

- A. Install compressed-air pressure-control panel in walls. Attach to substrate.

- B. Install compressed-air manifolds on concrete base anchored to substrate.
- C. Install compressed-air cylinders and connect to manifold piping.
- D. Install compressed-air manifolds with seismic restraints as indicated.
- E. Install compressed-air-cylinder wall storage racks attached to substrate.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for hangers, supports, and anchor devices specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- C. Vertical Piping: MSS Type 8 or Type 42 clamps.
- D. Individual, Straight, Horizontal Piping Runs:
 - 1. 100 Feet and Less: MSS Type 1, adjustable, steel, clevis hangers.
 - 2. Longer Than 100 Feet: MSS Type 43, adjustable, roller hangers.
- E. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for trapeze hangers.
- F. Base of Vertical Piping: MSS Type 52 spring hangers.
- G. Install hangers for copper tubing with maximum horizontal spacing and minimum rod diameters to comply with MSS SP-58, NFPA 99, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- H. Support horizontal piping within 12 inches of each fitting and coupling.
- I. Support vertical runs of copper tubing to comply with MSS SP-58, NFPA 99, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 IDENTIFICATION

- A. Install identifying labels and devices for laboratory compressed-air piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Install identifying labels and devices for medical compressed-air piping systems in accordance with NFPA 99. Use the following or similar captions and color-coding for piping products where required by NFPA 99:
 - 1. Medical Air: Black letters on yellow background.
 - 2. Dental Air: Black letters on yellow background.
 - 3. Instrument Air: White letters on red background.
 - 4. Laboratory Air: Black letters on yellow-and-white checkerboard background.

3.8 FIELD QUALITY CONTROL FOR MEDICAL COMPRESSED-AIR PIPING IN HEALTHCARE FACILITIES

- A. Testing Agency:
 - 1. Owner will engage a qualified testing agency to perform tests and inspections.
 - 2. Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections with the assistance of a factory-authorized service representative.
- D. Tests and Inspections:
 - 1. Medical Compressed-Air Testing Coordination: Perform tests, inspections, verifications, and certification of medical compressed-air piping systems concurrently with tests, inspections, and certification of medical gas piping and medical vacuum piping systems.
 - 2. Preparation: Perform the following Installer tests in accordance with requirements in NFPA 99 and ASSE Standard #6010:
 - a. Initial blowdown.
 - b. Initial pressure test.
 - c. Cross-connection test.
 - d. Piping purge test.
 - e. Standing pressure test for positive-pressure medical compressed-air piping.
 - f. Repair leaks and retest until no leaks exist.
 - 3. System Verification: Perform the following tests and inspections in accordance with NFPA 99, ASSE Standard #6020, and ASSE Standard #6030:
 - a. Standing pressure test.
 - b. Individual-pressurization or pressure-differential cross-connection test.
 - c. Valve test.
 - d. Master and area alarm tests.
 - e. Piping purge test.
 - f. Piping particulate test.
 - g. Piping purity test.
 - h. Final tie-in test.
 - i. Operational pressure test.
 - j. Medical air-purity test.
 - k. Verify correct labeling of equipment and components.
 - 4. Testing Certification: Certify that specified tests, inspections, and procedures have been performed, and certify report results. Include the following:
 - a. Inspections performed.
 - b. Procedures, materials, and gases used.
 - c. Test methods used.
 - d. Results of tests.
- E. Piping will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.9 FIELD QUALITY CONTROL FOR COMPRESSED-AIR PIPING IN LABORATORY FACILITIES

- A. Testing Agency: Engage qualified testing agency to perform tests and inspections of compressed-air piping in laboratory facilities and to prepare test and inspection reports.

- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections with the assistance of a factory-authorized service representative.
- D. Tests and Inspections:
 - 1. Piping Leak Tests for Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill compressed-air piping with oil-free dry nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
 - 2. Repair leaks and retest until no leaks exist.
- E. Piping will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.10 PROTECTION

- A. Protect tubing from damage.
- B. Retain sealing plugs in tubing, fittings, and specialties until installation.
- C. Clean tubing not properly sealed, and where sealing is damaged, in accordance with "Preparation" Article.

3.11 PIPING SCHEDULE

- A. Connect new tubing to existing tubing with memory-metal couplings.
- B. Flanges may be used where connection to flanged equipment is required.
- C. Type L Copper Tubing for Medical Air Piping Instrument Air Piping and Dental Air Piping, NPS 3 and Smaller, Operating between 15 psig and 50 psig: Type L copper tubing, wrought copper fittings, and brazed joints.
- D. Type K Copper Tubing for Medical Air Piping Instrument Air Piping and Dental Air Piping, NPS 3 and Smaller, Operating between 15 psig and 50 psig: Type K copper tubing, wrought copper fittings, and brazed joints.
- E. Type L Copper Tubing for Laboratory Air Piping, NPS 3 and Smaller, Operating between 15 psig and 50 psig: Type L copper tubing, wrought copper fittings, and brazed joints.

3.12 VALVE SCHEDULE

- A. Shutoff Valves: Ball valve with manufacturer-installed ASTM B819, copper-tube extensions.
- B. Zone Valves: Ball valve with manufacturer-installed ASTM B819, copper-tube extensions with pressure gauge on one copper-tube extension.

END OF SECTION

SECTION 22 62 13
VACUUM PIPING FOR LABORATORY AND HEALTHCARE FACILITIES

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. Medical-surgical vacuum piping, designated "medical vacuum."
 - 2. Waste anesthetic gas-disposal piping, designated "WAGD."
 - 3. Dental vacuum piping, designated "dental vacuum."
 - 4. Oral evacuation piping, designated "HVE."
 - 5. Laboratory vacuum piping, designated "laboratory vacuum."

1.3 DEFINITIONS

- A. HVE: High-volume (oral) evacuation.
- B. WAGD: Waste anesthetic gas disposal.
- C. Vacuum Piping Systems: Include medical vacuum, WAGD, dental vacuum, HVE, and laboratory vacuum piping systems.
- D. Laboratory Vacuum Piping Systems: Include laboratory low-vacuum and laboratory high-vacuum piping systems.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Seismic Qualification Data: Certificates, for compressed-air manifolds, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- C. Material Certificates: Signed by Installer, certifying that medical vacuum piping materials comply with requirements in NFPA 99 for medical vacuum systems.
- D. Brazing certificates.
- E. Field quality-control reports.
- F. Source quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For vacuum piping specialties to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Quick-Coupler Service Connections: Furnish complete noninterchangeable medical vacuum suction inlets.
 - 2. D.I.S.S. Service Connections: Furnish complete medical vacuum suction inlets complying with CGA V-5.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Medical Vacuum Piping Systems for Healthcare Facilities: In accordance with ASSE Standard #6010 and NFPA 99 for medical-gas-system installers.
 - 2. Pressure-Seal Joining Procedure for Copper Tubing: An authorized representative who is trained and approved by manufacturer.
 - 3. Extruded-Tee Outlet Procedure: An authorized representative who is trained and approved by manufacturer.
 - 4. Shape-Memory-Metal Coupling Joints: An authorized representative who is trained and approved by manufacturer in accordance with ASSE Standard #6040 and NFPA 99.
- B. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the vacuum piping testing indicated, that is a member of the Medical Gas Professional Healthcare Organization or is an NRTL, and that is acceptable to authorities having jurisdiction.
 - 1. Qualify testing personnel in accordance with ASSE Standard #6020 and NFPA 99 for medical-gas-system inspectors and ASSE Standard #6030 and NFPA 99 for medical-gas-system verifiers.
- C. Brazing: Qualify processes and operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications," or AWS B2.2/B2.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Medical gas manifolds and bulk medical gas storage tanks shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
 - 1. The term "withstand" means "the medical gas manifolds and bulk medical gas storage tanks will remain in place without separation of any parts when subjected to the seismic forces specified and the manifolds and tanks will be fully operational after the seismic event."
- B. Comply with NFPA 99.

2.2 PIPES, TUBES, AND FITTINGS

- A. Comply with NFPA 99 for medical vacuum piping materials.
- B. Copper Medical Gas Tube: ASTM B819, Type L, seamless, drawn temper that has been manufacturer cleaned, purged, and sealed for medical gas service or in accordance with CGA G-4.1 for oxygen service. Include standard color marking "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in blue.
- C. Copper Water Tube: ASTM B88/ASTM B88M, Type M, seamless, drawn temper that has been manufacturer cleaned, purged, and sealed for medical gas service or in accordance with CGA G-4.1 for oxygen service.
- D. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type that has been manufacturer cleaned, purged, and sealed for medical gas service or in accordance with CGA G-4.1 for oxygen service.
- E. Copper Unions: ASME B16.22 or MSS SP-123, wrought-copper or cast-copper alloy.
- F. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150.
 - 1. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, full-face type.
 - 2. Flange Bolts and Nuts: ASME B18.2.1 carbon steel.
- G. Shape-Memory-Metal Couplings:
 - 1. Description: Cryogenic compression fitting made of nickel-titanium, shape-memory alloy, and that has been manufacturer cleaned, purged, and sealed for oxygen service in accordance with CGA G-4.1.
- H. Pressure-Seal Fittings:
 - 1. NPS 2 and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
 - 2. NPS 2-1/2 to NPS 4: Bronze fitting with stainless steel grip ring and EPDM O-ring seal in each end.
- I. Extruded-Tee Outlets: ASTM F2014 procedure for making branch outlets in copper tube.
- J. Flexible Pipe Connectors:
 - 1. Description: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
 - a. Working-Pressure Rating: 200 psig to 250 psig minimum.

- b. End Connections: Plain-end copper tube.

2.3 JOINING MATERIALS

- A. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux in accordance with ASTM B813.
- B. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys.
- C. Threaded-Joint Tape: PTFE.

2.4 VALVES

- A. General Requirements for Valves: Manufacturer cleaned, purged, and bagged in accordance with CGA G-4.1 for oxygen service.
 - 1. Exception: Factory cleaning and bagging are not required for valves for WAGD service.
- B. Steel Zone-Valve Box Assemblies: Box with medical gas valves, tube extensions, and gages.
 - 1. Zone-Valve Boxes:
 - a. Steel Box with Aluminum Cover:
 - b. Steel Zone-Valve Box with Stainless Steel Cover:
 - 1) Description: Formed-steel box with cover, anchors for recessed mounting, holes with grommets in box sides for tubing extension protection, and of size for single or multiple valves with pressure gages and in sizes required to permit manual operation of valves. Medical air and medical vacuum tubing, valves, and gages may be incorporated in zone valve boxes for medical gases.
 - 2) Interior Finish: Factory-applied white enamel.
 - 3) Cover Plate: Aluminum or stainless steel with frangible or removable windows.
 - 4) Valve-Box Windows: Clear or tinted transparent plastic with labeling that includes rooms served, in accordance with NFPA 99.
 - c.
- C. Copper-Alloy Ball Valves:
 - 1. Standard: MSS SP-110.
 - 2. Description: Three-piece body, brass or bronze.
 - 3. Pressure Rating: 300 psig minimum.
 - 4. Ball: Full-port, chrome-plated brass.
 - 5. Seats: PTFE or TFE.
 - 6. Handle: Lever type with locking device.
 - 7. Stem: Blowout proof with PTFE or TFE seal.
 - 8. Ends: Manufacturer-installed ASTM B819, copper-tube extensions and manufacturer-installed ASTM B819, copper-tube extensions with pressure gauge on one copper-tube extension.
- D. Check Valves:
 - 1. Description: In-line pattern, bronze.
 - 2. Pressure Rating: 300 psig minimum.
 - 3. Operation: Spring loaded.
 - 4. Ends: Manufacturer-installed ASTM B819, copper-tube extensions.

2.5 MEDICAL VACUUM SERVICE CONNECTIONS

- A. General Requirements for Medical Vacuum Service Connections:
 - 1. Suitable for specific medical vacuum service listed.
 - 2. Include roughing-in assemblies, finishing assemblies, and cover plates.
 - 3. Individual cover plates are not required if service connection is in multiple units or assembly with cover plate.
 - 4. Recessed-type units made for concealed piping unless otherwise indicated.
- B. Roughing-in Assembly:
 - 1. Steel outlet box for recessed mounting and concealed piping.
 - 2. Brass-body inlet block.
 - 3. Seals that will prevent vacuum leakage.
 - 4. ASTM B819, NPS 3/8 copper outlet tube brazed to valve with service marking and tube-end dust cap.
- C. Finishing Assembly:
 - 1. Brass housing with primary check valve.
 - 2. Seals that will prevent vacuum leakage.
 - 3. Cover plate with gas-service label.
- D. Quick-Coupler Suction Service Connections:
 - 1. Inlets for medical vacuum and WAGD with noninterchangeable keyed indexing to prevent interchange between services.
 - 2. Constructed to permit one-handed connection and removal of equipment.
 - 3. With positive-locking ring that retains equipment stem in valve during use.
- E. D.I.S.S. Suction Service Connections:
 - 1. Inlets complying with CGA V-5.
 - 2. Threaded indexing to prevent interchange between services.
 - 3. Constructed to permit one-handed connection and removal of equipment.
 - 4. Medical Vacuum: CGA V-5, D.I.S.S. No. 1220.
 - 5. WAGD: CGA V-5, D.I.S.S. No. 2220.
- F. Vacuum Bottle Brackets: One piece, with pattern and finish matching corresponding service cover plate.
- G. Cover Plates:
 - 1. One piece.
 - 2. Aluminum or stainless steel.
 - 3. Permanent, color-coded, identifying label matching corresponding service.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Cleaning of Medical Vacuum Tubing: If manufacturer-cleaned and -capped fittings or tubing is not available or if precleaned fittings or tubing must be recleaned because of exposure, have supplier or separate agency acceptable to authorities having jurisdiction perform the following procedures:
 - 1. Clean medical vacuum tube and fittings, valves, gages, and other components of oil, grease, and other readily oxidizable materials as required for oxygen service in accordance with CGA G-4.1.

2. Wash medical vacuum tubing and components in hot, alkaline-cleaner-water solution of sodium carbonate or trisodium phosphate in proportion of 1 lb of chemical to 3 gal. of water.
 - a. Scrub to ensure complete cleaning.
 - b. Rinse with clean, hot water to remove cleaning solution.

3.2 INSTALLATION OF PIPING

- A. General Location and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of vacuum piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, vacuum producer sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Comply with NFPA 99 for installation of vacuum piping.
- C. Install piping concealed from view and protected from physical contact by building occupants 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, and coordinate with other services occupying that space.
- F. Install piping adjacent to equipment and specialties to allow service and maintenance.
- G. Install piping with 1 percent slope downward in direction of flow.
- H. Install nipples, unions, special fittings, and valves with pressure ratings same as or higher than piping pressure rating used in applications specified in "Piping Schedule" Article unless otherwise indicated.
- I. Install eccentric reducers, if available, where vacuum piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.
- J. Provide drain leg and drain trap at end of each main and branch and at low points.
- K. Install piping to permit valve servicing.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and for branch connections. Extruded-tee branch outlets in copper tubing may be made where specified.
- N. Install medical vacuum piping from medical vacuum service connections specified in this Section, to equipment specified in Section 22 62 19 "Vacuum Equipment for Laboratory and Healthcare Facilities," and to equipment specified in other Sections requiring medical vacuum service.
- O. Piping Restraint Installation: Install seismic restraints on vacuum piping. Seismic-restraint devices are specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

- P. Install vacuum service connections recessed in walls. Attach roughing-in assembly to substrate; attach finishing assembly to roughing-in assembly.
- Q. Install vacuum bottle bracket adjacent to each wall-mounted medical vacuum service connection suction inlet.
- R. Connect vacuum piping to vacuum producers and to equipment requiring vacuum service.
- S. Install unions in copper vacuum tubing adjacent to each valve and at final connection to each machine, specialty, and piece of equipment.
- T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 INSTALLATION OF VALVES

- A. Install shutoff valve at each connection to and from vacuum equipment and specialties.
- B. Install check valves to maintain correct direction of vacuum flow to vacuum-producing equipment.
- C. Install valve boxes recessed in wall and anchored to substrate. Single boxes may be used for multiple valves that serve same area or function.
- D. Install zone valves and gages in valve boxes. Rotate valves to angle that prevents closure of cover when valve is in closed position.
- E. Install flexible pipe connectors in suction inlet piping to each vacuum producer.

3.4 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. Threaded Joints: Apply appropriate tape to external pipe threads.
- D. Brazed Joints: Join copper tube and fittings in accordance with CDA's "Copper Tube Handbook," Ch. "Brazed Joints." Do not use flux. Continuously purge joint with oil-free dry nitrogen during brazing.
- E. Soldered Joints: Apply ASTM B813, water-flushable flux to tube end. Join copper tube and fittings in accordance with ASTM B828.
- F. Extruded-Tee Outlets: Form branches in copper tube in accordance with ASTM F2014, with tools recommended by tube manufacturer.
- G. Flanged Joints:

1. Copper Tubing: Install flange on copper tubes. Use pipe-flange gasket between flanges. Join flanges with gasket and bolts in accordance with ASME B31.9 for bolting procedure.
- H. Pressure-Sealed Joints: Join copper tube and copper and copper-alloy fittings with tools recommended by fitting manufacturer.
- I. Shape-Memory-Metal Coupling Joints: Join new copper tube to existing tube according to procedures developed by fitting manufacturer for installation of shape-memory-metal coupling joints.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for hangers, supports, and anchor devices specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- C. Vertical Piping: MSS Type 8 or Type 42, clamps.
- D. Individual, Straight, Horizontal Piping Runs:
 1. 100 Feet and Less: MSS Type 1, adjustable, steel, clevis hangers.
 2. Longer Than 100 Feet: MSS Type 43, adjustable, roller hangers.
- E. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze. Comply with requirements in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment" for trapeze hangers.
- F. Base of Vertical Piping: MSS Type 52 spring hangers.
- G. Install hangers for copper tubing with maximum horizontal spacing and minimum rod diameters to comply with MSS SP-58, NFPA 99, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- H. Support horizontal piping within 12 inches of each fitting and coupling.
- I. Support vertical runs of copper tubing to comply with MSS SP-58, NFPA 99, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 IDENTIFICATION

- A. Install identifying labels and devices for laboratory vacuum piping, valves, and specialties. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment."
- B. Install identifying labels and devices for medical vacuum piping systems in accordance with NFPA 99. Use the following or similar captions and color-coding for piping products where required by NFPA 99:
 1. Medical Vacuum: Black letters on white background.
 2. WAGD: White letters on violet background.
 3. Dental Vacuum: Black boxed letters on white-and-black diagonal stripe background.
 4. HVE: Black boxed letters on white-and-black diagonal stripe background.
 5. Laboratory Vacuum: Black boxed letters on white-and-black checkerboard background.

3.7 FIELD QUALITY CONTROL FOR HEALTHCARE FACILITY MEDICAL VACUUM PIPING

- A. Testing Agency:
 - 1. Owner will engage a qualified testing agency to perform tests and inspections.
 - 2. Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections with the assistance of a factory-authorized service representative.
- D. Tests and Inspections:
 - 1. Medical Vacuum Testing Coordination: Perform tests, inspections, verifications, and certification of medical vacuum piping systems concurrently with tests, inspections, and certification of medical compressed-air piping and medical gas piping systems.
 - 2. Preparation: Perform the following Installer tests in accordance with requirements in NFPA 99 and ASSE Standard #6010:
 - a. Initial blowdown.
 - b. Initial pressure test.
 - c. Cross-connection test.
 - d. Piping purge test.
 - e. Standing pressure test for vacuum systems.
 - f. Repair leaks and retest until no leaks exist.
 - 3. System Verification: Perform the following tests and inspections in accordance with NFPA 99, ASSE Standard #6020, and ASSE Standard #6030:
 - a. Standing pressure test.
 - b. Individual-pressurization or pressure-differential cross-connection test.
 - c. Valve test.
 - d. Master and area alarm tests.
 - e. Piping purge test.
 - f. Final tie-in test.
 - g. Operational vacuum test.
 - h. Verify correct labeling of equipment and components.
 - 4. Testing Certification: Certify that specified tests, inspections, and procedures have been performed, and certify report results. Include the following:
 - a. Inspections performed.
 - b. Procedures, materials, and gases used.
 - c. Test methods used.
 - d. Results of tests.
- E. Piping will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.8 FIELD QUALITY CONTROL FOR LABORATORY FACILITY VACUUM PIPING

- A. Testing Agency: Engage qualified testing agency to perform tests and inspections of vacuum piping in laboratory facilities and to prepare test and inspection reports.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections with the assistance of a factory-authorized service representative.

- D. Tests and Inspections:
 - 1. Piping Leak Tests for Vacuum Piping: Test new and modified parts of existing piping. Cap and fill vacuum piping with oil-free, dry nitrogen. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
 - a. Test Pressure for Copper Tubing: 100 psig to 150 psig.
 - 2. Repair leaks and retest until no leaks exist.
 - 3. Inspect filters for proper operation.
- E. Piping will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.9 PROTECTION

- A. Protect tubing from damage.
- B. Retain sealing plugs in tubing, fittings, and specialties until installation.
- C. Clean tubing not properly sealed, and where sealing is damaged, in accordance with "Preparation" Article.

3.10 PIPING SCHEDULE

- A. Connect new copper tubing to existing copper tubing with memory-metal couplings.
- B. Connect PVC pipe to copper tube with transition fittings.
- C. Flanges may be used where connection to flanged equipment is required.
- D. WAGD Piping: Use copper medical gas water tube, wrought-copper fittings, and brazed joints.
- E. Dental Vacuum Piping: Use copper water tube, wrought-copper fittings, and brazed soldered joints.
- F. HVE Piping: Use one of the following piping materials for each size range:
 - 1. NPS 4 and Smaller, Wrought-Copper Fittings: Copper medical gas water tube, wrought-copper fittings, and brazed soldered joints.
 - 2. NPS 4 and Smaller, Press-Type Fittings: Copper medical gas water tube, press-type fittings, and pressure-sealed joints.
 - 3. NPS 5 to NPS 8, Wrought-Copper Fittings: Type L, copper medical gas Type M, copper water tube; wrought-copper fittings; and brazed soldered joints.
- G. Medical Vacuum Piping: Use one of the following piping materials for each size range:
 - 1. NPS 4 and Smaller, Wrought-Copper Fittings: Copper medical gas water tube, wrought-copper fittings, and brazed soldered joints.
 - 2. NPS 4 and Smaller, Press-Type Fittings: Copper medical gas water tube, press-type fittings, and pressure-sealed joints.
 - 3. NPS 5 to NPS 8, Wrought-Copper Fittings: Copper medical gas water tube, wrought-copper fittings, and brazed soldered joints.
- H. Laboratory Vacuum Piping: Use one of the following piping materials for each size range:

1. NPS 4 and Smaller, Wrought-Copper Fittings: Copper medical gas water tube, wrought-copper fittings, and brazed soldered joints.
2. NPS 4 and Smaller, Press-Type Fittings: Copper medical gas water tube, press-type fittings, and pressure-sealed joints.
3. NPS 5 to NPS 8, Wrought-Copper Fittings: Copper medical gas water tube, wrought-copper fittings, and brazed soldered joints.
4. All Sizes: Extruded-tee fittings and brazed joints may be used instead of standard tee fittings.

3.11 VALVE SCHEDULE

- A. Shutoff Valves:
 1. Copper Tubing: Copper-alloy ball valve with manufacturer-installed ASTM B819, copper-tube extensions.
- B. Zone Valves: Copper-alloy ball valve with manufacturer-installed ASTM B819, copper-tube extensions with pressure gage on one copper-tube extension.

END OF SECTION 22 62 13

SECTION 22 63 13
GAS PIPING FOR LABORATORY AND HEALTHCARE FACILITIES

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 DEFINITIONS

- A. Medical gas piping systems include medical oxygen for healthcare facility patient care.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Seismic Qualification Data: Certificates from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Material Certificates: Signed by Installer certifying that medical gas piping materials comply with requirements in NFPA 99 for positive-pressure medical gas systems.
- D. Field Quality Control Reports: Brazing certificates.
- E. Source Quality Control Reports:
 - 1. Certificates of Shop Inspection and Data Report for Bulk Gas Storage Tanks: As required by ASME Boiler and Pressure Vessel Code.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For medical gas piping specialties to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Medical Gas Piping Systems for Healthcare Facilities: According to ASSE Standard #6010 for medical-gas-system installers.
2. Bulk Medical Gas Systems for Healthcare Facilities: According to ASSE Standard #6015 for bulk-medical-gas-system installers.
3. Shape-Memory-Metal Coupling Joints: An authorized representative who is trained and approved by manufacturer.

- B. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the medical gas piping testing indicated, that is a member of the Medical Gas Professional Healthcare Organization or is an NRTL, and that is acceptable to authorities having jurisdiction.

1. Qualify testing personnel according to ASSE Standard #6020 for medical-gas-system inspectors and ASSE Standard #6030 for medical-gas-system verifiers.

- C. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications"; or AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Medical oxygen operating at 50 to 55 psig (345 to 380 kPa).

2.2 PIPES, TUBES, AND FITTINGS

- A. Comply with NFPA 99.

- B. For all medical gases, all positive pressure medical gas piping, tubing, and fittings shall have been manufacturer cleaned, purged, and sealed for oxygen service, according to CGA G-4.1.

1. Each length of tubing shall be delivered plugged or capped by the manufacturer and kept sealed until prepared for installation.
2. Fittings and other components shall be delivered manufacturer sealed and labeled, and kept sealed until prepared for installation.

- C. Copper Medical Gas Tube: ASTM B 819, Type K, seamless, drawn temper. Include standard color marking "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in green for Type K tube.

- D. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type.

- E. Copper Unions: ASME B16.22 or MSS SP-123, wrought-copper or cast-copper alloy.
- F. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150.
 - 1. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness, full-face type.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel.
- G. Shape-Memory-Metal Couplings:
 - 1. Description: Cryogenic compression fitting made of nickel-titanium, shape-memory alloy.
- H. PVC Double-Wall Containment Pipe: ASTM D 1785, Schedule 40, as manufactured by Spears, or approved equal..
- I. PVC Double-Wall Containment Fittings: ASTM D 2466, Schedule 40, socket type, as manufactured by Spears, or approved equal.

2.3 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys.
- B. Threaded-Joint Tape: PTFE.
- C. Solvent Cement for Joining PVC Piping: ASTM D 2564. Include primer complying with ASTM F 656.

2.4 VALVES

- A. Ball Valves:
 - 1. Standard: MSS SP-110.
 - 2. Description: Three-piece body, brass or bronze.
 - 3. Pressure Rating: 300 psig (2070 kPa) minimum.
 - 4. Ball: Full-port, chrome-plated brass.
 - 5. Seats: PTFE or TFE.
 - 6. Handle: Lever type with locking device.
 - 7. Stem: Blowout proof with PTFE or TFE seal.
 - 8. Ends: Manufacturer-installed ASTM B 819, copper-tube extensions and manufacturer-installed ASTM B 819, copper-tube extensions with pressure gage on one copper-tube extension.
 - 9. Positive pressure medical gas valves, for all medical gas types, shall have been manufacturer cleaned, purged, and sealed for oxygen service, according to CGA G-4.1.
 - a. Valves shall be delivered sealed and labeled and kept sealed until prepared for installation.

- B. Check Valves:
 - 1. Description: In-line pattern, bronze.
 - 2. Pressure Rating: 300 psig (2070 kPa) minimum.
 - 3. Operation: Spring loaded.
 - 4. Ends: Manufacturer-installed ASTM B 819, copper-tube extensions.
 - 5. Positive pressure medical gas valves, for all medical gas types, shall have been manufacturer cleaned, purged, and sealed for oxygen service, according to CGA G-4.1.
 - a. Valves shall be delivered sealed and labeled and kept sealed until prepared for installation.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Cleaning of Medical Gas Tubing: If manufacturer-cleaned and -capped fittings or tubing is not available or if precleaned fittings or tubing must be recleaned because of exposure, have supplier or separate agency acceptable to authorities having jurisdiction perform the following procedures:
 - 1. Clean medical gas tube and fittings, valves, gages, and other components of oil, grease, and other readily oxidizable materials as required for oxygen service according to CGA G-4.1.
 - 2. Wash medical gas tubing and components in hot, alkaline-cleaner-water solution of sodium carbonate or trisodium phosphate in proportion of 1 lb (0.453 kg) of chemical to 3 gal. (11.3 L) of water.
 - a. Scrub to ensure complete cleaning.
 - b. Rinse with clean, hot water to remove cleaning solution.

3.2 EARTHWORK

- A. Comply with requirements for excavating, trenching, and backfilling and for underground warning tapes.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of gas piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Comply with NFPA 99 for installation of medical gas piping.
- C. Install piping concealed from view and protected from physical contact by building occupants 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 adjacent to equipment and specialties to allow service and maintenance.
- F. Install nipples, unions, special fittings, and valves with pressure ratings same as or higher than system pressure rating used in applications specified in "Piping Schedule" Article unless otherwise indicated.
- G. Install piping to permit valve servicing.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and for branch connections.
- J. Install medical gas piping to medical gas service connections specified in this Section, to medical gas service connections in equipment specified in this Section, and to equipment specified in other Sections requiring medical gas service.
- K. Install exterior, buried medical gas piping in protective conduit fabricated with PVC pipe and fittings. Do not extend conduit through foundation wall.
- L. Piping Restraint Installation: Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- M. Connect gas piping to gas sources and to gas outlets and equipment requiring gas service.
- N. Install unions in copper tubing adjacent to each valve and at final connection to each specialty and piece of equipment.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors.
- P. Install sleeve seals for piping penetrations of concrete walls and slabs.

3.4 VALVE INSTALLATION

- A. Install shutoff valve at each connection to healthcare equipment and specialties.
- B. Install check valves to maintain correct direction of gas flow from healthcare gas supplies.
- C. Install pressure regulators on gas piping where reduced pressure is required.

3.5 JOINT CONSTRUCTION

- A. Ream ends of PVC pipes and remove burrs.
- B. Remove scale, slag, dirt, and debris from outside of cleaned tubing and fittings before assembly.
- C. Threaded Joints: Apply appropriate tape to external pipe threads.
- D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Braze Joints" chapter. Continuously purge joint with oil-free, dry nitrogen during brazing.

- E. Shape-Memory-Metal Coupling Joints: Join new copper tube to existing tube according to procedures developed by fitting manufacturer for installation of shape-memory-metal coupling joints.
- F. Solvent-Cemented Joints: Clean and dry joining surfaces. Join PVC pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. Apply primer and join according to ASME B31.9 and ASTM D 2672 for solvent-cemented joints.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.
- B. Comply with requirements in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.
- C. Vertical Piping: MSS Type 8 or Type 42, clamps.
- D. Individual, Straight, Horizontal Piping Runs:
 - 1. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel, clevis hangers.
- E. Base of Vertical Piping: MSS Type 52, spring hangers.
- F. Support horizontal piping within 12 inches (300 mm) of each fitting and coupling.
- G. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch- (10-mm-) minimum rods.
- H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1/4 (DN 8): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 3/8 and NPS 1/2 (DN 10 and DN 15): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
 - 3. NPS 3/4 (DN 20): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
 - 4. NPS 1 (DN 25): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
 - 5. NPS 1-1/4 (DN 32): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
 - 6. NPS 1-1/2 (DN 40): 10 feet (3 m) with 3/8-inch (10-mm) rod.
 - 7. NPS 2 (DN 50): 11 feet (3.4 m) with 3/8-inch (10-mm) rod.
- I. Install supports for vertical copper tubing every 10 feet (3 m).

3.7 IDENTIFICATION

- A. Install identifying labels and devices for specialty gas piping, valves, and specialties.
- B. Install identifying labels and devices for healthcare medical gas piping systems according to NFPA 99. Use the following or similar captions and color-coding for piping products where required by NFPA 99:
 - 1. Oxygen: White letters on green background or green letters on white background.

3.8 FIELD QUALITY CONTROL FOR HEALTHCARE FACILITY MEDICAL GAS

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Medical Gas Piping Testing Coordination: Perform tests, inspections, verifications, and certification of medical gas piping systems concurrently with tests, inspections, and certification of systems.
 - 2. Preparation: Perform the following Installer tests according to requirements in NFPA 99 and ASSE Standard #6010:
 - a. Initial blowdown.
 - b. Initial pressure test.
 - c. Cross-connection test.
 - d. Piping purge test.
 - e. Standing pressure test for positive-pressure medical gas piping.
 - f. Repair leaks and retest until no leaks exist.
 - 3. Testing Certification: Certify that specified tests, inspections, and procedures have been performed and certify report results. Include the following:
 - a. Inspections performed.
 - b. Procedures, materials, and gases used.
 - c. Test methods used.
 - d. Results of tests.
- C. Remove and replace components that do not pass tests and inspections and retest as specified above.
- D. Prepare test and inspection reports.

3.9 FIELD QUALITY CONTROL FOR LABORATORY FACILITY SPECIALTY GAS

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Piping Leak Tests for Specialty Gas Piping: Test new and modified parts of existing piping. Cap and fill specialty gas piping with oil-free, dry nitrogen to pressure of 50 psig (345 kPa) above system operating pressure, but not less than 150 psig (1035 kPa). Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
2. Repair leaks and retest until no leaks exist.
3. Inspect specialty gas regulators for proper operation.

C. Remove and replace components that do not pass tests and inspections and retest as specified above.

D. Prepare test and inspection reports.

3.10 PROTECTION

- A. Protect tubing from damage.
- B. Retain sealing plugs in tubing, fittings, and specialties until installation.
- C. Clean tubing not properly sealed, and where sealing is damaged, according to "Preparation" Article.

3.11 PIPING SCHEDULE

- A. Protective Conduit: PVC pipe, PVC fittings, and solvent-cemented joints.

3.12 VALVE SCHEDULE

- A. Shutoff Valves: Ball valve with manufacturer-installed ASTM B 819, copper-tube extensions.

END OF SECTION

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section supplements all Sections of this Division and shall apply to all phases of Work required to provide for complete installation of mechanical system. Intent of this specification is to provide complete and fully functional mechanical system.

1.2 QUALITY REQUIREMENTS

A. General Requirements.

1. All Mechanical Work performed under this Division shall be installed by competent craftsmen, skilled in the trade involved, and shall be installed in conformance with all applicable local codes.
2. Installation of all items shall be performed in strict accordance with all codes and regulations set forth by State, including CALGreen Tier 1 requirements, as well as Local, and Federal authorities.

B. Requirements of Regulatory Agencies:

1. Codes and Ordinances.

- a. All Work shall meet the requirements of local codes, ordinances, and utility companies except adhere to the Contract Documents when more strict requirements are specified.

b. Codes which govern mechanical Work in this Project are as follows:

- 1) ASME Boiler Code
- 2) NFPA Life Safety Code I01
- 3) NFPA 90A
- 4) NFPA I3
- 5) Factory Mutual Standards
- 6) American Gas Association
- 7) California State Fire Marshal Regulations.

2. Manufacturer's Tests. All materials shall, so far as possible, be subjected to standard tests by the manufacturer before shipment.

1.3 SUBMITTALS

A. Shop Drawings and Product Data:

1. General requirements for all shop drawings are specified elsewhere in these specifications. Check individual sections for any specific submittal requirements.
- B. Operation and Maintenance Data:
1. Maintenance Manuals.
 - a. Furnish two sets of maintenance manuals, each containing items specified below. Furnish manuals to Owner before final acceptance of the mechanical Work.
 - b. Definitions Applicable to the Maintenance Manuals.
 - 1) Literature. Any page (either whole or in part), sheet, drawing, or booklet describing the maintenance, operation, and parts of mechanical equipment, which is furnished either in the shipping carton, attached to the equipment, or otherwise prepared and distributed by the manufacturer for the user, not limited to papers submitted as shop drawings.
 - 2) Mechanical Equipment. All major items shown in the Mechanical Division Drawings and Work for which shop drawings are requested except the following: thermometers, expansion tanks, air separating tanks, insulation materials, vibration isolation equipment, plumbing drains and fixture carriers, and boiler stack.
 - 3) Instructions. An outline written by the Contractor with information necessary to help Owner apply the maintenance manual and simplify verbal instructions.
 - c. Collection of "Literature." Collect "literature" in like new condition, of all pieces of "mechanical equipment" until two copies of each are obtained. Copies soiled during construction will not be accepted.
 - d. Assembly of "Literature."
 - 1) Assemble "literature" in separate, multiples of two, 3-ring loose leaf binders, 2 inches (50 mm) size, with chrome-plated piano hinges and black hard coated covers.
 - 2) Small or large "literature" not easily inserted in binders shall each be put in heavy manila envelopes.
 - 3) Furnish each binder with plastic enclosed tabs on reinforced paper neatly arranged. Type each of the following on a separate tab.
 - a) Instructions
 - b) Valve Charts
 - c) Accessories
 - d) Lubrication
 - e) Testing and Balancing Reports
 - f) Each Specification and Title in the Project Specification for which "Literature" has been collected.

- 1) File "instructions" envelopes and "literature" under correct tabs. Clearly identify each piece of "literature" and envelope with equipment name and numbers.
- e. Valve Charts.
 - 1) Format. Arrange format of valve charts by rooms and sequence all valve numbers starting with mechanical equipment rooms and finishing with "occupied spaces."
 - 2) Information. Furnish the following information typed on valve charts for each valve furnished throughout the Project in the Mechanical Division, except check valves and automatic valves.
 - a) Room numbers and name where valve is located, i.e. "ZG boiler room."
 - b) Valve number assigned by Contractor and stamped on brass plate, i.e. "147."
 - c) Service medium using designation assigned to Drawings on mechanical symbols, i.e. "heating hot water supply" or "plumbing cold water."
 - d) Valve types as specified herein.
 - e) Function valve serves, i.e. "strainer shut-off" or "balancing valve."
 - f) Zone identification, i.e. "AHU-2" or "auxiliary heating."
 - g) Insert Charts in Manuals.
- f. Lubrication Charts. Furnish a chart listing each lubricated piece of equipment, the proper type of oil or grease required, and recommended frequency of lubrication. Insert charts in manuals.
- g. Accessories.
 - 1) Furnish Owner with a complete equipment accessory schedule listing each piece of equipment and the related size, type, number required, and manufacturer of the following items.
 - a) Filters
 - b) Fan Belts
 - c) Refrigerant Dryers
 - 2) Insert Schedules in Manuals.
 - a) Insert 2 copies each of correct testing and balancing reports in manuals.
2. Instructions in Operation.
 - a. After all tests and adjustments have been made and the maintenance manual has been completed and given to Owner, furnish one or more full-time qualified personnel as necessary to put the mechanical Work in continuous operation for a

period of not less than two days, during which time the designated personnel's only purpose shall be to give complete operating and maintenance instructions to Owner.

1.4 JOB CONDITIONS

A. Existing Conditions:

1. Existing Pipe Lines.

- a. If any existing water, gas, or other pipes and appurtenances are encountered which interfere with the proper installation of new Work and which will not be used in connection with new Work, or existing systems, close such pipe in a proper manner, and if necessary, move or remove the pipes as directed by Owner.
- b. Where existing Work is to be modified, it shall be done in conformance with the Specifications. Materials used shall be same as existing unless otherwise specified.

B. Sequencing, Scheduling:

1. Coordination of Work.

- a. Plan all Work so that it proceeds with a minimum of interference with other trades. Inform the general Contractor of all openings required in the building construction for the installation of mechanical Work. Provisions shall be made for all special frames, openings, and pipe sleeves as required. The mechanical Contractor shall pay for all extra cutting and patching made necessary by his failure to properly direct such Work at the correct time.
- b. Verify local utility company's inspection requirements and abide by their rights of inspection before covering or otherwise concealing any piping, wiring, or equipment.

PART 2 - PRODUCTS – Not Applicable.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Installation:

1. General.

- a. Cooperate with all other Contractors in furnishing material and information for correct location, in proper sequence, of all sleeves, bucks, inserts, foundations, wiring, etc.
 - b. All piping connections to equipment shall be made with unions or flanges to permit dismantling. Flanges and unions shall also be installed in the piping systems to permit disassembly consistent with good installation practice and as required for removal of connected equipment from place of installation.
2. All belt drives, flexible couplings, and other exposed rotating or reciprocating parts shall be covered with OSHA approved safety covers. Covers shall be permanent type and easily removable.

3. All motors and bearings shall be covered with watertight and dust-proof covers during construction period.
4. Sleeves, frames, and wall pipes shall be furnished and installed for all pipes and ducts, passing through concrete floors and walls and shall be coordinated with other trades. Special sleeves through floors and walls shall be installed in accordance with manufacturers printed instructions and as detailed.
 - a. All sleeves and frames through exterior floors and walls above ground and all interior floors and walls shall be black iron pipe unless otherwise noted. Sleeves and frames shall be of a size to accommodate the pipe or duct and insulation.
 - b. Sleeves and frames shall be grouted in place with installation left smooth and finished to match surrounding surfaces.
 - c. Pipes passing through exterior floors and walls below ground, 3 inch (75 mm) and larger, shall utilize cast iron wall pipes unless noted or detailed otherwise. The wall pipe shall be used to convey the liquid or gas through the floor or wall without the use of sleeves. Wall pipes shall be furnished complete with end connections and adapters required to connect to the piping material. Size of wall pipe shall equal or exceed the maximum pipe size connected thereto. Wall pipes shall be integrally cast into floor or wall construction and provide the best possible seal at the exterior exposure.
 - d. Pipes passing through exterior floors and walls below ground, 2-1/2 inch (63 mm) and smaller, shall utilize black iron pipe sleeves as specified for aboveground in conjunction with a modular mechanical type seal as hereinafter specified.
 - 1) The modular mechanical type seal shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. Tightening of the bolts shall cause the rubber sealing elements to expand providing a watertight seal between the pipe and wall sleeve.
 - 2) The required inside diameter of the sleeve and the installation of the seal shall be coordinated with the seal manufacturer to provide a watertight joint. Seals shall be "Link Seal" manufactured by Thunderline Corporation. A seal consisting of a combination of a sleeve and a pressure clamping system manufactured by O. Z. Manufacturing is acceptable.
 - e. Cutting of openings and installation of sleeves and frames through exterior floors and walls above grade, and interior floors and walls shall be done in a neat, workmanlike manner. Openings shall be cut only as large as required for the installation.
 - 1) At fire-rated floor and wall penetrations, provide penetration sealant as specified in herein.
 - f. Sleeves and frames at floors and walls in concealed locations and in unfinished spaces such as mechanical rooms, etc. shall extend 1 inch (25 mm) from the finished surface. All other sleeves at floors shall extend 1/4 inch (6 mm) from finished floor surface, but shall allow placement of escutcheons. All other sleeves at walls shall be installed flush with finished surface.

- g. Escutcheons for exposed pipe through floors and walls, where exposed to view, shall be provided and shall be chromium plated except where special escutcheons are required under plumbing fixtures. Escutcheons shall be sized sufficiently to conceal the floor or wall opening and sleeve.
- 5. Interference.
 - a. Wherever piping runs on ceilings, arrange the run of the piping in such a manner that it does not interfere with grilles, light outlets or light fixtures.
- 6. Valves.
 - a. Valves shall be provided on all piping wherever shown or specified using adapters where required. All removable or replaceable equipment shall be valved. All valves shall have a securely fastened stamped brass metal plate each bearing a different number identified in the maintenance manual.
- 7. Openings in Pipes.
 - a. All openings in pipes shall be kept closed during the progress of the Work.
- 8. Lubrication.
 - a. Provide all lubrication for the operation of all equipment until substantial completion of the Project. Run in all bearings, and after they are run in, drain and flush bearings and refill with a new oil change. Refer to maintenance manual specification for lubrication chart.

3.2 ADJUSTMENT AND CLEANING

- A. Safety Devices. Thoroughly check all safety devices to assure proper operation and protection.
- B. Service.
 - 1. Perform service on all mechanical Work until the date of substantial completion including oiling and greasing, adjustments, cleaning, packing of seals, and other items as recommended by equipment manufacturer in the maintenance manual hereinbefore specified.
 - 2. Air filters.
 - a. Do not operate air moving equipment having air filters unless temporary filters are in place to protect the mechanical Work.
 - b. Clean or replace these temporary filters before final test and balance Work is begun as necessary for accurate readings. After completing the testing and balancing Work, replace temporary filters with new filter media as specified.
 - 3. Strainers.
 - a. Remove, clean and reinstall each strainer screen as specified below after systems have been flushed as specified in other sections of Division 23.

- 1) Clean each strainer after all adjustments have been made and system has operated a minimum of 24 hours, but before final test and balancing operation is started.
 - 2) Clean each strainer again, after final test and balancing operation and before substantial completion of the Project.
- b. Certain screens may remain out of the strainer body after removal during the final cleaning only as directed by the Owner.
4. Purge all air from water systems after each servicing.
 - a. Protect all furnishings and finishes during each servicing operation, and repair or replace to original condition, those damaged as a result of servicing.
5. Replace insulation removed or damaged after each operation. Leave insulation as specified herein.
6. Contractor may coordinate servicing operations with OWNER's operating personnel so as to coincide with time interval specified for instruction in operation.
7. Put system in full operating condition before substantial completion of the Project.
- C. Alarms. Test and adjust alarms for satisfactory operation.
- D. Tests and Adjustments. Upon completion of the installation and before substantial completion of the Project, the Contractor shall make all necessary tests and adjustments to place the system in a working condition. Systems shall be balanced as specified herein. The general operating tests shall cover a period of not less than 12 hours after completion of final testing and balancing, and shall demonstrate that the entire equipment is functioning in accordance with the Specifications. Furnish all instruments, test equipment, and competent personnel that are required for the tests.

END OF SECTION

SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - DESCRIPTION

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Requirements Division 01, Division 23 Specification Sections, and Common Work Requirements for HVAC apply to the work specified in this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and poly- phase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on AC power systems up to 600V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
- B. Section also includes the adjustable speed drive requirements.
- C. Efficiency of the motors for the HVAC shall be in compliance with provisions of California Energy Code, Table 100-A and the latest edition of the Building Energy Efficiency Standards, Title 24.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - MATERIALS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.
- C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 104° F and at altitude of 3300 feet above sea level.

- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1, including applications of premium efficiency motors.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Re-greasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.

- 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 ADJUSTABLE SPEED DRIVES

- A. Manufacturer: Magna Drive or approved equal.
- B. Components:
 - 1. Copper Conductor Rotor Assembly directly connected to the motor (input) shaft.
 - 2. The Magnet Rotor Assembly and the Actuation Components are directly connected to the load (output) shaft. Magnets to be rare-earth type.
 - 3. The ASD's output is controlled by an actuator. The actuator allows the process control signal to modulate the speed or torque output of the drive. Actuator to be 110 VAC with a 4 to 20 mA control signal.
 - 4. Hubs and shrink discs.
 - 5. Oil lubricated gear box and output shaft assembly.
 - 6. Vertical applications to have oil lubricated thrust bearings with AFBMA 40,000 hour life and with 25,000 pounds of vertical down-thrust capacity
- C. Suitable mounting kits shall be provided depending on mounting orientation (vertical or horizontal).
- D. Connect power to meet application requirements.

2.6 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 HP shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 23 05 16
EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Flexible pipe connectors.
 - 2. Expansion joints.
 - 3. Flexible expansion loops.
 - 4. Pipe alignment guides.
 - 5. Pipe anchors.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.1 - Power Piping.
 - 2. ASME B31.5 - Refrigeration Piping.
 - 3. ASME B31.9 - Building Services Piping.
 - 4. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- B. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code - Steel.

1.3 DESIGN REQUIREMENTS

- A. Provide structural work and equipment required for expansion and contraction of piping. Verify anchors, guides, and expansion joints provide and adequately protect system.
- B. Expansion Compensation Design Criteria:
 - 1. Installation Temperature: 50 degrees F.
 - 2. Hot Water Heating System Temperature: 210 degrees F.
 - 3. Chilled Water: 40 degrees F.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate layout of piping systems, including flexible connectors, expansion joints, expansion compensators, loops, offsets and swing joints. Submit shop drawings sealed by a registered California Mechanical Professional Engineer.

- B. Product Data:
 - 1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
 - 2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
- C. Design Data: Indicate criteria and show calculations.
- D. Manufacturer's Installation Instructions: Submit special procedures.
- E. Provide Manufacturer's Certificate.
- F. Manufacturer's Field Reports: Indicate results of inspection by manufacturer's representative.

PART 2 - PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS

- A. Manufacturers:
 - 1. Flexicraft.
 - 2. Flex Hose.
 - 3. Metraflex.
- B. Steel Piping:
 - 1. Inner Hose: Stainless Steel.
 - 2. Exterior Sleeve: Double braided stainless steel.
 - 3. Pressure Rating: 200 psig WOG and 250 degrees F.
 - 4. Joint: As specified for pipe joints.
 - 5. Size: Use pipe-sized units.
 - 6. Maximum offset: 3/4 inch to 1 inch on each side of installed center line.
- C. Copper Piping:
 - 1. Inner Hose: Bronze.
 - 2. Exterior Sleeve: Braided bronze.
 - 3. Pressure Rating: 200 psig WOG and 250 degrees F.
 - 4. Joint: As specified for pipe joints.
 - 5. Size: Use pipe sized units.

6. Maximum offset: 3/4 inch on each side of installed center line.

2.2 EXPANSION JOINTS

A. Manufacturers:

1. Flexicraft.
2. Flex Hose.
3. Metraflex.

B. Stainless Steel Bellows Type:

1. Pressure Rating: 200 psig WOG and 250 degrees F.
2. Maximum Compression: 1-3/4 inch.
3. Maximum Extension: 1/4 inch.
4. Joint: As specified in for piping system.
5. Size: Use pipe sized units.
6. Application: Steel piping 3 inch and smaller.

C. External Ring Controlled Stainless Steel Bellows Type:

1. Pressure Rating: 200 psig WOG and 250 degrees F.
2. Maximum Compression: 15/16 inch.
3. Maximum Extension: 5/16 inch 3/8 inch.
4. Maximum Offset: 1/8 inch.
5. Joint: Flanged.
6. Size: Use pipe sized units.
7. Accessories: Internal flow liner.
8. Application: Steel piping 3 inch and larger.

2.3 FLEXIBLE EXPANSION LOOPS

A. Manufacturers:

1. Flexicraft.
2. Flex Hose.
3. Metraflex.

- B. Flexible Expansion Loops shall consist of two parallel sections of corrugated metal hose, braid and a 180 degree return bend, or three equal length sections of annular corrugated close-pitch hose with over-braid, with inlet and outlet 90 degree elbow connections.
- C. Type 304 Stainless steel braids shall be used with type 321 stainless steel hose. Fitting materials of construction and end fitting type shall be consistent with pipe material and equipment/ pipe connection fittings.
- D. The loops shall be engineered to move in all three planes, and shall impart no thrust loads to system anchors.
- E. Field fabricated loops shall not be acceptable.

2.4 ACCESSORIES

- A. Pipe Alignment Guides: Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.
- B. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- C. Rigidly anchor pipe to building structure. Provide pipe guides to direct movement only along axis of pipe. Erect piping so strain and weight is not on cast connections or apparatus.
- D. Provide support and anchors for controlling expansion and contraction of piping. Provide loops, pipe offsets, and expansion joints where required.
- E. Provide grooved piping systems with manufacturer recommended coupling and installation for flexible connectors or flexible connector supported by vibration isolation.

3.2 PIPE BEND AND LOOP INSTALLATION

- A. Install pipe bends and loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.
- B. Attach pipe bends and loops to anchors:
 - 1. Steel Anchors: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualification."
 - 2. Concrete Anchors: Attach by fasteners. Follow fastener manufacturer's written instructions.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Furnish inspection services by flexible pipe manufacturer's representative for final installation and certify installation is in accordance with manufacturer's recommendations and connectors are performing satisfactorily.

END OF SECTION

SECTION 23 05 23
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gate valves.
2. Globe valves.
3. Ball valves.
4. Plug valves.
5. Butterfly valves.
6. Check valves
7. Pressure and Safety relieve valves.

1.2 REFERENCES

A. ASTM International:

1. ASTM A216 / A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
2. ASTM D1785 - Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.

B. ASTM D4101 - Standard Specification for Propylene Injection and Extrusion Materials.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.

PART 2 - PRODUCTS

2.1 GATE VALVES

A. Manufacturers:

1. Crane.
2. Milwaukee.
3. Nibco

- B. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded bonnet, rising stem, inside screw solid wedge disc, solder or threaded ends.
- C. 2-1/2 inches and Larger: MSS SP 70, Class 125, cast iron body, bronze trim, bolted bonnet, rising stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.2 GLOBE VALVES

- A. Manufacturers:
 - 1. Crane
 - 2. Milwaukee
 - 3. Nibco
- B. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded bonnet, hand wheel, Buna-N composition disc, solder or threaded ends.
- C. 2-1/2 inches and Larger: MSS SP 85, Class 125, cast iron body, bronze trim, hand wheel, outside screw and yoke, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.3 BALL VALVES

- A. Manufacturers:
 - 1. Crane
 - 2. Milwaukee
 - 3. Nibco
- B. 2 inches and Smaller: MSS SP 110, Class 150, bronze, two piece body, type 316 stainless steel ball, full port, teflon seats, blow-out proof stem, solder or threaded end and handle with balancing stops.

2.4 PLUG VALVES

- A. Manufacturers:
 - 1. Nordstrom
 - 2. Dezurik
 - 3. Crane
- B. 2 inches and Smaller: MSS SP 78, Class 300, cast iron construction, round port, full pipe area, pressure lubricated, teflon packing, threaded ends. Furnish one plug valve wrench for every ten plug-valves with minimum of one wrench.

- C. 2-1/2 inches and Larger: MSS SP 78, Class 300, cast iron construction, round port, full pipe area, pressure lubricated, teflon packing, flanged ends. Furnish wrench-operated or worm gear-operated.

2.5 BUTTERFLY VALVES

A. Manufacturers:

- 1. Crane
- 2. Milwaukee
- 3. Nibco

B. 2-1/2 inches and Larger: MSS SP 67, Class 200.

- 1. Body: Cast or ductile iron, lug or grooved ends, stainless steel stem, extended neck.
- 2. Disc: Aluminum bronze.
- 3. Seat: Resilient replaceable EPDM.
- 4. Handle and Operator: Infinite position lever handle with memory stop. Furnish gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.6 CHECK VALVES

A. Horizontal Swing Check Valves:

1. Manufacturers:

- a. Crane
- b. Milwaukee
- c. Nibco

- 2. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N, solder or threaded ends.
- 3. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

B. Spring Loaded Check Valves:

1. Manufacturers:

- a. Crane.
- b. Milwaukee
- c. Nibco

2. 2 inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, solder or threaded ends.
3. 2-1/2 inches and Larger: MSS SP 71, Class 125, wafer style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install valves with stems upright or horizontal, not inverted.
- B. Install valves with clearance for installation of insulation and allowing access.
- C. Provide access where valves and fittings are not accessible.

3.2 VALVE APPLICATIONS

- A. Install shutoff and drain valves at locations in accordance with this Section.
- B. Install butterfly or gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Install ball butterfly or globe valves for throttling, bypass, or manual flow control services.
- D. Install spring loaded check valves on discharge of water pumps.
- E. Install lug end butterfly valves adjacent to equipment when functioning to isolate equipment.
- F. If valve applications are not indicated, use the following:
 1. Shutoff Service: Ball, butterfly gate, or plug valves.
 2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
 3. Throttling and By-Pass Service: Globe, ball, or butterfly valves.
 4. Pump-Discharge Check Valves: Center-guided silent check valves.
 5. Lubricated plug valves may be used for throttling service. Non-lubricated plug valves may be used only when shut-off or isolating valves are also provided.
 6. Install drain valves, with cap and chain, as noted.
 - a. All applications use 3/4 inch ball or globe valves.
 7. Provide 1/4 inch ball valve as gauge cocks.
- G. Safety and Relief Valves:
 1. Constructed, rated and stamped in accordance with ASME
 - a. Install relief valves for unheated liquids.

- b. Install safety relief valves for heated liquids.
 - c. Install safety valves for steam.
- 2. Set Pressures and Ratings:
 - a. Suitable and rated for system pressure and temperature.
 - 1) For Safety Relief Valves: Minimum temperature rating shall be equal to saturated steam temperature corresponding to pressure 10 percent higher than valve set pressure.
 - b. Set pressure; not to exceed pressure rating of protected equipment.
- 3. Valves to open, under test, at set pressure with following tolerance:
 - a. Set pressure up to 70 psi: Plus or minus 2 psi.
 - b. Set pressure, above 70 psi: Plus or minus 3 percent.
- 4. Capacities: Selected and sized to:
 - a. Relieve maximum possible generated energy.
 - b. Maintain pressure in protected equipment at not more than following:
 - 1) Low Pressure Boilers: 5 psi above boiler working pressure.
 - 2) Unfired Pressure Vessels: 10 percent above vessel working pressure.
- 5. Provide multiple valves if required to meet capacity requirements.
- H. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- I. Select valves, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - a. For Copper Tubing, NPS 5 and Larger: Flanged ends.
 - b. For Steel Piping, NPS 2 and Smaller: Threaded ends.
 - c. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - d. For Steel Piping, NPS 5 and Larger: Flanged ends.
 - e. For Grooved-End Copper Tubing and Steel Piping except Steam and Steam Condensate Piping: Valve ends may be grooved.

3.3 CHILLED-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, brass with brass trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.
4. Bronze Gate Valves: Class 125, RS, bronze.
5. Bronze Globe Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, aluminum-bronze disc.
3. Iron, Single-Flange Butterfly Valves, NPS 14 to NPS 24: 150 CWP, EPDM seat, aluminum-bronze disc.
4. Iron, Grooved-End Butterfly Valves, NPS 2-1/2 to NPS 12: 175 CWP.
5. Iron Swing Check Valves: Class 125, metal seats.
6. Iron, Grooved-End Check Valves, NPS 3 to NPS 12: 300 CWP.
7. Iron, Center-Guided Check Valves: Class 125, globe, metal seat.
8. Iron Gate Valves: Class 125, OS&Y.
9. Iron Globe Valves: Class 125.
10. Lubricated Plug Valves: Class 125, regular gland, flanged

3.4 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, brass with brass trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.
4. Bronze Gate Valves: Class 125, RS.
5. Bronze Globe Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, aluminum-bronze disc.
3. Iron, Single-Flange Butterfly Valves, NPS 14 to NPS 24: 150 CWP, EPDM seat, aluminum-bronze disc.
4. Iron, Grooved-End Butterfly Valves, NPS 2-1/2 to NPS 12: 175 CWP.
5. Iron Swing Check Valves: Class 125, metal seats.
6. Iron, Grooved-End Check Valves, NPS 3 to NPS 12: 300 CWP.
7. Iron, Center-Guided Check Valves: Class 125, globe, metal seat.
8. Iron Gate Valves: Class 125, OS&Y.
9. Iron Globe Valves, NPS 2-1/2 to NPS 12: Class 125.

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports.
2. Hanger rods.
3. Inserts.
4. Flashing.
5. Equipment curbs.
6. Sleeves.
7. Mechanical sleeve seals.
8. Formed steel channel.
9. Firestopping relating to HVAC work.
10. Firestopping accessories.
11. Equipment bases and supports.

1.2 SUBMITTALS

- A. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.
- B. Product Data:
1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
 2. Firestopping: Submit data on product characteristics, performance and limitation criteria.
- C. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers. Submit sizing methods calculations sealed by a registered professional engineer.

- E. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.
 - 2. Firestopping: Submit preparation and installation instructions.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- G. Engineering Judgments: For conditions not covered by UL or WH listed designs, submit judgments by licensed Professional Engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. Tolco/B-Line Systems/Cooper Industries.
 - 2. PHD Manufacturing
 - 3. Or approved equal.
- B. Hydronic Piping:
 - 1. Conform to ASME B31.9 and ASME B31.1.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
 - 4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
 - 5. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger.
 - 6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
 - 8. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hooks.
 - 9. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
 - 10. Wall Support for Hot Pipe Sizes 6 inches and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
 - 11. Vertical Support: Steel riser clamp.
 - 12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor

flange, and concrete pier or steel support.

13. Floor Support for Hot Pipe Sizes 4 Inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Copper-plated, carbon steel ring.

C. Refrigerant Piping:

1. Conform to ASME B31.5.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
6. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Copper-plated carbon-steel ring.

2.2 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 INSERTS

A. Manufacturers:

1. Tolco/ B-Line Systems/ Cooper Industries.
2. PHD Manufacturing.
3. Or Approved Equal.

- B. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods; casting anchors or anchor inserts are acceptable.

2.4 PIPE STAND FABRICATION

- A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support exterior piping.

- B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
1. Manufacturers:
 - a. ERICO/Michigan Hanger Co.
 - b. MIRO Industries.
 - c. Or Approved Equal.
- C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
1. Manufacturers:
 - a. MIRO Industries.
 - b. Or Approved Equal.
- D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
1. Manufacturers:
 - a. ERICO/Michigan Hanger Co.
 - b. MIRO Industries.
 - c. Portable Pipe Hangers, L.P. (Houston, Texas).
 2. Base: Stainless steel.
 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous- thread rods.
 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless- steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
1. Manufacturers:
 - a. Portable Pipe Hangers, L.P. (Houston, Texas).
 - b. Or Approved Equal.
 2. Bases: One or more plastic.
 3. Vertical Members: Two or more protective-coated-steel channels.
 4. Horizontal Member: Protective-coated-steel channel.

5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

- F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.5 FLASHING

- A. Metal Flashing: 26 gauge galvanized steel.
- B. Metal Counter-flashing: 22 gauge galvanized steel.
- C. Lead Flashing:
1. Waterproofing: 5 lb./sq. ft sheet lead.
 2. Soundproofing: 1 lb./sq. ft sheet lead.
- D. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

2.6 EQUIPMENT CURBS

- A. Manufacturers: To match equipment.

2.7 SLEEVES

- A. Sleeves for Pipes through Non-fire Rated Floors: 18 gauge galvanized steel.
- B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gauge galvanized steel.
- C. Sleeves for Round Ductwork: Galvanized steel.
- D. Sleeves for Rectangular Ductwork: Galvanized steel.

2.8 MECHANICAL SLEEVE SEALS

- A. Manufacturers:
1. Thunderline Link-Seal, Inc.
 2. NMP Corporation.
 3. Or Approved Equal.
- B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.9 FORMED STEEL CHANNEL

- A. Manufacturers:

1. Tolco/B-Line Systems/ Cooper Industries.
 2. Hilti.
 3. Unistrut Corp.
- B. Product Description: Galvanized 12 gauge steel, with holes 1-1/2 inches on center.
- 2.10 FIRESTOPPING
- A. Manufacturers:
1. Dow Corning Corp.
 2. Hilti Corp.
 3. 3M Fire Protection Products.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive sleeves.
- B. Verify openings are ready to receive firestopping.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install materials to arrest liquid material leakage.
- D. Obtain permission from BUILDING OWNER before using Powder-Actuated Fasteners.
- E. Obtain permission from BUILDING OWNER before drilling or cutting structural members.

3.3 INSTALLATION - INSERTS

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- B. Place hangers within 12 inches of each horizontal elbow, 12 inches from end of fitting.
- C. Use hangers with 1-1/2 inch minimum vertical adjustment.
- D. Support vertical piping at every other floor.
- E. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- F. Support riser piping independently of connected horizontal piping.
- G. Design hangers for pipe movement without disengagement of supported pipe.
- H. Prime coat exposed steel hangers and supports.
- I. Provide clearance in hangers and from structure and other equipment for installation of insulation.

3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members formed steel channel steel pipe and fittings. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.6 INSTALLATION - FLASHING

- A. Provide flexible flashing and metal Counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms for sound control.
- C. Provide curbs for roof installations 14 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach Counter-flashing to equipment and lap base flashing on roof curbs. Flatten and solder joints.
- D. Adjust storm collars tight to pipe with bolts, caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.7 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals.

- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors one inch above finished floor level. Caulk or seal sleeves.
- E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with firestopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install escutcheons at finished surfaces to match surface, or chrome.

3.8 INSTALLATION - FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.
- D. Fire Rated Surface:
 - 1. Seal openings
- E. Field Identification of Firestop Systems: Provide an identification tag at the location of each firestop system with a permanent label or mobile application QR tag, marking to indicate the name of the installer, the date of installation, the name of manufacturer and firestop system, the name of testing agency and tested firestop system identification, and the words "Do Not Disturb – Fire Resistance Rated System."
- F. Install firestopping product in accordance with manufacturer's instructions.

END OF SECTION

SECTION 23 05 48
VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Vibration isolators.
 2. Duct silencers.
 3. Ductwork lagging.

1.2 REFERENCES

- A. Air Movement and Control Association International, Inc. (AMCA).
- B. American National Standards Institute (ANSI):
1. ANSI S1.4 - Sound Level Meters.
 2. ANSI S1.8 - Reference Quantities for Acoustical Levels.
 3. ANSI S1.13 - Methods for the Measurement of Sound Pressure Levels in Air.
 4. ANSI S12.36 - Survey Methods for the Determination of Sound Power Levels of Noise Sources.
- C. Air-Conditioning, Heating, and Refrigeration Institute (AHRI):
1. ANSI/AHRI 575 - Method of Measuring Machinery Sound Within An Equipment Space.
- D. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
1. ASHRAE 68 - Laboratory Method of Testing In-Duct Sound Power Measurement Procedure for Fans.
 2. ASHRAE Handbook - HVAC Applications.
- E. ASTM International:
1. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 2. ASTM E477 - Standard Test Method for Laboratory Measurements of Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.
 3. ASTM E596 - Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures.
- F. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

1. ANSI/SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- G. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS):
 1. MSS SP-127 – Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.
- 1.3 SUBMITTALS
 - A. Shop Drawings: Indicate equipment bases and locate vibration isolators, with static and dynamic load on each. Indicate assembly, material, thickness, dimensional data, pressure losses, acoustical performance, layout, and connection details for sound attenuation products fabricated for this project.
 - B. Product Data: Submit schedule of vibration isolator type with location and load on each. Submit catalog information indicating, materials, dimensional data, pressure losses, and acoustical performance for standard sound attenuation products.
- 1.4 PERFORMANCE
 - A. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval from City of Santa Ana Department of Building and Safety or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings.
 - B. All anchor bolts and tie-ins to structure shall be designed per the Airport Structural Design Standards.

PART 2 - PRODUCTS

- 2.1 VIBRATION ISOLATORS
 - A. Manufacturers:
 1. ISAT.
 2. Mason Industries.
 3. Or approved equal.
 - B. Open Spring Isolators:
 1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 3. Spring Mounts: Furnish with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.

4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
- C. Restrained Spring Isolators:
1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 3. Spring Mounts: Furnish with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
 4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
 5. Restraint: Furnish mounting frame and limit stops.
- D. Closed Spring Isolators:
1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
 3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance.
- E. Restrained Closed Spring Isolators:
1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
 3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.

4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.

F. Spring Hanger:

1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators rubber hanger with threaded insert.
4. Misalignment: Capable of 20 degree hanger rod misalignment.

G. Neoprene Pad Isolators:

1. Rubber or neoprene-waffle pads.
 - a. 30 durometer.
 - b. Minimum 0.5 inch thick.
 - c. Maximum loading 40 psi.
 - d. Height of ribs: not to exceed 0.7 times width.
2. Configuration: Single layer. 0.5 inch thick waffle pads bonded each side of 1/4 inch thick steel plate.

H. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches deflection with threaded insert.

I. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

J. Seismic Snubbers:

1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
2. Neoprene Elements: Replaceable, minimum of 0.75 inch thick.
3. Capacity: 4 times load assigned to mount groupings at 0.4 inch deflection.
4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.

2.2 DUCT SILENCERS

A. Manufacturers:

1. Noise Control, Inc.
2. McGill Airflow LLC.
3. Semco.

- B. Description: Duct section with sheet metal outer casing, sound absorbing fill material, and inner casing of perforated sheet metal; incorporating interior baffles of similar construction.

2.3 DUCTWORK LAGGING

- A. Acoustic Insulation: 2 inch thick, 3 to 5 lb/cu ft density glass fiber or mineral wool insulation.
- B. Covering: Sheet lead, vinyl, or gypsum board with surface weight minimum 4 lb/sq ft.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify equipment, ductwork and piping is installed before work in this section is started.

3.2 EXISTING WORK

- A. Provide access to existing piping and ductwork and other installations remaining active and requiring access.
- B. Extend existing piping and ductwork installations using materials and methods compatible with existing electrical installations.

3.3 INSTALLATION

- A. Support duct silencers independent of ductwork.
- B. Lag ductwork by wrapping with insulation and covering. Apply covering to be airtight. Do not attach covering rigidly to ductwork.
- C. Install isolation for motor driven equipment.
- D. Adjust equipment level.
- E. Install spring hangers without binding.
- F. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

3.4 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment Restraints:
1. Install seismic snubbers on HVAC 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 agency acceptable to authorities having jurisdiction.
4. All equipment whether isolated or not, shall be bolted to structure per Code or the manufacturer's recommendations, whichever is more restrictive.
5. All structurally suspended overhead equipment isolated or non-isolated shall be four point independently braced within Type III seismic restraining system.
6. Where base anchoring is insufficient to resist seismic forces, supplementary restraining such as seismic restraint system Type III shall be used above systems center of gravity to suitably resist "G" force levels. Vertically mounted tanks may require this additional restraint.

B. Piping Restraints:

1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
2. Brace a change of direction longer than 12 feet.
3. Install Seismic Restraining System Type III: Taut for overhead suspended non-isolated equipment, piping and slack with 0.5 inch cable deflection for isolated systems.
4. Seismically restrain all piping with Type III restraining system in accordance with guideline as outlined below.
5. Install vibration isolation at all piping connected to rotating equipment and within 50 feet of each piece of equipment such as air handling units, fan coil units and computer room AC units, condensing units, exhaust fans and make-up air units.

C. 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 Owner 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. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Screw Anchors: Clean holes to remove loose material and drilling dust prior to installation of anchor.
6. Set anchors to manufacturer's recommended torque, using a torque wrench.

7. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.
8. Provide ICC ESR reports or product approval by another agency acceptable to authorities having jurisdictions for all applicable products and anchorages.

END OF SECTION

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nameplates.
 - 2. Tags.
 - 3. Stencils.
 - 4. Pipe markers.
 - 5. Ceiling tacks.
 - 6. Labels.
 - 7. Lockout devices.
 - 8. Warning Signs & Labels.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturers catalog literature for each product required.
- B. Samples.
- C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

PART 2 - PRODUCTS

2.1 NAMEPLATES

- A. Manufacturers:
 - 1. Craftmark Pipe Markers.
 - 2. Seton Identification Products / Tricor Direct / Brady Corporation.
 - 3. Kolbi Pipe Marker Company.

- B. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.
- C. Metal Labels for Equipment:
 - 1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than
 - 4. 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-fourths the size of principal lettering.
 - 5. Fasteners: Stainless-steel rivets.
 - 6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

2.2 TAGS

- A. Plastic Tags:
 - 1. Manufacturers:
 - a. Seton Identification Products / Tricor Direct / Brady Corporation.
 - b. Brady Worldwide, Inc.
 - c. Kolbi Pipe Marker Company.
 - 2. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter square.
- B. Metal Tags:
 - 1. Manufacturers:
 - a. Seton Identification Products / Tricor Direct / Brady Corporation.
 - b. Brady Worldwide, Inc.
 - c. Kolbi Pipe Marker Company.
 - 2. Aluminum with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges.
- C. Tag Chart: Typewritten letter size list of applied tags and location in anodized aluminum frame plastic laminated.

2.3 STENCILS

- A. Manufacturers:
 - 1. Seton Identification Products / Tricor Direct / Brady Corporation.
 - 2. Brady Worldwide, Inc.
 - 3. Kolbi Pipe Marker Company.
- B. Stencils: With clean cut symbols and letters of following size:
 - 1. Up to 2 inches Outside Diameter of Insulation or Pipe: 1/2 inch high letters.
 - 2. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1-inch high letters.
 - 3. Over 6 inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.
 - 4. Ductwork and Equipment: 1-3/4 inches high letters.
- C. Stencil Paint: Semi-gloss enamel.

2.4 PIPE MARKERS

- A. Plastic Pipe Markers:
 - 1. Manufacturers:
 - a. Seton Identification Products / Tricor Direct / Brady Corporation.
 - b. Brady Worldwide, Inc.
 - c. Kolbi Pipe Marker Company.
 - 2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.
- B. Plastic Tape Pipe Markers:
 - 1. Manufacturers:
 - a. Seton Identification Products / Tricor Direct / Brady Corporation.
 - b. Brady Worldwide, Inc.
 - c. Kolbi Pipe Marker Company.
 - 2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.5 CEILING TACKS

- A. Manufacturers:
 - 1. Seton Identification Products / Tricor Direct / Brady Corporation.
 - 2. Brady Worldwide, Inc.

3. Kolbi Pipe Marker Company.
- B. Description: Steel with 3/4 inch diameter color-coded head.
- C. Color code as follows:
 1. HVAC equipment: Yellow.
 2. Fire dampers/smoke dampers: Red.
 3. Plumbing valves: Green.
 4. Heating/cooling valves: Blue.

2.6 LABELS

- A. Manufacturers:
 1. Seton Identification Products / Tricor Direct / Brady Corporation.
 2. Brady Worldwide, Inc.
 3. Kolbi Pipe Marker Company.
- B. Description: Aluminum, size 1.9 x 0.75 inches, adhesive backed with printed identification.
- C. Pipe Labels:
 1. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
 2. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
 - a. NPS 5 (DN 125) and smaller: Attach to pipe without fasteners or adhesive.
 - b. NPS 6 (DN 150) and larger: Attach to pipe with stainless steel spring fasteners.
 3. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - a. 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.
 - b. Lettering Size: At least 1-1/2 inches high.
 4. Maximum Temperature: Able to withstand temperatures up to 180 deg F (83 deg C).
- D. Duct Labels:
 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: Black.

3. Background Color: Blue.
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
7. 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-fourths the size of principal lettering.
8. Fasteners: Stainless-steel rivets.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
10. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
 - a. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.
 - b. Lettering Size: At least 1-1/2 inches high.

2.7 LOCKOUT DEVICES

A. Lockout Hasps:

1. Manufacturers:
 - a. Seton Identification Products / Tricor Direct / Brady Corporation.
 - b. Brady Worldwide, Inc.
 - c. Kolbi Pipe Marker Company.
2. Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

B. Valve Lockout Devices:

1. Manufacturers:
 - a. Seton Identification Products / Tricor Direct / Brady Corporation.
 - b. Brady Worldwide, Inc.
 - c. Kolbi Pipe Marker Company.
2. Steel device preventing access to valve operator, accepting lock shackle.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces for stencil painting.

3.2 INSTALLATION

- A. Apply stencil painting.
- B. Install identifying devices after completion of coverings and painting.
- C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- D. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.
- E. Install tags using corrosion resistant chain. Number tags consecutively by location.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Testing, adjusting, and balancing of air systems.
2. Testing, adjusting, and balancing of hydronic systems.
3. Measurement of final operating condition of HVAC systems.
4. Sound measurement of equipment operating conditions.
5. Vibration measurement of equipment operating conditions.
6. Testing, adjusting and balancing of smoke control systems.

1.2 REFERENCES

A. Associated Air Balance Council (AABC):

1. AABC MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.

B. National Environmental Balancing Bureau (NEBB):

1. Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems. Latest Edition.

C. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):

1. ASHRAE 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.
2. ASHRAE 62.1, Section 7.2.2.
3. ASHRAE 90.1, Section 6.2.3 System Balancing.

1.3 SUBMITTALS

- A. Prior to commencing Work, submit proof of latest calibration date of each instrument.
- B. Test Reports: Indicate data on AABC or NEBB Total System Balance forms.
- C. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment.
- D. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty.

- E. Submit draft copies of report for review prior to final acceptance of Project.
- F. Furnish printed reports (not hand-written) in binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Prior to commencing Work, calibrate each instrument to be used. Upon completing Work, recalibrate each instrument to assure reliability.

1.6 QUALIFICATIONS

- A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum five years documented experience certified by AABC or NEBB.

1.7 WARRANTY

- 1. National Project Performance Guarantee: Provide a guarantee AABC or NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:
 - 2. The certified TAB firm has tested and balanced systems according to the Contract Documents.
 - 3. Systems are balanced to optimum performance capabilities within design and installation limits.
 - 4. Warranty Period: Five (5) years.
- B. Special Guarantee: Provide a guarantee AABC or NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:
 - 1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
 - 2. Systems are balanced to optimum performance capabilities within design and installation limits.
 - 3. Warranty Period: Five (5) years.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify systems are complete and operable before commencing work. Verify the following:
1. Systems are started and operating in safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Fire and volume dampers are in place and open.
 8. Air coil fins are cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage is minimized.
 12. Hydronic systems are flushed, filled, and vented.
 13. Steam systems are flushed, filled and steam traps and condensate pipe install properly.
 14. Proper strainer baskets are clean and in place or in normal position.
 15. Service and balancing valves are open.
 16. Drains are flushed and clean.

3.2 PREPARATION

- A. Furnish instruments required for testing, adjusting, and balancing operations.
- B. Make instruments available to Owner to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

- A. Verify recorded data represents actual measured or observed conditions.

- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
- D. Report defects and deficiencies noted during performance of services, preventing system balance.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner.
- G. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to obtain required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.
- E. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.
- F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes if applicable to vary fan speed. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. At modulating damper locations, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to obtain required relationship between each to maintain approximately 0.05 inches positive static pressure near building entries.

- M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.
- N. For variable air volume system powered units set volume controller to airflow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable-air-volume temperature control.
- O. On fan powered VAV boxes, adjust airflow switches for proper operation.

3.6 WATER SYSTEM PROCEDURE

- A. Adjust water systems, after air balancing, to obtain design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in system.
- C. Adjust systems to obtain prescribed pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open or in normal position to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, simulate full flow in one part by temporary restriction of flow to other parts.

3.7 WATER AND STEAM PIPE LEAKAGE TESTS

- A. Witness the pipe pressure testing performed by Installer.
- B. Verify that proper test methods are used and that leakage rates are within specified limits.
- C. Report deficiencies observed.

3.7 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing:
 - 1. MRI chiller (refer to manufacturer requirement)
 - 2. Steam humidifier.
 - 3. Fan Coil Units.
 - 4. Air Terminal Units.
 - 5. Air Inlets and Outlets.
- B. Report Forms
 - 1. Title Page:

- a. Name of Testing, Adjusting, and Balancing Agency
 - b. Address of Testing, Adjusting, and Balancing Agency
 - c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency
 - d. Project name
 - e. Project location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project altitude
 - j. Report date
2. Summary Comments:
- a. Design versus final performance
 - b. Notable characteristics of system
 - c. Description of systems operation sequence
 - d. Summary of outdoor and exhaust flows to indicate building pressurization
 - e. Nomenclature used throughout report
 - f. Test conditions
3. MRI chiller
- a. Identification/number
 - b. Location
 - c. Manufacturer
 - d. Model number
 - e. Serial number
 - f. Entering DB chilled water temperature, design and actual
 - g. Leaving DB chilled water temperature, design and actual
 - h. Number of compressors
4. Fan Coil Data:
- a. Manufacturer

- b. Identification/number
- c. Location
- d. Model number
- e. Size
- f. Air flow, design and actual
- g. Water flow, design and actual
- h. Water pressure drop, design and actual
- i. Entering water temperature, design and actual
- j. Leaving water temperature, design and actual
- k. Entering air temperature, design and actual
- l. Leaving air temperature, design and actual
- 5. Supply air /Return Air/Exhaust air inlet and outlet
 - a. Identification/location
 - b. Design air flow
 - c. Actual air flow
- 6. Duct Traverse:
 - a. System zone/branch
 - b. Duct size
 - c. Area
 - d. Design velocity
 - e. Design air flow
 - f. Test velocity
 - g. Test air flow
 - h. Duct static pressure
 - i. Air temperature
 - j. Air correction factor
- 7. Terminal Unit Data:
 - a. Manufacturer

- b. Type, constant, variable, single, dual duct
 - c. Identification/number
 - d. Location
 - e. Model number
 - f. Size
 - g. Minimum static pressure
 - h. Minimum design air flow
 - i. Maximum design air flow
 - j. Maximum actual air flow
 - k. Inlet static pressure
 - l. Reheating coil gpm
 - m. Reheating coil heat water enter temperature.
 - n. Reheating coil heat water leaving temperature.
8. Steam humidifier:
- a. Inlet steam pressure in psig .

END OF SECTION

SECTION 23 07 00
HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. HVAC piping insulation, jackets and accessories.
2. HVAC ductwork insulation, jackets, and accessories.
3. Equipment Insulation, jackets and accessories.

1.2 REFERENCES

A. ASTM International and Underwriters Laboratories:

1. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
2. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
3. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
4. ASTM D4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.
5. ASTM C165 – Standard Test Method for Measuring Compressive Properties of Thermal Insulations.
6. ASTM C177 – Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
7. ASTM C335 – Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
8. ASTM C356 – Standard Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat.
9. ASTM C411 – Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
10. ASTM C447 – Standard Practice for Estimating the Maximum Use Temperature of Thermal Insulations.
11. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

12. ASTM C1139 – Standard Specification for Fibrous Glass Thermal Insulation and Sound Absorbing Blanket and Board for Military Applications
13. ASTM C1393 – Standard Specification for Perpendicularly Oriented Mineral Fiber Roll and Sheet Thermal Insulation for Pipes and Tanks.
14. ASTM D624 – Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
15. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
16. ASTM E1196 – Standard Guide for Thermal Industrial Insulation Systems.
17. UL 723 – Test for Surface Burning Characteristics of Building Materials.
18. UL/ULC Classified – Underwriters Laboratories classification mark for products the UL has evaluated by its standards and are covered by UL's follow-up Services program.

B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS

- A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

1.4 WARRANTY

- A. Furnish five year manufacturer warranty for man-made fiber.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:

1. Johns Manville.
2. Knauf Insulation
3. Owens-Corning.

B. Manufacturers for Closed Cell Elastomeric Insulation Products:

1. Aeroflex. Aerocell.
2. Armacell, LLC. Armaflex.
3. Nomaco. K-flex.

2.2 PIPE INSULATION

- A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 850 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- B. TYPE P-2: ASTM C547, molded glass fiber pipe insulation. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 850 degrees F.
- C. TYPE P-3: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 650 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- D. TYPE P-4: ASTM C612; semi-rigid, fibrous glass board noncombustible. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 650 degrees F.
- E. TYPE P-5: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: Minus 70 to 180 degrees F.
- F. TYPE P-6: ASTM C534, Type I, Grade 2, flexible, closed cell elastomeric insulation, tubular.
 - 1. Thermal Conductivity: 0.30 at 75 degrees F.
 - 2. Maximum Service Temperature: 300 degrees F.
 - 3. Operating Temperature Range: Minus 58 to 300 degrees F.
- G. TYPE P-7: ASTM C534, Type I, flexible, non-halogen, closed cell elastomeric insulation, tubular.

1. Thermal Conductivity: 0.27 at 75 degrees F.
 2. Maximum Service Temperature: 250 degrees F.
 3. Operating Temperature Range: Minus 58 to 250 degrees F.
- H. TYPE P-8: ASTM C547, Type I or II, mineral fiber preformed pipe insulation, noncombustible.
1. Thermal Conductivity: 0.23 at 75 degrees F.
 2. Maximum Service Temperature: 1200 degrees F.
 3. Canvas Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric treated with fire retardant lagging adhesive.

2.3 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:

1. ASTM C921, ASTM C1136 white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Water Vapor Permeance: ASTM E96 / E96M; 0.02 perms.

B. PVC Plastic Pipe Jacket:

1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.
2. Thickness: 30 mil.
3. Connections: Brush on welding adhesive with VOC content of 50 g/l according to 40 CFR 59, subpart D (EPA Method 24).

C. ABS Plastic Pipe Jacket:

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
2. Water Vapor Permeance: ASTM E96 / E96M; 0.02 perms.
3. Thickness: 30 mil.
4. Connections: Brush on welding adhesive.

D. Aluminum Pipe Jacket:

1. ASTM B209.
2. Thickness: 0.2 inch thick sheet.
3. Finish: Embossed.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.2 inch thick die shaped fitting covers with factory attached protective liner.

- E. Stainless Steel Pipe Jacket:
 - 1. ASTM A240 / A240M OR ASTM 666 Type 304 stainless steel.
 - 2. Thickness: 0.016 inch thick.
 - 3. Finish: Smooth.
- F. Field Applied Glass Fiber Fabric Jacket System:
 - 1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
 - 2. Glass Fiber Fabric:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Blanket: 1.0 lb/cu ft density.

2.4 PIPE INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.
- D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.
- E. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum single piece construction with self-adhesive closure. Thickness to match pipe insulation.
- F. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- G. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449 / C449M.
- H. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.
- I. Adhesives: Compatible with insulation.

2.5 DUCTWORK INSULATION

- A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Maximum Operating Temperature: 250 degrees F.
 - 3. Density: 0.75 pound per cubic foot.
- B. TYPE D-2: ASTM C612, Type IA or IB, rigid glass fiber, with factory applied all service facing meeting ASTM C1136, Type II.

1. Thermal Conductivity: 0.22 at 75 degrees F.
 2. Density: 2.25 pound per cubic foot.
- C. TYPE D-3: ASTM C612, Type IA or IB, rigid glass fiber, no facing.
1. Thermal Conductivity: 0.24 at 75 degrees F.
 2. Density: 2.25 pound per cubic foot.
- D. TYPE D-4: ASTM C1071, Type I, flexible, glass fiber duct liner with coated air side.
1. Thermal Conductivity: 0.25 at 75 degrees F.
 2. Density: 1.5 pound per cubic foot.
 3. Maximum Operating Temperature: 250 degrees F.
 4. Maximum Air Velocity: 6,000 feet per minute.
- E. TYPE D-5: ASTM C1071, Type II, rigid, glass fiber duct liner with coated air side.
1. Thermal Conductivity: 0.23 at 75 degrees F.
 2. Density: 3.0 pound per cubic foot.
 3. Maximum Operating Temperature: 250 degrees F.
 4. Maximum Air Velocity: 4,000 feet per minute.
- F. TYPE D-6: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.
1. Thermal Conductivity: 0.27 at 75 degrees F.
 2. Service Temperature Range: Minus 58 to 180 degrees F.

2.6 DUCTWORK INSULATION JACKETS

- A. Aluminum Duct Jacket:
1. ASTM B209.
 2. Thickness: 0.016 inch thick sheet.
 3. Finish: Embossed.
 4. Joining: Longitudinal slip joints and 2 inch laps.
 5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
- B. Vapor Retarder Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film 0.0032 inch vinyl.

2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
3. Secure with pressure sensitive tape.
- C. Canvas Duct Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.
- D. Outdoor Duct Jacket: Asphalt impregnated and coated sheet, 36 lb/square.

2.7 DUCTWORK INSULATION ACCESSORIES

- A. Vapor Retarder Tape:
 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- B. Vapor Retarder Lap Adhesive: Compatible with insulation.
- C. Adhesive: Waterproof, ASTM E162 fire-retardant type.
- D. Liner Fasteners: Galvanized steel, self-adhesive pad with integral press-on head.
- E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- F. Lagging Adhesive: Fire retardant type with maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.
- H. Adhesives: Compatible with insulation.
- I. Membrane Adhesives: As recommended by membrane manufacturer.

2.8 EQUIPMENT INSULATION

- A. TYPE E-1: ASTM C553; glass fiber, flexible or semi-rigid, noncombustible.
 1. Thermal Conductivity: 0.24 at 75 degrees F .
 2. Operating Temperature Range: 0 to 450 degrees F .
 3. Density: 1.5 pound per cubic foot.
- B. TYPE E-2: ASTM C612; glass fiber, rigid board, noncombustible with factory applied reinforced foil kraft jacket.
 1. Thermal Conductivity: 0.24 at 75 degrees F .
 2. Operating Temperature Range: 0 to 450 degrees F
 3. Density: 3.0 pound per cubic foot.
 4. Jacket Temperature Limit: minus 20 to 150 degrees F.

- C. TYPE E-3: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket.
1. Thermal Conductivity: 0.27 at 75 degrees F.
 2. Operating Temperature Range: 0 to 650 degrees F .
 3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.
 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- D. TYPE E-4: ASTM C612; semi-rigid, fibrous glass board noncombustible.
1. Thermal Conductivity: 0.27 at 75 degrees F
 2. Operating Temperature Range: 0 to 650 degrees F.
- E. TYPE E-5: ASTM C552 Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Products: Provide the following:
 - a. Cell-U-Foam Corporation; Ultra-CUF.
 - b. Pittsburgh Corning Corporation; Foamglas Super K.
 2. Thermal Conductivity (k-value) at 75°F mean temperature is 0.27 Btu x in./hr. x ft. x degree F. or less.
 3. Block Insulation: ASTM C552, Type I.
 4. Special-Shaped Insulation: ASTM C552, Type III.
 5. Board Insulation: ASTM C552, Type IV.
 6. Preformed Pipe Insulation without Jacket: Comply with ASTM C552, Type II, Class 1.
 7. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C552, Type II, Class 2.
 8. Factory fabricate shapes according to ASTM C450 and ASTM C585.
- F. TYPE E-7: ASTM C533; Type II, hydrous calcium silicate block insulation, asbestos free.
1. Thermal Conductivity: 0.45 at 200 degrees F
 2. Operating Temperature Range: 140 to 1200 degrees F
- G. TYPE E-9: ASTM C612, manmade mineral fiber, noncombustible, Classes 1-4.
1. Thermal Conductivity: 0.25 at 100 degrees F
 2. Maximum Service Temperature: 1200 degrees F

3. Density: 4 pound per cubic foot.

2.9 EQUIPMENT INSULATION JACKETS

A. PVC Plastic Equipment Jacket:

1. Product Description: ASTM D1785, sheet material, off-white color.
2. Minimum Service Temperature: -40 degrees
3. Maximum Service Temperature: 150 degrees F
4. Water Vapor Permeance: ASTM E96 / E96M; 0.02 perms
5. Thickness: 10 mil.
6. Connections Pressure sensitive color matching vinyl tape.

B. Aluminum Equipment Jacket:

1. ASTM B209 Thickness: 0.016 inch thick sheet.
2. Finish: Smooth
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

C. Canvas Equipment Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.

D. Vapor Retarder Jacket:

1. ASTM C921, ASTM C1136 white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Water Vapor Permeance: ASTM E96 / E96M; 0.02 perms.

E. Field Applied Glass Fiber Fabric Jacket System:

1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
2. Glass Fiber Fabric:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Blanket: 1.0 lb/cu ft density.
 - c. Weave: 5 x 5.
3. Indoor Vapor Retarder Finish:
 - a. Cloth: Untreated; 9 oz/sq yd weight.

- b. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.10 EQUIPMENT INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- D. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449 / C449M.
- E. Adhesives: Compatible with insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify piping, and ductwork has been tested before applying insulation materials.
- B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

- A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.
- B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.
- C. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than one hour.
- D. Piping Systems Conveying Fluids Below Ambient Temperature:
 - 1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
 - 2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 - 3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- E. Glass Fiber Board Insulation:
 - 1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
 3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.
- F. Hot Piping Systems less than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
 3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.
- G. Hot Piping Systems greater than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
 3. Insulate flanges and unions at equipment.
- H. Inserts and Shields:
1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
 2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
 - a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
 - b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
 3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.
- I. Insulation Terminating Points:
1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
 2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.
 3. Condensate Piping: Insulate entire piping system and components to prevent condensation.

J. Closed Cell Elastomeric Insulation:

1. Push insulation on to piping.
2. Miter joints at elbows.
3. Seal seams and butt joints with manufacturer's recommended adhesive.
4. When application requires multiple layers, apply with joints staggered.
5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.

K. High Temperature Pipe Insulation:

1. Install in multiple layers to meet thickness scheduled.
2. Attach each layer with bands. Secure first layer with bands before installing next layer.
3. Stagger joints between layers.
4. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

L. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

M. Piping Exterior to Building: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.

N. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

O. Heat Traced Piping Interior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer.

P. Heat Traced Piping Exterior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size insulation large enough to enclose pipe and heat tracer. Cover with aluminum stainless steel jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water.

Q. Prepare pipe insulation for finish painting.

3.3 INSTALLATION - DUCTWORK SYSTEMS

A. Insulated ductwork conveying air below ambient temperature:

1. Provide insulation with vapor retarder jackets.
2. Finish with tape and vapor retarder jacket.

3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- B. Insulated ductwork conveying air above ambient temperature:
1. Provide with or without standard vapor retarder jacket.
 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- C. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
- D. External Glass Fiber Duct Insulation:
1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
 2. Secure insulation without vapor retarder with staples, tape, or wires.
 3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
 4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- E. External Elastomeric Duct Insulation:
1. Adhere to clean oil-free surfaces with full coverage of adhesive.
 2. Seal seams and butt joints with manufacturer's recommended adhesive.
 3. When application requires multiple layers, apply with joints staggered.
 4. Insulate standing metal duct seams with insulation of like material and thickness as adjacent duct surface. Apply adhesive at joints with flat duct surfaces.
 5. Lift ductwork off trapeze hangers and insert spacers.
- F. Duct and Plenum Liner:
1. Adhere insulation with adhesive for 90-100 percent coverage.
 2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.
 3. Seal and smooth joints. Seal and coat transverse joints.
 4. Seal liner surface penetrations with adhesive.

5. Cut insulation for tight overlapped corner joints. Support top pieces of liner at edges with side pieces.
- G. Ducts Exterior to Building:
1. Install insulation according to duct liner paragraph above.
 2. Provide external insulation with vapor retarder jacket. Cover with outdoor jacket finished with caulked aluminum jacket with seams located on bottom side of horizontal duct section.
 3. Finish with aluminum duct jacket.
 4. Calk seams at flanges and joints. Located major longitudinal seams on bottom side of horizontal duct sections.
- H. Prepare duct insulation for finish painting.

3.4 INSTALLATION - EQUIPMENT

- A. Factory Insulated Equipment: Do not insulate.
- B. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- D. Equipment Containing Fluids Below Ambient Temperature:
1. Insulate entire equipment surfaces.
 2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
 3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 4. Finish insulation at supports, protrusions, and interruptions.
- E. Equipment Containing Fluids 140 degrees or Less:
1. Do not insulate flanges and unions, but bevel and seal ends of insulation.
 2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
 3. Finish insulation at supports, protrusions, and interruptions.
- F. Equipment Containing Fluids Over 140 degrees F:
1. Insulate flanges and unions with removable sections and jackets.

2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
 3. Finish insulation at supports, protrusions, and interruptions.
- G. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting or PVC jacket and fitting covers.
- H. Equipment Located Exterior to Building: Install vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal equipment.
- I. Cover insulation with aluminum jacket.
- J. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.
- K. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

3.5 SCHEDULES

A. Cooling Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Chilled Water Supply and Return 40 to 60 degrees F	P-1	Less than 4 inches 4 inches and larger	1.5 3.0
Chilled Water Supply and Return less than 40 degrees F	P-1	3/4 inch and smaller 1 inch to 6 inches 8 inches and larger	1.5 2.0 3.0
Condensate Piping from Cooling Coils	P-5	All sizes	0.5
Refrigerant Suction	P-5	All sizes	1.0
Refrigerant Hot Gas	P-5	All sizes	1.0

B. Heating Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Heating Water Supply and Return 105 to 140 degrees F	P-1	1 inch and smaller Greater than 1 inch	1.0 1.5
Heating Water Supply and Return 141 to 200 degrees F	P-1	Less than 1-1/2 inches 1-1/2 inches and larger	1.5 2.0
Heating Water Supply and Return 201	P-1	Less than 4 inches	2.5

to 250 degrees F		4 inches and larger	3.0
Heating Water Supply and Return 251 to 350 degrees F	P-1	Less than 1 ½ inches 1-1/2 inches and larger	4.0 4.5
Heating Water Supply and Return Above 350 degrees F	P-1	1 inch and less Greater than 1 inch	4.5 5.0
Humidifier Supply Piping	P-1	2 inches and smaller 2-1/2 inches and larger	1.5 2.0
Humidifier Drain Piping	P-1	All sizes	1.0

C. Ductwork Insulation Schedule:

DUCTWORK SYSTEM	INSULATION TYPE	INSULATION THICKNESS inches
Combustion Air	D-2	1.5
Outside Air Intake	D-2	1.5
Equipment Casings	D-2	1.0
Supply Ducts (internally insulated)	D-4 or D-5	1.0
Return Ducts (internally insulated)	D-4 or D-5	1.0
Supply Ducts (externally insulated) Thickness indicated is installed thickness.	D-1 or D-2	1.5
Return Ducts (externally insulated) Thickness indicated is installed thickness.	D-1 or D-2	1.5
Duct Coils	D-1	1.0
Supply Air, Return Air, (exterior to building on roof)	D-2	2.5
Rectangular Supply Ducts Downstream of Variable Air Volume Boxes (internally insulated)	D-4 or D-5	1.0
Rectangular Supply Ducts Downstream of Variable Air Volume Boxes (externally insulated)	D-1 or D-2	1.5
Round Supply Ducts Downstream of Variable Air Volume Boxes (externally insulated)	D-1 or D-2	1.5
Transfer Air Ducts (internally insulated)	D-4 or D-5	1.0

Minimum Pipe Insulation Thickness						
Piping System Type	Temp. Range (°F)	< 1"	1 to < 1.5"	1.5 to < 4"	4" to < 8"	8" and larger
Steam and Steam Condensate	Above 350	4.5	5.0	5.0	5.0	5.0
Steam and Steam Condensate	251-350	3.0	4.0	4.5	4.5	4.5
Steam and Steam Condensate	201-250	2.5	2.5	2.5	3.0	3.0
Steam and Steam Condensate	141-200	1.5	1.5	2.0	2.0	2.0
Steam and Steam Condensate	105-140	1.0	1.5	1.5	1.5	1.5

END OF SECTION

SECTION 23 09 93.11
SEQUENCE OF OPERATIONS FOR HVAC DDC

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 control sequences for DDC for HVAC systems, subsystems, and equipment.

1.3 DEFINITIONS

- A. Analog Output: Proportional output signal (zero- to 10-V dc, 4 to 20 mA).
- B. Binary Output: On/off output signal or contact closure.
- C. DDC: Direct digital control.
- D. Digital Output: Data output that must be interpreted digitally.

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. An instrumentation list for each controlled system. Label each element of the controlled system in table format. Show, in the table element name, type of device, manufacturer, model number, and control device product data sheet number.
 - 2. A complete description of the operation of the control system, including sequences of operation. Include and reference a schematic diagram of the controlled system.
- B. Shop Drawings:
 - 1. Riser diagrams showing control network layout, communication protocol, and wire types.
 - 2. Schematic diagram of each controlled system. Include all control points labeled with point names shown or listed. Show the location of control elements in the system.
 - 3. Wiring diagram for each controlled system. Show all control elements labels. Where a control element is the same as that shown on the control system schematic, label with the same name. Label all terminals.

1.5 MECHANICAL EQUIPMENT CONTROL SEQUENCE

- A. Humidifier:
 - 1. Input:
 - a. Device: Moisture sensor and transmitter.

- b. Location: Space.
 - c. Transference: DDC controller.
- 2. Output:
 - a. Device: Analog output.
 - b. Location: Humidifier.
 - c. Transference: Valve actuator.
- 3. Action:
 - a. Modulate humidity control valve.
 - b. Maintain humidity in straight-line relationship for the following conditions:
 - 1) 20 percent when outdoor-air temperature is minus 30 deg F.
 - 2) 40 percent when outdoor-air temperature is 75 deg F.
- 4. Humidity Limit:
 - a. Input:
 - 1) Device: Moisture sensor and transmitter.
 - 2) Location: Supply airstream.
 - 3) Transference: DDC controller.
 - b. Output:
 - 1) Device: Analog output.
 - 2) Location: Evaporative cooler.
 - 3) Transference: Valve actuator.
 - c. Action:
 - 1) Return humidity control valve and to their normal position.
 - 2) Signal high humidity alarm.
- 5. Space Humidity Reset:
 - a. Input:
 - 1) Device: Moisture sensor and transmitter.
 - 2) Location: Return-air duct.
 - 3) Transference: DDC controller.

- b. Input:
 - 1) Device: Analog output.
 - 2) Location: Cooling-coil control valve.
 - 3) Transference: Valve actuator.
 - c. Action: Reset supply-air temperature to 55 deg F (13 deg C) to maintain space relative humidity of 45 percent.
- B. Two-Pipe, Single-Coil, Fan-Coil Unit:
- 1. Manual Start:
 - a. Input:
 - 1) Device: Fan switch.
 - 2) Location: Integral to thermostat.
 - b. Output:
 - 1) Device: Hard wired.
 - 2) Location: Motor controller.
 - 3) Transference: Starter relay.
 - c. Action: Start and stop fan.
 - 2. Space Temperature:
 - a. Input:
 - 1) Device: Electronic thermostat.
 - 2) Location: Space.
 - b. Output:
 - 1) Device: Low-voltage wiring.
 - 2) Location: Control valve.
 - 3) Transference: Valve.
 - c. Action: Modulate valve to maintain the following space temperature set points:
 - 1) Occupied Cooling Temperature: 75 deg F.
 - 2) Occupied Heating Temperature: 70 deg F.
 - 3) Unoccupied Cooling Temperature: 85 deg F.

- 4) Unoccupied Heating Temperature: 65 deg F.
3. Occupied Time Schedule:
 - a. Input:
 - 1) Device: DDC controller.
 - 2) Location: Time schedule.
 - 3) Transference: DDC controller.
 - b. Output:
 - 1) Device: Binary output.
 - 2) Location: Motor controller.
 - 3) Transference: Starter relay.
 - c. Action: Start and stop fan.
4. Space Temperature:
 - a. Input:
 - 1) Device: Air-temperature sensor.
 - 2) Location: Space.
 - 3) Transference: DDC controller.
 - b. Output:
 - 1) Device: Analog output.
 - 2) Location: Control valve.
 - 3) Transference: Valve actuator.
 - c. Action: Modulate valve to maintain the following space temperature set points:
 - 1) Occupied: 75 deg F.
 - 2) Unoccupied: 65 deg F.
 - d. System Changeover:
 - e. Input:
 - 1) Device: Liquid temperature sensor or liquid temperature sensor with liquid transmitter.
 - 2) Location: Supply-water piping.

- 3) Transference: DDC controller.
 - f. Output:
 - 1) Device: Binary output.
 - 2) Location: Control valve.
 - 3) Transference: Valve actuator.
 - g. Action: Reverse control-valve action to switch from heating to cooling.
- C. Constant-Volume, Terminal Air Units:
- 1. Occupancy:
 - a. Input:
 - 1) Device: Occupancy sensor.
 - 2) Location: Space.
 - 3) Transference: DDC controller.
 - b. Output:
 - 1) Device: DDC controller.
 - c. Action: Report occupancy and enable occupied temperature set point.
 - 2. Space Temperature:
 - a. Input:
 - 1) Device: Air-temperature sensor or air-temperature sensor with air-temperature RTD transmitter.
 - 2) Location: Space.
 - 3) Transference: DDC controller.
 - b. Output:
 - 1) Device: Analog output.
 - 2) Location: Control valve.
 - 3) Transference: Valve actuator.
 - c. Action: Modulate valve to maintain the following space temperature set points:
 - 1) Occupied Cooling Temperature: 75 deg F.
 - 2) Occupied Heating Temperature: 70 deg F.

3) Unoccupied Cooling Temperature: 85 deg F.

4) Unoccupied Heating Temperature: 65 deg F.

D. Indicate the following on the operator's workstation display terminal:

1. DDC system graphic.
2. DDC system on-off indication (operating or not operating).
3. DDC system occupied/unoccupied mode.
4. Outdoor-air-temperature indication.
5. Two-Pipe, Single-Coil, Fan-Coil Unit:
 - a. Space temperature indication.
 - b. Space temperature set point.
 - c. Control-valve position.
 - d. Supply-water temperature indication.
 - e. Space humidity.
6. Four-Pipe, Hydronic Fan-Coil Unit:
7. Constant-Volume Terminal Air Units with Hydronic Coils:
 - a. Space/area served.
 - b. Space occupied/unoccupied.
 - c. Space temperature indication.
 - d. Space temperature set point.
 - e. Space cooling and heating temperature set point, occupied.
 - f. Space cooling and heating temperature set point, unoccupied.
 - g. Air-damper position as percentage open.
 - h. Control-valve position as percentage open.
 - i. Space humidity set point.
 - j. Space humidity.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 23 21 13
HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
- B. Heating water piping, above ground.
 - 1. Equipment drains and over flows.
 - 2. Unions and flanges.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
- B. ASME B16.3 - Malleable Iron Threaded Fittings.
- C. ASME B16.4 - Gray Iron Threaded Fittings.
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
- E. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- F. ASME B31.1 - Power Piping.
- G. ASME B31.9 - Building Services Piping.
- H. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- I. ASTM International:
- J. ASTM A53 / A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- K. ASTM A234 / A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
- L. ASTM A395 / A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
- M. ASTM A536 - Standard Specification for Ductile Iron Castings.
- N. ASTM B32 - Standard Specification for Solder Metal.
- O. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

- P. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
- Q. American Welding Society:
- R. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
- S. AWS D1.1 - Structural Welding Code - Steel.

1.3 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. When joining dissimilar metals piping use Brass ball valve and 6 inch long Brass nipples for 1-1/2 inch and larger. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- B. Provide pipe hangers and supports in accordance with these specifications and drawings.
- C. Flexible Connectors: Use at or near pumps and motor driven equipment where piping configuration does not absorb vibration.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
 - 2. Welding certificates.
 - 3. Qualification Data: For installer.
- B. Shop Drawings: For hydronic piping layout. Include plans, piping layout and elevations, sections, and details for fabrication for pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail locations of anchors, alignment guides, and expansion joints and loops.

Shop Drawing Scale: 1/4 inch per foot.
- C. Delegated-Design Submittal: For hydronic piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Detail fabrication and assembly of seismic restraints.
 - 1. Design Calculations: Calculate requirements for selecting seismic restraints.
 - 2. Comply with the requirements of Section 23 0548, Vibration and Seismic Controls for HVAC Piping and Equipment.

1.5 QUALITY ASSURANCE

- A. Qualification for Welders: Welders performing work under this Contract shall be certified and qualified in accordance with tests prescribed by the National Certified Welding Bureau (NCWB) or by other approved test procedures using methodology and procedures covered in the ASME Boiler and Pressure Vessel Code, Section IX, "Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators."
- B. Submit for approval the names, identification, and welder's assigned number, letter or symbol of welders assigned to this project.
- C. The assigned identification symbol shall be used to identify the work of each welder and shall be marked with an indelible paint marking pen upon completion of each weld.
- D. Welders shall be tested and certified for all positions, per NCPWB or AWS.
- E. Submit identifying stenciled test coupons made by each operator to NCPWB or AWS when testing is required.
- F. Any or all welders may be required to retake welding certification tests without additional expense.
- G. When so requested, a welder shall not be permitted to work as a welder on this project until he has been recertified in accordance with NCPWB or AWS.
- H. Recertification of the welder shall be made after the welder has taken and passed the required tests.
- I. When piping 1-1/2 in. and smaller is butt or socket welded, follow NCPWB or AWS testing procedures, or submit three samples of test welds for approval.
- J. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- K. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
- L. Certify that each welder has passed NWPCB or AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 HEATING WATER PIPING, ABOVE GROUND

- A. Steel Pipe: ASTM A53 / A53M, Schedule 40 black steel with plain ends; welded and seamless, Grade B.
- B. Fittings: ASME B16.3, Class 150, malleable iron or ASTM A234 / A234M, forged steel welding type.

- C. Joints: Threaded for pipe 2 inches and smaller; welded for pipe 2-1/2 inches and larger.
- D. Copper Tubing: ASTM B88, Type L drawn (Alternate pipe material for heating water piping, NPS 2 and Smaller).
- E. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
- F. Joints: Solder, lead free, ASTM B32, Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.
- G. Press-connect Fittings: Bronze or copper shall conform to the material requirements of ASME B16.18 or ASME B16.22, and the performance requirements of IAPMO PS117, and ICC/ANSI LC1002 and NSF/ANSI 61-pw (if used in a potable water system.) Press-connect fittings 1/2-inch thru 4-inch for use with ASTM B88 copper tube shall have an EPDM sealing element, and an un-pressed fitting, leak identification feature. 2-1/2-inch thru 4-inch shall have a 420 stainless steel grip ring, PBT separator ring, and EPDM sealing element. Sealing elements shall be verified for the intended use. Contractor shall be trained by a factory authorized representative and provide verification of training to the LAWA Inspector.

2.2 EQUIPMENT DRAINS AND OVERFLOWS

- A. Steel Pipe: ASTM A53 / A53M Schedule 40, galvanized.
- B. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
- C. Joints: Threaded for pipe 2 inches and smaller; flanged for pipe 2-1/2 inches and larger.
- D. Copper Tubing: ASTM B88, Type DWV or L, drawn (alternate pipe material for equipment drains and overflows, NPS 2 and Smaller).
- E. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
- F. Joints: Solder, lead free, ASTM B32.

2.3 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Ferrous Piping: Class 150, malleable iron, threaded.
 - 2. Copper Piping: Class 150, bronze unions with soldered joints.
 - 3. Dissimilar Materials: Brass ball valve and 6 inch long Brass nipple.
- B. Flanges for Pipe 2-1/2 inches and Larger:
 - 1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
 - 2. Copper Piping: Class 150, slip-on bronze flanges.

3. Gaskets: 1/16 inch thick preformed neoprene gaskets.
4. Dissimilar Materials: Brass ball valve and 6 inch long Brass nipple.

PART 3 - EXECUTION

3.1 INSTALLATION - INSERTS

- A. Provide inserts for placement in concrete forms.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger, casting anchor or anchor inserts.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

3.2 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Support piping in accordance with the requirements of Section 23 05 29, Hangers and Supports for HVAC Piping and Equipment.
- B. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 1. NPS 3/4: maximum span, 7 feet with 3/8-inch rod.
 2. NPS 1: Maximum span, 7 feet with 3/8-inch rod.
 3. NPS 1-1/2: Maximum span, 9 feet with 3/8-inch rod.
 4. NPS 2: Maximum span, 10 feet.
 5. NPS 2-1/2: Maximum span, 11 feet with 1/2-inch rod.
 6. NPS 3: Maximum span, 12 feet with 1/2-inch rod.
 7. NPS 4: Maximum span, 12 feet with 5/8-inch rod.
 8. NPS 6: Maximum span, 12 feet with 3/4-inch rod.
 9. NPS 8 and Larger: Maximum span, 12 feet with 7/8-inch rod.
- C. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
 1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.

5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 7. NPS 3 and larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.
- D. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - E. Place hangers within 12 inches of each horizontal elbow, 12 inches from end of fitting.
 - F. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - G. Support vertical piping at every floor, roof and at 10 foot intervals between floors. Support riser piping independently of connected horizontal piping.
 - H. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
 - I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- 3.3 INSTALLATION - ABOVE GROUND PIPING SYSTEMS
- A. Route piping parallel to building structure and maintain gradient.
 - B. Install piping to conserve building space, and not interfere with use of space.
 - C. Group piping whenever practical at common elevations.
 - D. Sleeve pipe passing through partitions, walls and floors.
 - E. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.
 - F. Install pipe identification.
 - G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
 - H. Contractor shall provide access where valves and fittings are not exposed.
 - I. Horizontal hydronic piping to run level. Drain systems at low points. Use eccentric reducers or concentric to reduce pipe, maintain top of pipe aligned, when possible.
 - J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
 - K. Prime unfinished pipe, fittings, supports, and accessories, ready for finish painting.
 - L. Install valves with stems upright or horizontal, not inverted.

- M. Insulate piping as required.
- N. Install control valves furnished by Integrated Building Systems Contractor. Refer to Section 25 5000, Integrated Building System.
- O. Install flow sensors, switches and meters furnished by the Integrated Building System Contractor. Refer to Section 25 50 00, Integrated Building System.
- P. Install pressure and temperature wells and sockets furnished by the Integrated Building system Contractor. Refer to Section 25 50 00, Integrated Building System.

3.4 FIELD QUALITY CONTROL

- A. Test all piping to at least 150% of working pressure for minimum of two hours.

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests on hydronic piping:
 - 1. Verify that pipe is clean and free of debris and has been completed.
 - 2. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 3. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 - 4. Isolate expansion tanks and determine that hydronic system is full of water.
 - 5. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 - 6. After hydrostatic test pressure has been applied for at least 2 hours, with system valves capped and pressure apparatus disconnected, and no change in test pressure, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components and repeat hydrostatic test until there are no leaks.
 - 7. Prepare written report of testing.

3.6 ADJUSTMENT AND CLEANING

- A. Cleaning:

1. During construction, prevent entry of foreign matter, clean pipe, fittings, and valves internally and hammer welds to remove all loose dirt, mill scale, metal chips, weld beads rust and harmful substances. Flush piping system with clear water prior to connection to coils, control valves and equipment. Install temporary strainer or by-pass piping around factory cleaned components such as coils, control valves and equipment where piping system is not flushed prior to connection. Remove temporary strainer or by-pass piping before the Owner's final acceptance.
2. Flush with clear water and seal ends after cleaning.
3. Water Systems:
 - a. Open all valves, drains, vents and strainers at all system levels.
 - b. Remove plugs, caps, spool pieces and components to facilitate early debris discharge from system.
 - c. Isolate or protect clean systems components including pumps and pressure vessels and remove any component that may be damaged. Install temporary strainer where necessary.
 - d. Flush bottoms of risers.
 - e. After start-up flushing, fill with clean water, add products recommended by water treatment supplier to remove adherent organic soil, hydrocarbon flux, pipe mill varnish, joint compounds, rust and harmful substances not removed by initial flushing.
 - f. Circulate water of each system at respective design flow rates for at least 8 hours.
 - g. At end of 8 hour period, remove and clean strainers and blow off low point, then completely drain out entire systems of cleaning solution.
 - h. Refill systems with clean water and circulate for an additional 4 hour period and, at the end of that interval, completely drain systems, operate all valves to dislodge debris.
 - i. Drain, refill with clear water and circulate, and provide water treatment as directed by the water treatment company.

END OF SECTION

SECTION 23 21 16
HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes special-duty valves and specialties for the following:

Heating water piping.

1. Makeup-water piping.
2. Condensate-drain piping.
3. Blowdown-drain piping.
4. Air-vent piping.
5. Safety-valve-inlet and -outlet piping.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
- B. Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
1. Air-control devices.
 2. Hydronic specialties.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.5 QUALITY ASSURANCE

- A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- B. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

- A. Performance requirements in this article are for the piping system. Individual components may have higher pressure or temperature ratings.

2.2 VALVES

- A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Section 23 05 23, General-Duty Valves for HVAC Piping.
- B. Large plastic butterfly valves may have reduced pressure ratings.
- C. Bronze, Calibrated-Orifice, Balancing Valves:
- D. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong Pumps, Inc.
 - a. Bell & Gossett Domestic Pump.
 - b. Flow Design Inc.
 - c. Gerand Engineering Co.
 - d. Griswold Controls.
 - e. Nexus Valve, Inc.
 - f. Taco.
 - 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.
- E. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:
- F. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong Pumps, Inc.

- a. Bell & Gossett Domestic Pump.
 - b. Flow Design Inc.
 - c. Gerand Engineering Co.
 - d. Griswold Controls.
 - e. Nexus Valve, Inc.
 - f. Taco.
2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.
- G. Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.
- H. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AMTROL, Inc.
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump.
 - c. Conbraco Industries, Inc.
 - d. Spence Engineering Company, Inc.
 - e. Watts Regulator Co.
 2. Body: Bronze or brass.
 3. Disc: Glass and carbon-filled PTFE.
 4. Seat: Brass.

5. Stem Seals: EPDM O-rings.
 6. Diaphragm: EPT.
 7. Low inlet-pressure check valve.
 8. Inlet Strainer: Bronze or brass, removable without system shutdown.
 9. Valve Seat and Stem: Noncorrosive.
 10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.
- I. Diaphragm-Operated Safety Valves: ASME labeled.
- J. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AMTROL, Inc.
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump.
 - c. Conbraco Industries, Inc.
 - d. Spence Engineering Company, Inc.
 - e. Watts Regulator Co.
 2. Body: Bronze or brass.
 3. Disc: Glass and carbon-filled PTFE.
 4. Seat: Brass.
 5. Stem Seals: EPDM O-rings.
 6. Diaphragm: EPT.
 7. Wetted, Internal Work Parts: Brass and rubber.
 8. Inlet Strainer: Bronze or brass, removable without system shutdown.
 9. Valve Seat and Stem: Noncorrosive.
 10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.
- I. Mud Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. M&H Valve Co.
 - a. Penn-Troy Manufacturing, Inc.
 - b. Trumbull Industries, Inc.
 - c. Waterman Industries
3. Description: Heavy duty flanged type designed to provide a positive seal under both seating and unseating head conditions. Valves shall be guaranteed against stem galling for the life of the valve. Stems shall not be coated.
4. Non-rising stem, stainless steel with rolled threads.
5. Frame, Plug, Operating Stem, and Yoke: Stainless steel.
6. Plug base shall have no thru holes as to prevent any possible leak path.
7. Seamless molded plug seat, tapered resilient ring of BUNA-N, designed to accurately mate with the seat ring for a positive seal.
8. Plug stem with hydraulic relief slots to prevent sediment from building up in plug stem area.
9. Plug base shall have no thru holes.
10. Accessories:
 - Extended valve operating stainless steel stems.
 - a. Wall brackets, adjustable with stainless steel stem guides.
 - b. Handwheels with floor stands.

2.3 AIR-CONTROL DEVICES

- A. Air vents aid in system filling. Air removal after initial startup is accomplished by air separator or boiler dip-tube.
- B. Leakage from automatic air vents may cause damage to ceilings and other finished surfaces. Manual air vents may be preferred over automatic air vents in finished spaces.
- C. Manual Air Vents:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 2. AMTROL, Inc.
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump.
 - c. Nexus Valve, Inc.

- d. Taco, Inc.
- 3. Body: Bronze.
- 4. Internal Parts: Nonferrous.
- 5. Operator: Screwdriver or thumbscrew.
- 6. Inlet Connection: NPS 1/2.
- 7. Discharge Connection: NPS 1/8.
- 8. CWP Rating: 150 psig.
- 9. Maximum Operating Temperature: 225 deg F.
- D. Automatic Air Vents:
- E. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AMTROL, Inc.
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump.
 - c. Nexus Valve, Inc.
 - d. Taco, Inc.
 - 2. Body: Bronze or cast iron.
 - 3. Internal Parts: Nonferrous.
 - 4. Operator: Noncorrosive metal float.
 - 5. Inlet Connection: NPS 1/2.
 - 6. Discharge Connection: NPS 1/4.
 - 7. CWP Rating: 150 psig.
 - 8. Maximum Operating Temperature: 240 deg F.
- F. Bladder-Type Expansion Tanks:
- G. 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:
 - 1. AMTROL, Inc.
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump.

- c. Taco, Inc.
 - 2. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature. Factory test after taps are fabricated and supports installed and are labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
 - 3. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
 - 4. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.
- H. Tangential-Type Air Separators:
- I. Basis of Design: Subject to compliance with requirements, provide product indicated on the Drawings or by one of the following:
- 1. AMTROL, Inc.
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump.
 - c. Taco, Inc.
 - 2. Tank: Welded steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg F maximum operating temperature.
 - 3. Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank.
 - 4. Tangential Inlet and Outlet Connections: Threaded for NPS 2 and smaller; flanged connections for NPS 2-1/2 and larger.
 - 5. Blowdown Connection: Threaded.
 - 6. Size: Match system flow capacity.
- J. Air and Dirt Eliminators:
- K. Basis of Design: Subject to compliance with requirements, provide products indicated on the Drawings or by one of the following:
- 1. Bell & Gossett Domestic Pump
 - a. Spirotherm
 - b. Taco, Inc.
 - c. Thrush Company, Inc..
 - 2. Units shall be designed and constructed in accordance with ASME Section VIII, Div. 1.
 - 3. Minimum Working Pressure: 150 psig.

4. Inlet Design Velocity: Up to 10 feet per second.
5. Units shall include manufacturers proprietary filtration internal system.
6. Units shall be capable of removing 100% of the free air, 100% of the entrained air, and up to 99.6% of the dissolved air in the system fluid. Dirt separation shall be at least 80% of all particles 30 micron or larger within 100 passes.
7. Provide separate venting chamber with integral full port float actuated brass venting mechanism.
8. Provide valved side tap to flush floating dirt or liquids.
9. Units for condenser water system shall have a top removable cover to inspect and clean the media.
10. Provide a signed independent 3rd party test certificate verifying performance data in accordance with manufacturer's published data.

2.4 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: Stainless-steel, 40 -mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 125 psig.

B. Expansion Fittings: Comply with requirements in Section 23 0516 Expansion Fittings and Loops for HVAC Piping.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
- B. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
- C. Install check valves at each pump discharge and elsewhere as required to control flow direction.
- D. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.
- E. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.2 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
- B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.
- C. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain.
- D. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

END OF SECTION

SECTION 23 22 13
STEAM AND CONDENSATE HEATING PIPING

PART 1 - GENERAL

1.1 OVERVIEW

- A. Purpose: USC preferences and requirements are indicated in this document.
- B. For other related requirements, refer to Section 23 05 16.
- C. Additional Information:
 - 1. For the purpose of this guideline, this section pertains to the following services: steam and steam condensate piping.
 - 2. This section covers only clauses unique to steam-related piping.

1.2 SUMMARY

- A. Section includes pipe and fittings for low pressure steam and condensate piping:
 - 1. Steel pipe and fittings.
- B. Related Requirements:
 - 1. Section 23 22 16 "Steam and Condensate Heating Piping Specialties".

1.3 PROCEDURAL REQUIREMENTS

- A. Design considerations specific to components in this section:
 - 1. Required:
 - a. New piping systems shall be designed to avoid exceeding the pressure drop and velocity criteria at specified locations as listed below. Existing piping systems affected by retrofit shall maintain the current velocity in the system (by calculation) or meet the criteria noted below, whichever is greater. Refer to Section 23 0000 for testing "pre-read" requirements for retro-fit applications. Building Laterals from Site Utility Source.
 - b. Building Laterals from Site Utility Source:
 - 1) 2 feet/100 feet.
 - 2) 4,000 FPM
 - c. Building Risers and Floor Level Main Headers:
 - 1) 3 feet/100 feet.
 - 2) 4,000 FPM

- d. Equipment Branches/Circuits or Sub-Headers:
 - 1) 4 feet/100 feet
 - 2) 4,000 FPM
 - e. Pre-manufactured/Pre-packaged valve sets with combination valves or configurations that cannot be field-dismantled are not allowed. This clause does not preclude pre-fabricated valve sets built up out of individual components separated with flanges or unions.
 - f. Only 90-degree fittings/transitions shall be used for steam piping and the elbows shall be of long-radius type.
- 2. Preferred: No preferences
 - 3. Disallowed:
 - a. No 45-degree fittings/ transitions allowed for steam piping.
- B. Quality Assurance requirements beyond standard 1-year warranty: None required.
- 1.4 ACTION SUBMITTALS
- A. Product Data: For each type of the following:
 - 1. Steel pipe and fitting.
 - B. Delegated-Design Submittal:
 - 1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, and attachments of the same to the building structure.
 - 2. Locations of pipe anchors.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Coordination Drawings: Piping layout, drawn to scale, on which the following items are shown and coordinated with each other.
 - B. Qualification Data: For Installer.
 - C. Welding certificates.
 - D. Field quality-control reports.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications:
 - B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - C. Pipe Welding: Qualify procedures and operators according to the following:

1. ASME Compliance: Comply with ASME B31.9, "Building Services Piping for materials, products, and installation.
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:
 1. LP Steam Piping: 8 psig operating pressure
 2. Condensate Piping: 250 deg.
 3. Blowdown-Drain Piping: Equal to pressure of the piping system to which it is attached.
 4. Air-Vent and Vacuum-Breaker Piping: Equal to pressure of the piping system to which it is attached.
 5. Safety-Valve-Inlet and -Outlet Piping: Equal to pressure of the piping system to which it is attached.

2.2 STEEL PIPE AND FITTINGS

- A. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- B. Wrought-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 1. Material Group: 1.1.
 2. Facings: Raised face.
- C. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, black steel of same Type, Grade, and Schedule as pipe in which installed.

PART 3 - EXECUTION

3.1 LP STEAM PIPING APPLICATIONS

- A. LP Steam Piping, NPS 2 and Smaller, Schedule 40, Type S, Grade B, steel pipe; Class 150 wrought-steel fittings; and welded and flanged joints. Domestic schedule 40 black seamless.
- B. LP Steam Piping, NPS 2-1/2 through NPS 12, Schedule 40, Type S, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints. Domestic schedule 40 black seamless.
- C. Condensate piping above grade, NPS 2 and smaller, shall be

1. Schedule 80, Type S, Grade B, steel pipe; Class 150 wrought-steel fittings; and weld and flanged joints. Domestic Schedule 80 Black (welded).

3.2 ANCILLARY PIPING APPLICATIONS

- A. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.
- B. Vacuum-Breaker Piping: Outlet, same as service where installed.
- C. Safety-Valve-Inlet and -Outlet Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping to permit valve servicing.
- C. Install piping free of sags and bends.
- D. Install fittings for changes in direction and branch connections.
- E. Install piping to allow application of insulation.
- F. Select system components with pressure rating equal to or greater than system operating pressure.
- G. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- H. Install drains, consisting of a drain valve with cap, at low points in piping system mains and elsewhere as required for system drainage.
- I. Install steam supply piping at 1 inch per 10 feet in direction of steam flow.
- J. Install condensate return piping at 2 percent downward in direction of condensate flow.
- K. Reduce pipe sizes using eccentric reducer fitting installed with level side down (refer to mechanical drawings).
- L. Install valves according to the following Sections or other Sections as needed:
 1. Section 23 05 23 "General Duty Valves for HVAC Piping."
- M. Install unions and flanges in piping as indicated.
- N. Install shutoff valve as indicated.
- O. Install strainers, control valve, and traps as indicated. Install NPS 3/4 nipple and full port ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blow off connection for strainers smaller than NPS 2.

P. Comply with requirements in Section 23 05 53 "Identification for HVAC Piping and Equipment" for identifying piping.

Q. Install drip leg as indicated.

1. Size drip legs same size as main.

3.4 STEAM AND CONDENSATE PIPING SPECIALTIES INSTALLATION

A. Comply with requirements in Section 23 22 16 "Steam and Condensate Heating Piping Specialties" for installation requirements for strainers, special-duty valves, steam traps and vacuum breakers.

3.5 HANGERS AND SUPPORTS

A. Comply with requirements in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment" for installation of hangers and supports. Comply with requirements below for maximum spacing.

3.6 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

D. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Size for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install traps and control valves in accessible locations.

C. Install vacuum breakers downstream from control valve.

3.8 FIELD QUALITY CONTROL

A. Prepare steam and condensate piping according to] ASME B31.9, "Building Services Piping," and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.

2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.

3. Flush system with clean water. Clean strainers.

4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
- B. Testing Agency: A qualified testing agency to perform tests and inspections per codes and industry standards
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 2. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength.
 3. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
- E. Perform hydronic cleaning per codes and industry standards.
- F. Prepare test, inspection and hydronic cleaning reports.

END OF SECTION

SECTION 23 22 16
STEAM AND CONDENSATE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 OVERVIEW

- A. Purpose: USC preferences and requirements are indicated in this document.
- B. For other related requirements, refer to Sections 23 05 23 and 23 22 13. For steam and condensate meters, refer to independent controls guidelines.

1.2 SUMMARY

- A. Section includes the following piping specialties for steam and condensate piping:
 - 1. Strainers.
 - 2. Check valves.
 - 3. Safety valves.
 - 4. Steam traps.
 - 5. Vacuum breakers.
 - 6. Control valves.

1.3 PROCEDURAL REQUIREMENTS

- A. Design considerations specific to components in this section:
 - 1. Required:
 - a. Safety valves and pressure vessels shall bear the appropriate ASME label per Boiler and Pressure Vessel Code: Section VIII, Division 1.
 - 1) Safety Valves
 - 2) Pressure Reducing Valves
 - b. The specialties shall be rated for pressure equal to the pressure of the piping system to which it is attached, and safety valves shall be sized as required benchmarked against the associated equipment's normal operating pressure and input capacity.
 - c. Design documents shall state the minimum working pressures, temperatures and safety valve setpoints for each system.
 - d. Only 90-degree fittings/transitions shall be used for steam piping and the elbows shall be of long-radius type.
 - 2. Preferred: None

- 3. Disallowed:
 - a. No 45-degree fittings/ transitions allowed for steam piping.
- B. Quality Assurance requirements beyond standard 1-year warranty: None required.
- 1.4 ACTION SUBMITTALS
 - A. Product Data: For each type of product.
 - 1. Strainer.
 - 2. Valve.
 - 3. Steam trap.
 - 4. Vacuum breaker.
 - 5. Control valve.
- 1.5 CLOSEOUT SUBMITTALS
 - A. Operation and Maintenance Data: For valves, safety valves, steam traps, and vacuum breakers, to include in emergency, operation, and maintenance manuals.
- 1.6 QUALITY ASSURANCE
 - A. Pipe Welding: Qualify procedures and operators according to the following:
 - 1. ASME Compliance: Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp flash tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

- 2.1 PRODUCT REQUIREMENTS
 - A. Specialties:

1. Manufacturers:
 - a. Required: No requirements.
 - b. Preferred:
 - 1) Spirax Sarco (in particular, Spirax Sarco steam traps must be utilized)
 - 2) Armstrong
 - 3) Watts
 - 4) Kunkle Valve
 - 5) Hoffman Specialties.
 - c. Disallowed: None.
2. Component Characteristics:
 - a. Required:
 - 1) Provide the following materials and joints for the following valves:

Service	Valve Type	Size	Material	Joining Method
Low Pressure Steam (LPS) Steam Condensate (CR)	Check	≤2-inch	Cast Iron	Screwed
		≥2 ½-inch	Steel	Flanged
	Strainer	≤2-inch	Steel	Screwed
	Strainer	≥2 ½-inch	Steel	Flanged

- 2) The following specialties shall be used:

Y pattern strainers	250 CWP rating Stainless steel mesh Blow off plug.	Threaded ends 2-inches and below, flanged ends for larger sizes. Provide blowdown connection with drain line, hose bibb, cap and chain.
Basket strainers	250 CWP rating Stainless steel mesh.	Threaded ends 2" and below, flanged ends for larger sizes. Provide blowdown connection with drain line, hose bibb, cap and chain.
Valves	Alloy disc, fully enclosed steel spring.	Adjustable pressure range and positive shutoff, factory set and sealed.

Cast-Iron Safety Valves	Class 250, forged copper alloy disc with bronze nozzle, fully enclosed cadmium-plated steel spring.	Raised flange connections, adjustable pressure range and positive shutoff, factory set and sealed.
Float and Thermostatic Traps	Cast iron with bolted cap, balanced pressure type, stainless steel head and seat, stainless steel bellows with vacuum breaker.	Threaded connections, capable of withstanding 45°F or superheat and resisting water hammer without sustaining damage. Provide with trap monitoring system.
Vacuum Breakers	Stainless steel body, stainless steel sealing ball, retainer, spring and screen.	Threaded connections.

b. Preferred: No preferences.

c. Disallowed: None.

B. Flexible Connectors:

1. Manufacturers:

a. Required: No requirements.

b. Preferred:

1) Hyspan Precision Industries.

2) Mason Industries.

- 3) Metraflex Company.
 - c. Disallowed: None.
 - 2. Component Characteristics:
 - a. Required:
 - 1) Stainless steel bellows with woven, flexible bronze wire-reinforced protective jacket.
 - 2) Capable of 3/4 inch misalignment.
 - 3) Threaded or flanged connections to match equipment requirements.
 - b. Preferred: No preferences.
 - c. Disallowed: None.
- 2.2 PERFORMANCE REQUIREMENTS
- A. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:
- 1. LP Steam Piping: 8 psig operating pressure
 - 2. Condensate Piping: 250 deg .
 - 3. Blowdown-Drain Piping: Equal to pressure of the piping system to which it is attached.
 - 4. Air-Vent and Vacuum-Breaker Piping: Equal to pressure of the piping system to which it is attached.
 - 5. Safety-Valve-Inlet and -Outlet Piping: Equal to pressure of the piping system to which it is attached.
- 2.3 STRAINERS
- A. Y-Pattern Strainers:
- 1. Body: ASTM A 126, Class B cast iron, with bolted cover and bottom drain connection.
 - 2. End Connections: Threaded ends for strainers NPS 2 and smaller; flanged ends for strainers NPS 2-1/2 and larger.
 - 3. Strainer Screen: Stainless-steel, mesh strainer or perforated stainless-steel basket.
 - 4. Tapped blow off plug.
 - 5. CWP Rating: 250-psig working steam pressure.
- B. Basket Strainers:
- 1. Body: ASTM A 126, Class B cast iron, with bolted cover and bottom drain connection.

2. End Connections: Threaded ends for strainers NPS 2 and smaller; flanged ends for strainers NPS 2-1/2 and larger.
3. Strainer Screen: Stainless-steel, mesh strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 250-psig working steam pressure.

2.4 STOP-CHECK VALVES

A. Stop-Check Valves:

1. Body and Bonnet: Malleable iron.
2. End Connections: Flanged.
3. Disc: Cylindrical with removable liner and machined seat.
4. Stem: Brass alloy.
5. Operator: Outside screw and yoke with cast-iron handwheel.
6. Packing: PTFE-impregnated packing with two-piece packing gland assembly.
7. Pressure Class: 250.

2.5 STEAM TRAPS

A. Float and Thermostatic Steam Traps:

1. Spirax Sarco model FT-15
2. Body and Bolted Cap: ASTM A 126 cast iron.
3. End Connections: Threaded.
4. Float Mechanism: Replaceable, stainless steel.
5. Head and Seat: Hardened stainless steel.
6. Trap Type: Balanced pressure.
7. Thermostatic Bellows: Stainless steel or monel.
8. Thermostatic air vent capable of withstanding 45 deg F of superheat and resisting water hammer without sustaining damage.
9. Vacuum Breaker: Thermostatic with phosphor bronze bellows, and stainless-steel cage, valve, and seat.
10. Maximum Operating Pressure: 125 psig

2.6 VACUUM BREAKERS

A. Vacuum Breakers:

1. Body: Cast iron, bronze, or stainless steel.
2. End Connections: Threaded.
3. Sealing Ball, Retainer, Spring, and Screen: Stainless steel.
4. O-Ring Seal: Ethylene propylene rubber.
5. Pressure Rating: 125 psig
6. Maximum Temperature Rating: 350 deg F

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Required:

1. Specialties shall be installed at the following locations (also refer to PID & 3D views in mechanical drawings):

Shut off valves	At Branch connections. At Steam supply connections. At outlet of steam traps. Upstream of each dielectric fitting.	Install unions at valves 2-inches and small, flanges for larger pipe sizes.
Strainers	At supply side of control valves. Upstream of pressure reducing valves. At steam traps.	Install ¾-inch nipple and full port ball valve in blowdown connection for strainers 2" and large, match pipe size for smaller sizes.
Safety Valves	Downstream of pressure reducing valve.	Pipe discharge piping without valves to nearest floor drain. For valves larger than 2.5-inches, install exhaust head with drain to waste.
Float and thermostatic trap – for all heat exchangers, modulating.	As close as possible to connected equipment.	Install full port ball valve, strainer and union upstream of trap, union, check valve and full port ball valve downstream.
Control Valves.	Provided by equipment manufacturer.	Installed by equipment manufacturer by field install per their instructions
Vacuum Breakers.	Downstream from Control Valve.	Install close to equipment inlet connection.
Check Valves.	Downstream from steam traps, yet prior to isolation valve on condensate side.	

B. Preferred:

1. Strainers on steam systems to be installed in a horizontal configuration, so as to avoid potential accumulation of condensate a low point in piping system.

C. Disallowed: None

3.2 VALVE APPLICATIONS

A. Install shutoff duty valves as indicated in mechanical drawings.

B. Install safety valves on pressure-reducing stations and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install safety-valve discharge piping, without valves, to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

3.3 PIPING INSTALLATION

A. Install piping to permit valve servicing.

B. Install drains, consisting of a drain valve with cap, at low points in piping system mains and elsewhere as required for system drainage.

C. Install valves according to Section 230523 "General Duty Valves for HVAC Piping,".

D. Install unions in piping as indicated.

E. Install flanges in piping, as indicated.

F. Install shutoff valve as indicated.

G. Install strainers, control valve, traps as indicated. Install nipple and full-port ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blow-off connection for strainers smaller than NPS 2.

3.4 STEAM-TRAP INSTALLATION

A. Install steam traps as indicated.

3.5 EVALUATION OR COMMISSIONING

A. List of items or systems requiring testing, evaluation, verification, or commissioning; required items:

1. Safety Valves.
2. Pressure Reducing Valves.

B. Documentation required:

1. ASME label and listing: Safety Valves, Pressure-Reducing Valves.

C. Required testing protocols: None

END OF SECTION

SECTION 23 31 13
HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Flush flat seam rectangular ducts and fittings.
4. Sheet metal materials.
5. Flexible Ducts.
6. Insulated flexible ducts.
7. Casings.
8. Duct Sealants and Gaskets.
9. Hangers and Supports.
10. Seismic Restraint Devices.

1.2 REFERENCES

A. ASTM International: Provide appropriate references.

B. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

C. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - HVAC Air Duct Leakage Test Manual.
2. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

D. Underwriters Laboratories Inc.:

1. UL 181 - Factory-Made Air Ducts and Connectors.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with the latest edition of the City of Santa Ana Mechanical Code and SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" section of this specification.
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in the Code and OWNER Airport Structural Design Standards. Subject to compliance, SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems" may be followed.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2013.

1.4 SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Sealants and gaskets.
 - 2. Other factory made items specified herein.
- B. Shop Drawings:
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
 - 3. Elevation of top and bottom of ducts.
 - 4. Dimensions of main duct runs from building grid lines.
 - 5. Fittings.
 - 6. Penetrations through fire-rated and other partitions.
 - 7. Equipment installation based on equipment being used on Project, including curbs and bases.
 - 8. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
- C. Delegated-Design Submittal:
 - 1. Factory- and shop-fabricated ducts and fittings min. scale 1/4".
 - 2. Reinforcement and spacing.
 - 3. Seam and joint construction.
 - 4. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

5. Sheet metal thicknesses.
 6. Joint and seam construction and sealing.
 7. Reinforcement details and spacing.
 8. Materials, fabrication, assembly, and spacing of hangers and supports.
 9. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports and seismic restraints.
- D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
 2. Suspended ceiling components.
 3. Structural members to which duct will be attached.
 4. Size and location of initial access modules for acoustical tile.
 5. Penetrations of smoke barriers and fire-rated construction.
 6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.
- E. Welding certificates.
- F. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SINGLE-WALL 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.

2.2 SINGLE-WALL 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.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McGill AirFlow LLC.
 - b. SEMCO Incorporated.
 - c. Spiral Manufacturing Co., Inc.

2.3 FLUSH FLAT SEAM 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, except use sheet metal 2 gauge numbers heavier than required for classification with normal standing seam construction.

2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with the City of Santa Ana Mechanical Code and 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 A653/A653M.
 - 1. Galvanized Coating Designation: minimum G60 or minimum G90 for exposed ductwork.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A480/A480M, 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.
- D. Aluminum Sheets: Comply with ASTM B209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- E. Reinforcement Shapes and Plates: ASTM A36/A36M, 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.
- 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.

2.5 FLEXIBLE DUCTS

- A. Manufacturers:

1. Flexmaster USA, Inc.
2. Hart & Cooley Inc.
3. Casco

B. Product Description: Two ply vinyl film supported by helical wound spring steel wire.

1. Pressure Rating: 1.5 inches water gauge (WG) positive and 0.5 inches WG negative.
2. Maximum Velocity: 4000 fpm.
3. Temperature Range: -10 degrees F to 160 degrees F.

2.6 INSULATED FLEXIBLE DUCTS

A. Manufacturers:

1. Flexmaster USA, Inc.
2. Hart & Cooley Inc.
3. Casco

B. Product Description: Two ply vinyl film supported by helical wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.

1. Pressure Rating: 1.5 inches WG positive and 0.5 inches WG negative.
2. Maximum Velocity: 4000 fpm.
3. Temperature Range: -10 degrees F to 160 degrees F.
4. Thermal Resistance: Comply with ASHRAE 90.1-2013 or most recent version.

2.7 CASINGS

A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and construct for required operating pressures.

B. Reinforce access door frames with steel angles tied to horizontal and vertical plenum supporting angles. Furnish hinged access doors where indicated or required for access to equipment for cleaning and inspection. Furnish clear wire glass observation ports, minimum 6 x 6 inch size.

2.8 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 C920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer, 1/8 inch thick of width to match angle connection.

2.9 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. Duct Attachments: All duct attachments and anchors to structure shall be designed and selected to meet Code requirements and OWNER Airport Structural Design Standards.
- E. Trapeze and Riser Supports:
 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Galvanized-steel shapes and plates with protection against dissimilar metals.

3. Supports for Aluminum Ducts: Aluminum or galvanized-steel shapes and plates with protection against dissimilar metals.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Install round ducts in maximum practical lengths.
- B. Install ducts with fewest possible joints.
- C. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- D. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- E. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- F. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- G. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- H. 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.
- I. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- J. Ducts that traverse smoke zones shall be fabricated of sheet metal gauges conforming to NFPA 90A.
- K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with the requirements of the City of Santa Ana Green Code, SMACNA's "Duct Cleanliness for New Construction Guidelines," and/or the manufacturer's recommendations, whichever are more stringent.
- L. Duct Openings:
 1. Provide openings in ducts where required to accommodate thermometers, smoke detectors, control devices, sensors, and devices. Install same though airtight rubber grommets.
 2. Provide pilot tube openings where required for testing of systems. Each opening shall be complete with a metal cap, with a spring device or screw to ensure against air leakage.
 3. At openings in insulated ducts, install insulation material inside metal ring.

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. 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, at junctions and at maximum intervals of 12 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 INSTALLATION OF DUCTS OUTDOORS

- A. Ducts shall be made completely watertight.
- B. Construct ducts as follows to assure water run-off.
 - 1. Arrange standing seams so as not to act as dams.
 - 2. Erect ducts with longitudinal seams at bottom of duct.
 - 3. Slope entire top of duct down towards side.
 - 4. Provide vertical struts within duct to bow tap panels of duct into convex shape.
 - 5. Erect ducts with mastic sealant within sheet metal joints.

3.5 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 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.

3.6 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 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. Extend strap supports down both sides of ducts and turn under bottom at least 1 inch. Secure hanger to sides and bottom of ducts with sheet metal screws.
- 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.

- G. Avoid penetrations of ducts. Provide airtight rubber grommets at unavoidable penetrations of hanger rods.

3.7 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."
 - 1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 2. Brace a change of direction longer than 12 feet.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the OWNER 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 applications and hot-dip galvanized or stainless-steel anchors for applications exposed to weather.

3.8 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.9 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Test the following systems:
 - a. Ducts with a Pressure Class Higher Than 3-Inch WG: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
 - 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 4. Test for leaks before applying external insulation.
 - 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 - 6. Give seven days' advance notice for testing.
- C. Duct System Cleanliness Tests:
 - 1. Visually inspect new and/or existing duct systems to ensure that no visible contaminants are present.
 - 2. For existing duct, 5 years and older, test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- D. Duct system will be considered defective if it does not pass tests and/or inspections.
- E. Prepare test and inspection reports.

3.11 DUCT CLEANING

- A. Clean ductwork that fails the cleanliness test and/or inspections before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
1. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 2. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 3. Coils and related components.
 4. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 5. Supply-air ducts, dampers, actuators, and turning vanes.
 6. Dedicated exhaust and ventilation components and makeup air systems.
- E. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.

5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.12 START UP

- A. Air Balance: Comply with requirements in Section "Testing, Adjusting, and Balancing for HVAC."
- B. Comply with Commissioning Requirements.

3.13 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
 1. Outdoor, Exposed to Weather Ducts: Type 304, stainless steel sheet, watertight.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Back-draft dampers.
2. Backdraft and pressure relief dampers.
3. Barometric relief dampers.
4. Combination fire/smoke dampers.
5. Duct access doors.
6. Static fire dampers.
7. Ceiling fire dampers.
8. Volume control dampers.
9. Flexible duct connections.
10. Dial thermometers.
11. Static pressure gauges.
12. Motorized control dampers.
13. Louvers.
14. Air flow measuring stations.
15. Turning vanes.

1.2 REFERENCES

A. Air Movement and Control Association International, Inc.:

1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

B. ASTM International:

1. ASTM E1 - Standard Specification for ASTM Thermometers.

C. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air- Conditioning Systems.
 3. NFPA 92A - Recommended Practice for Smoke-Control Systems.
 - D. Sheet Metal and Air Conditioning Contractors' National Association:
 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
 - E. Underwriters Laboratories Inc.:
 1. UL 555 - Standard for Safety for Fire Dampers.
 2. UL 555C - Standard for Safety for Ceiling Dampers.
 3. UL 555S - Standard for Safety for Smoke Dampers.
- 1.3 SUBMITTALS
- A. Product Data: Submit data for shop fabricated assemblies and hardware used.
 - B. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.
 1. Fire dampers including locations and ratings.
 2. Combination Fire-Smoke dampers including locations and ratings.
 3. Backdraft dampers.
 4. Flexible duct connections.
 5. Volume control dampers.
 6. Duct access doors.
 7. Duct test holes.
 - C. Product Data: For fire dampers and combination fire/smoke dampers submit the following:
 1. Include UL ratings, dynamic ratings, leakage, pressure drop and maximum pressure data.
 2. Indicate materials, construction, dimensions, and installation details.
 3. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.
 - D. Manufacturer's Installation Instructions: Submit for Fire and Combination Smoke/Fire Dampers.
 - E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

PART 2 - PRODUCTS

2.1 BACK-DRAFT DAMPERS

A. Manufacturers:

1. Greenheck.
2. Ruskin.
3. Pottorf.

B. Product Description: Multi-Blade, back-draft dampers: Parallel-action, gravity-balanced, Galvanized 16 gauge thick steel, or extruded aluminum. Blades, maximum 6 inch width, with felt or flexible vinyl sealed edges. Blades linked together in rattle-free manner with 90- degree stop, steel ball bearings, and plated steel pivot pin. Furnish dampers with adjustment device to permit setting for varying differential static pressure.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck.
2. Ruskin.
3. Pottorf.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm (10 m/s).

D. Maximum System Pressure: 2-inch WG (0.5 kPa).

E. Frame: 0.063-inch- (1.6-mm-) thick extruded aluminum, with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch (150-mm) width, 0.050-inch- (1.2-mm-) thick aluminum sheet noncombustible, tear-resistant, neoprene-coated fiberglass with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene, mechanically locked.

I. Blade Axles:

1. Material: Stainless steel.
2. Diameter: 0.20 inch (5 mm).

J. Tie Bars and Brackets: Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. 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.
6. Sleeve Thickness: 20-gauge (1.0-mm) minimum.
7. Sleeve Length: 6 inches (152 mm) minimum.
8. Screen Mounting: Rear mounted.
9. Screen Material: Aluminum.
10. Screen Type: Insect.
11. 90-degree stops.

2.3 BAROMETRIC RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck.
 2. Ruskin.
 3. Pottorf.
- B. Suitable for horizontal or vertical mounting.
- C. Maximum Air Velocity: 2000 fpm (10 m/s).
- D. Maximum System Pressure: 2-inch WG (0.5 kPa).
- E. Frame: 0.063-inch- (1.6-mm-) thick extruded aluminum, with welded corners and mounting flange.
- F. Blades:
1. Multiple, 0.050-inch- (1.2-mm-) thick aluminum sheet.
 2. Maximum Width: 6 inches (150 mm).
 3. Action: Parallel.
 4. Balance: Gravity.
 5. Eccentrically pivoted.

- G. Blade Seals: Neoprene.
- H. Blade Axles: Galvanized steel.
- I. Tie Bars and Brackets:
 - 1. Material: Aluminum.
 - 2. Rattle free with 90-degree stop.
- J. Return Spring: Adjustable tension.
- K. Bearings: Stainless steel.
- L. Accessories:
 - 1. Flange on intake.
 - 2. Adjustment device to permit setting for varying differential static pressures.

2.4 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers:
 - 1. Greenheck.
 - 2. Ruskin.
 - 3. Pottorf.
- B. Fire Resistance: 1-1/2 hours or 3 hours Conform to UL 555.
- C. Leakage Rating: Class I, maximum of 8 cfm at 4 inches WG differential pressure.
- D. Damper Temperature Rating: 250 degrees F.
- E. Frame: 16 gauge, galvanized steel.
- F. Blades:
 - 1. Style: Airfoil-shaped, single piece, double skin.
 - 2. Action: Opposed.
 - 3. Orientation: Horizontal.
 - 4. Material: Minimum 14 gauge equivalent thickness, galvanized steel.
 - 5. Width: Maximum 6 inches.
- G. Bearings: Stainless steel pressed into frame.
- H. Seals: Silicone blade edge seals and flexible stainless steel jamb seals.
- I. Linkage: Concealed in frame.

- J. Release Device: Close in controlled manner and allow damper to be automatically reset.
- K. Actuator:
 - 1. Type: Electric 120 volt, 60 hertz, two-position, fail close or Electric 24 volt, 60 hertz, two-position, fail close as shown on drawings.
 - 2. Mounting: External or Internal.
- L. Fusible Link Release Temperature: 165 degrees F.
- M. Finish: Mill galvanized.
- N. Factory installed sleeve and mounting angles. Furnish silicone caulk factory applied to sleeve at damper frame to comply with leakage rating requirements.

2.5 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. American Warming and Ventilating.
 - 2. Pottorf.
 - 3. McGill.
- B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch thick insulation with sheet metal cover.
 - 1. Less than 12 inches square, secure with sash locks.
 - 2. Up to 18 inches Square: Furnish two hinges and two sash locks.
 - 3. Up to 24 x 48 inches: Three hinges and two compression latches.
 - 4. Larger Sizes: Furnish additional hinge.
 - 5. Access panels with sheet metal screw fasteners are not acceptable.

2.6 FIRE DAMPERS

- A. Manufacturers:
 - 1. Greenheck.
 - 2. Ruskin.
 - 3. Pottorf.
- B. Fire Rating: UL 555 classified, curtain type, and labeled as a 1-1/2 or 3 hour static fire damper.
- C. Air Flow Rating: UL approved for dual directional air flow.
- D. Integral Sleeve Frame: Minimum 20 gauge by 12 inches roll formed, galvanized steel.

1. Factory Sealant: Apply to dampers in HVAC systems with pressures to maximum 4 inches WG.

E. Blades:

1. Style: Curtain type, in airstream.
2. Action: Spring or gravity closure upon fusible link release.
3. Orientation: Horizontal.
4. Material: Minimum 24 gauge roll formed, galvanized steel.

F. Closure Springs: Type 301 stainless steel, constant force type, if required.

G. Temperature Release Device:

1. Fusible link, 165 degrees F.
2. Mounting: Vertical or Horizontal as shown on the drawings.

H. Finish: Mill galvanized.

I. Picture Frame Mounting Angles:

1. One-piece, roll formed retaining angles as detailed.
2. Factory matched and shipped attached to damper.

2.7 CEILING FIRE DAMPERS

A. Manufacturers:

1. Greenheck.
2. Ruskin.
3. Pottorf.

B. Fire Rating: UL 555C classified and labeled as a 1-1/2 hour ceiling damper.

C. Air Flow Rating: UL approved for dual directional air flow.

D. Frame: Galvanized steel with roll formed ridge for blade stop.

E. Blades:

1. Style: Two-piece, single-thickness with blade insulation, hinged in center, and held open with fusible link.
2. Action: Butterfly.
3. Orientation: Horizontal.
4. Material: Minimum 20 gauge galvanized steel.

- F. Hinge: Spring stainless steel, mechanically attached to blades.
- G. Mounting: Horizontal.
- H. Temperature Release Device: Fusible link, 165 degrees F.
- I. Finish: Mill galvanized.
- J. Performance Data:
 - 1. Pressure Drop: Maximum 0.1 inches w.g. at 500 fpm across 18 x 18 inch damper.
- K. Fusible Volume Adjust: UL classified.

2.8 VOLUME CONTROL DAMPERS

- A. Manufacturers:
 - 1. Greenheck.
 - 2. Ruskin.
 - 3. Pottorf.
- B. Splitter Dampers:
 - 1. Material: Same gauge as duct to 24 inches size in both dimensions, and two gauges heavier for sizes over 24 inches.
 - 2. Blade: Fabricate of double thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 - 3. Operator: Minimum 1/4 inch diameter rod in self-aligning, universal joint action, flanged bushing with set screw.
 - 4. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
- C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware.
- D. Quadrants:
 - 1. Furnish locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches furnish regulator at both ends.

2.9 FLEXIBLE DUCT CONNECTIONS

- A. Manufacturers:
 - 1. Duro Dyne Inc.

2. Ventfabrics.
 3. Ward Industries
- B. Connector: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd.
 2. Net Fabric Width: Approximately 3 inches wide.
 3. Metal: 3 inch wide, 24 gauge galvanized steel.
- C. Lead vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs. per sq ft, 10 dB attenuation in the 10 to 10,000 Hz range.

2.10 DIAL THERMOMETERS

- A. Manufacturers:
1. Ashcroft.
 2. Terice.
 3. Watts.
- B. Thermometer: ASTM E1, stainless steel case, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.
1. Size: 3 inch diameter dial.
 2. Lens: Clear Lexan.
 3. Accuracy: 1 percent.
 4. Calibration: Degrees F.

2.11 STATIC PRESSURE GAUGES

- A. Manufacturers:
1. Ashcroft.
 2. Terice.
 3. Watts.
- B. Dial Gauges: 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front calibration adjustment, 2 percent of full scale accuracy.
- C. Inclined Manometer: Plastic with red liquid on white background with black figures, front calibration adjustment, 3 percent of full scale accuracy.

- D. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

2.12 MOTORIZED CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by BAS vendor or one of the following:
 - 1. Greenheck.
 - 2. Ruskin Company.
 - 3. Pottorf.
- B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- C. Frames:
 - 1. Hat shaped.
 - 2. Stainless-steel channels, 0.064 inch (1.62 mm) thick.
 - 3. Mitered and welded corners.
- D. Blades:
 - 1. Multiple blades with maximum blade width of 8 inches (200 mm).
 - 2. Opposed-blade design.
 - 3. Stainless steel.
 - 4. 0.064 inch (1.62 mm) thick.
 - 5. Blade Edging: Closed-cell neoprene edging.
 - 6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
- E. Blade Axles: 1/2-inch- (13-mm-) diameter; stainless 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 (minus 40 to plus 93 deg C).
- F. Bearings:
 - 1. Stainless-steel sleeve.
 - 2. Dampers in ducts with pressure classes of 3-inch WG (750 Pa) 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.
 - 4. Damper Motors: Modulating action.

2.13 LOUVERS

- A. Connect to louvers furnished under General Construction work.

2.14 AIR FLOW MEASURING STATIONS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ruskin, IAQ Measuring Damper, Model AML3.
 - 2. Air Monitor Corp.
 - 3. Wetmaster Co.
- B. Description: Factory fabricated unit with casing, velocity traverse section and sensors, companion volume meter, and interconnection to volume meter. Air monitoring station must be accurate within 5percent between 350 and 400 fpm free area velocity. Air flow resistance not to exceed 0.04" WG at 1000 fpm face velocity.
- C. Casing: 0.064 inch (1.62 mm) thick welded galvanized sheet steel, with flanged ends to match connecting ductwork.
- D. Velocity Traverse Section:
 - 1. Copper static pressure sensors.
 - 2. Copper total pressure sensing manifolds and control averaging manifold.
 - 3. Operation: Equalizing and integrating all sensor measurements into one total pressure and one static pressure metering port.
 - 4. Sensors positioned on equal-area traverse principle.
 - 5. Aluminum honeycomb air straightener.
- E. Volume Meter:
 - 1. Dry dial and diaphragm-actuated type.
 - 2. Calibrated in CFM (cu cm/sec) and FPM (m/s).
 - 3. Provided with mounting bracket.
- F. Install nameplate for each station to indicate:
 - 1. Unit size and unit designation.
 - 2. Design air quantity.
 - 3. Design air flow.
 - 4. Design air velocity.

2.15 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. Metalaire.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized steel, aluminum or stainless steel sheet, to match duct material; 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.
- C. 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.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."
- E. Vane Construction: Double wall.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install back-draft dampers on exhaust fans or exhaust ducts nearest to outside.
- B. Access Doors:
 - 1. Install access doors at the following locations:
 - a. On both sides of duct coils.
 - b. Upstream and downstream from duct filters.
 - c. At outdoor-air intakes and mixed-air plenums.
 - d. At drain pans and seals.
 - e. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - f. 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.
 - g. At each change in direction and at maximum 50-foot spacing.

- h. Upstream and downstream from turning vanes.
 - i. Upstream or downstream from duct silencers.
 - j. Control devices requiring inspection, including smoke detection heads.
 - k. At fan bearings enclosed in ducts.
 - l. Inlet side of each single width centrifugal fan.
 - m. Install at locations for cleaning kitchen exhaust ductwork in accordance with NFPA 96.
 - 2. Install access doors with swing against duct static pressure.
 - 3. Access Door Sizes:
 - a. One-Hand or Inspection Access: 8 by 5 inches.
 - b. Two-Hand Access: 12 by 6 inches.
 - c. Head and Hand Access: 18 by 12 inches.
 - d. Head and Shoulders Access: 21 by 14 inches.
 - e. Body Access: 25 by 14 inches.
 - f. Body plus Ladder Access: 25 by 17 inches.
 - 4. Label access doors according to Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
 - 5. Mark access doors for fire and smoke dampers on outside surface, with minimum 1/2 inch high letters reading: FIRE/SMOKE DAMPER, SMOKE DAMPER, OR FIRE DAMPER.
- C. Flexible Connectors.
- 1. Install flexible connectors at duct connections to equipment, at building expansion joints, at connections between ducts of dissimilar metals and at penetrations of mechanical equipment room walls.
 - 2. Install flexible connections with 2 inches slack in fabric and minimum movement of 1 inch.
 - 3. For fans developing static pressures of 5-inch WG and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- D. Flexible Ducts
- 1. Installation of flexible ducts shall comply with the Santa Ana Mechanical Code or the manufacturer's recommendations, whichever is more stringent.
 - 2. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws. Attach to supply air duct with low entrance loss, bellmouth type connector at air inlet end.

- E. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.
- F. Install wire mesh screen grilles at return air ducts in hung ceilings and in other places where indicated. Bolt grilles to flanged connections or ducts at terminations.
- G. Install louvers in building construction at locations where indicated. Coordinate mounting details with particular building construction and/or window framing details. Install blank-off panels at unused portions of louvers; secured with bolts and/or screws.
- H. Air Flow Measuring Stations
 - 1. Install air flow measuring stations where indicated, or as directed by engineer.
 - 2. Install all interconnecting tubing between measuring station, companion meter and control systems, in accordance with the manufacturer's printed instructions.
- I. Install temporary duct test holes and required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- J. Install fire dampers and combination fire and smoke dampers at required locations. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
 - 1. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.
 - 2. Install dampers square and free from racking with blades running horizontally.
 - 3. Do not compress or stretch damper frame into duct or opening.
 - 4. Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jack shaft.
 - 5. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.
- K. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- L. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts and as indicated. 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.
 - 1. Install volume dampers at the following locations:
 - a. At all splits, except grease exhaust ducts.
 - b. In ducts serving single supply, return and exhaust outlets.
 - c. In open return ducts above ceiling.

- d. In ducts connecting to a common plenum.
 - e. Where required for balancing.
2. Install remote damper operators for volume dampers above ceilings which are non-accessible or without access panels.
 3. Install steel volume dampers in steel ducts.
 4. Install aluminum volume dampers in aluminum ducts.
 5. Do not install volume dampers in grease ducts.

END OF SECTION

SECTION 23 36 00
AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
- B. Shut-off, single duct, air terminal units

1.2 REFERENCES

- A. American Refrigeration Institute:
- B. ARI 880 - Air Terminals.
- C. ARI 885 - Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.
- D. National Electrical Manufacturers Association:
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- F. National Fire Protection Association:
- G. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- H. Underwriters Laboratories Inc.:
- I. UL 181 - Factory-Made Air Ducts and Connectors.
- J. American Society of Heating, Refrigerating, and Air-Conditioning Engineers.
- K. ASHRAE Standard 62.1 - Ventilation for Acceptable Indoor Air Quality.

1.3 SUBMITTALS

- A. Product Data: Submit data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings indicating airflow, static pressure, heating coil capacity and NC designation. Include electrical characteristics and connection requirements. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 1 inch to 4 inches WG.
- B. Manufacturer's Installation Instructions: Submit support and hanging details, and service clearances required.
- C. Delegated Design Submittal:

- D. Submit drawings and details for material, fabrication, assembly, and spacing of hangers and supports for specified Variable Volume Terminal Units.
 - 1. Submit design calculations, including analysis data signed and sealed by the qualified registered professional engineer responsible for their preparation, for selecting hangers and supports and seismic restraints.
 - 2. Comply with requirements for seismic-restraint vibration isolation devices in Section 23 0548 Vibration and Seismic Controls for HVAC Piping and Equipment.

1.4 CLOSEOUT SUBMITTALS

- A. Execution and Closeout Requirements:
- B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.

1.5 WARRANTY

- A. Minimum one-year warranty from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SINGLE DUCT VARIABLE VOLUME AIR TERMINAL UNITS

- 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:
 - 1. Anemostat.
 - 2. Price
 - 3. Titus.
- B. Product Description: Variable air volume terminal units for connection to central air systems, with electronic controls and hot water heating coils.
- C. Identification: Furnish each air terminal unit with identification label and airflow indicator. Include unit nominal airflow, maximum factory-set airflow and minimum factory-set airflow and coil type.
- D. Basic Assembly:
 - 1. Casings: Minimum 22 gauge galvanized steel.
 - 2. Lining: Minimum 1 inch thick neoprene or vinyl coated glass fiber insulation, 1.5 lb./cu ft density, meeting NFPA 90A requirements and UL 181 erosion requirements. Liner shall be an EPA registered antimicrobial protection product.
 - 3. Plenum Air Outlets: S slip-and-drive connections.

E. Basic Unit:

1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
2. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings; maximum damper leakage: 2 percent of design air flow at 3 inches inlet static pressure.

F. Round Outlet: Discharge collar matching inlet size.

G. Hot Water Heating Coil:

1. Construction: 1/2 inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig pressure, factory installed. Refer to VAV terminal unit schedule on the drawings.

2.2 VARIABLE AIR VOLUME TERMINAL UNIT CONTROLS

- A. Variable Volume Air Terminal Unit Controllers shall be furnished in accordance with the requirements of Section 25 5000, Integrated Building System (IBS) and shall be furnished to the Variable Air Volume Terminal manufacturer for installation on each terminal unit. Variable Air Volume Terminal Unit Manufacturer shall factory test not less than 25% of all terminal units with IBS Controller installed to verify terminal unit operation as designed.
- B. Variable Air Volume Terminal Unit manufacturer shall coordinate with IBS Contractors to insure that controls are compatible with pneumatic inlet velocity sensor supplied by the terminal unit manufacturer. The sensor shall be multi point center averaging type with four measuring ports parallel to the take off point of the sensor. Sensors with measuring ports in series are not acceptable. The sensor shall provide a minimum differential pressure signal of 0.03 inches WG at an inlet velocity of 500 fpm.
- C. Controls shall be factory set for unit size and the scheduled minimum and maximum flow rates.
 1. The terminal air unit manufacturer shall provide Class II, 24 VAC transformer and disconnect switch. Actuator shall be direct connection shaft mount type without linkage. All controls shall be installed in approved NEMA1 sheet metal enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install ceiling access doors or locate units above easily removable ceiling components.
- B. Support units individually from structure. Do not support from adjacent ductwork.

3.2 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.

- B. Complete installation and startup checks according to manufacturer's written instructions.
 - 1. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
 - 2. Verify that controls and control enclosure are accessible.
 - 3. Verify that control connections are complete.
 - 4. Verify that nameplate and identification tag are visible.
 - 5. Verify that controls respond to inputs as specified.

3.3 TRAINING

- A. See Specification 01 79 00 Demonstration and Training for demonstration and training requirements.
- B. Engage a factory-authorized service representative to train the Owner Maintenance personnel to adjust, operate and maintain Air Terminal Units.
- C. Training shall include minimum of 8 Owner personnel for 24 hours, 8 hours shall be classroom training per person and 16 hours shall be hands-on training per person.

END OF SECTION

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Diffusers.
 - 2. Registers
 - 3. Grilles.

PART 2 - PRODUCTS

2.1 ROUND CEILING DIFFUSERS

- A. Manufacturers:
 - 1. Anemostat.
 - 2. Price.
 - 3. Titus.
- B. Product Description: Type: Round, adjustable pattern, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern, with sector baffles where indicated. Diffuser collar not more than 1 inch above ceiling. In plaster ceilings, furnish plaster ring and ceiling plaque.
- C. Fabrication: Steel or aluminum with baked enamel off-white finish.

2.2 RECTANGULAR CEILING DIFFUSERS

- A. Manufacturers:
 - 1. Anemostat.
 - 2. Price.
 - 3. Titus.
- B. Type: Square and rectangular, adjustable pattern, multi-louvered diffuser.
- C. Frame: To match the architectural surface.
- D. Fabrication: Steel or Aluminum with baked enamel off-white finish.

2.3 PERFORATED FACE CEILING DIFFUSERS

- A. Manufacturers:

1. Anemostat.

2. Price.

3. Titus.

B. Type: Perforated face with fully adjustable pattern and removable face.

C. Frame: To match architectural surface.

D. Fabrication: Steel or aluminum with steel frame and baked enamel off-white finish.

2.4 CEILING SLOT DIFFUSERS (LINEAR)

A. Manufacturers:

1. Anemostat.

2. Price.

3. Titus.

B. Type: Continuous with size and number of slots and adjustable vanes for left, right or vertical discharge.

C. Fabrication: Aluminum extrusions or Steel with factory finish and color to be selected by architect.

D. Frame: To match architectural surface.

2.5 CEILING SUPPLY REGISTERS/GRILLES

A. Manufacturers:

1. Anemostat.

2. Price.

3. Titus.

B. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection.

C. Frame: 1 inch margin with countersunk screw mounting and gasket.

D. Fabrication: Steel or aluminum extrusions with factory off-white enamel finish unless noted otherwise.

E. Damper: Integral, gang-operated, opposed-blade type with removable key operator, operable from face.

2.6 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Manufacturers:

1. Anemostat.
 2. Price.
 3. Titus.
- B. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees.
- C. Frame: 1 inch margin with countersunk screw mounting.
- D. Fabrication: Steel with 20 gauge minimum frames and 22 gauge minimum blades, steel and aluminum with 20 gauge minimum frame, or aluminum extrusions, with factory off-white baked enamel finish.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

2.7 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

- A. Manufacturers:
1. Anemostat.
 2. Price.
 3. Titus.
- B. Type: Fixed grilles of 1/2 x 1/2 x 1 inch louvers.
- C. Fabrication: Steel or aluminum with off-white finish.
- D. Frame: 1 inch margin with countersunk screw mounting. Channel lay-in frame for suspended grid ceilings.

2.8 CEILING LINEAR EXHAUST AND RETURN GRILLES

- A. Manufacturers:
1. Anemostat.
 2. Price.
 3. Titus.
- B. Type and materials to match those provided for supply air.

2.9 WALL SUPPLY REGISTERS/GRILLES

- A. Manufacturers:
1. Anemostat.
 2. Price.

3. Titus.

- B. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, double deflection.
- C. Frame: 1 inch margin with countersunk screw mounting and gasket.
- D. Fabrication: Steel with 20 gauge minimum frames and 22 gauge minimum blades, steel and aluminum with 20 gauge minimum frame, or aluminum extrusions, with factory off-white baked enamel finish.
- E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.10 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Manufacturers:

- 1. Anemostat.
- 2. Price.
- 3. Titus.

- B. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, horizontal face.
- C. Frame: 1 inch margin with countersunk screw mounting.
- D. Fabrication: Steel or aluminum with 20 gauge minimum frames and 22 gauge minimum blades, with factory off-white baked enamel finish.
- E. Damper (only if specifically called for on drawings): Integral, gang-operated, opposed-blade type with removable key operator, operable from face.

2.11 LINEAR WALL REGISTERS/GRILLES

A. Manufacturers:

- 1. Anemostat.
- 2. Price.
- 3. Titus.

- B. Type: Streamlined blades with 15 degree deflection, 1/8 x 3/4 inch on 1/4 inch centers.
- C. Frame: 1 inch margin with countersunk screw mounting and gasket.
- D. Fabrication: Steel or aluminum extrusions, with factory off-white enamel finish.
- E. Damper: Integral gang-operated opposed blade hinged single blade damper with removable key operator, operable from face.

2.12 LOUVERED PENTHOUSE

- A. Manufacturers:
 - 1. Greenheck.
 - 2. Industrial Louvers Inc.
 - 3. Ruskin.
- B. Fabrication: Completely welded assembly. Fabricate with mitered corners. Structural supports rated for 20 psf wind and snow loading. Furnish sill water catch with 2 inch high water stop and depth to enclose structural supports.
- C. Roof: Aluminum construction, standing seam type with formed water baffle plates open at corners for drainage.
- D. Bird Screen: Interwoven wire mesh of aluminum, 0.063 inch diameter wire, 1/2 inch open weave.
- E. Roof Curb: 12 inch high self-flashing galvanized steel construction with continuously welded seams 1 inch insulation and curb bottom, hinged curb adapter.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: 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 OWNER for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.
- D. Carefully install all ceiling mounted air distribution devices back pan insulation and vapor barrier. Where pre-molded insulation and vapor barrier is not furnished as an accessory to the air distribution device by the manufacturer the Contractor is responsible for field installation of insulation and vapor barrier for ceiling air distribution device back pans.
- E. All visible interior surfaces of all grilles and air device accessories and components visible through the face of the outlet shall be factory painted flat black.
- F. Install a manual volume damper in the branch duct to the air distribution device or at the conical bell-mouth spin-in fitting for connection of round flexible duct to the rectangular duct for balancing purposes.
- G. Provide all required blank off for directional pattern.
- H. Diffusers Utilizing a Plenum Box: Provide plenum box fabricated of 24 USBG galvanized steel, with internal surfaces lined with minimum 1/2 inch thick duct liner.
- I. Install return and exhaust registers with blades oriented to prevent sight through outlets.
- J. Transfer Grilles: Provide 2 grilles, one on each side of wall with connecting sheet metal collar.

K. Transfer Ducts: Provide 2 grilles, one at each end of duct.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles before starting air balancing.

END OF SECTION

SECTION 23 82 19
FAN COIL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes fan coil units and accessories.

1.2 DEFINITIONS

- A. BAS: Building Automation System.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories, a schedule documenting radiated, inlet, and discharge sound pressure levels per octave band center frequency at the operating conditions scheduled.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection and associated values.
1. Wiring Diagrams: Power, signal, and controls wiring.
- C. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Ceiling suspension components.
 2. Structural members to which fan coil units will be attached.
 3. Method of attaching hangers to building structure.
 4. Size and location of initial access modules for acoustical tile.
 5. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 6. Perimeter moldings for exposed or partially exposed cabinets.
- D. Samples for Initial Selection: For units with factory-applied color finishes.

- E. Samples for Verification: For each type of fan coil unit indicated.
- F. Manufacturer Seismic Qualification Certification: Submit certification that fan coil units, accessories, and components will withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment." Include the following:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. 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 and the unit will be fully operational after the seismic event."
 - 3. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- G. Field quality-control test reports.
- H. Operation and Maintenance Data: For fan coil units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Maintenance schedules and repair part lists for motors, coils, integral controls and filters.
- I. Warranty: Special warranty specified in this Section.

1.4 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. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1- Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. ARI Compliance: Rated and tested in accordance with ARI Standard 440 "Room Fan Coil Units."
- E. UL listed and labeled in accordance with ANSI/UL Standard 880 - "Safety Standard for Fan Coil Units."
- F. All units must be tested in accordance with ARI 350 "Sound rating of Non-Ducted indoor Air-Conditioning Equipment"

1.5 COORDINATION

- A. Coordinate layout and installation of fan coil units and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- B. Coordinate size and location of wall sleeves for outdoor-air intake.
- C. Specific configuration of the supply and return ductwork and piping at each unit has been indicated on the drawings. If the configuration of the units furnished on the project differs from that indicated on the drawings (whether or not the units furnished are the specific units or an acceptable substitute), it shall be the contractor's responsibility to modify ductwork, piping, etc., as required to accommodate the actual configuration of units furnished on the project.

1.6 WARRANTY

- A. Furnish minimum 1 year from date of final acceptance.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fan coil unit Filters: Furnish two spare filters for each filter installed.
 - 2. Fan Belts: Furnish two spare fan belts for each unit installed.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Manufacturer shall be responsible for examining applications of each type of unit to assure that each will operate properly in the intended application.
- B. Unit sizes are shown as selected in accordance with the principles set forth in the ASHRAE Guide and Manufacturer's literature.
- C. All items of a given type shall be the products of the same manufacturer.

2.2 FAN COIL UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
- B. Manufacturers
 - 1. Carrier Corporation.
 - 2. Trane.
 - 3. Johnson Controls.
- C. Description: Factory-packaged, completely assembled and -tested units rated according to ARI 440, ASHRAE 33, and UL 1995.

- D. Coil Section Insulation: 1-inch (25-mm) thick, foil-covered, closed-cell foam complying with ASTM C1071 and attached with adhesive complying with ASTM C916.
 - 1. Fire-Hazard Classification: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E84.
 - 2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1
- E. Main and Auxiliary Drain Pans: Stainless steel. Fabricate pans and drain connections to comply with ASHRAE 62.1
- F. Chassis: 18 gauge galvanized steel casing withstanding 125 hour salt spray test per ASTM B117. Floor-mounted units shall have leveling screws.
- G. Cabinet: 18 gauge galvanized steel casing withstanding 125 hour salt spray test per ASTM B117 with baked-enamel finish in manufacturer's custom paint color as selected by Architect.
 - 1. Vertical Unit Front Panels: Removable, steel, with steel discharge grille and channel-formed edges, cam fasteners, and insulation on back of panel.
 - 2. Horizontal Unit Bottom Panels: Fastened to unit with cam fasteners and hinge and attached with safety chain; with integral stamped discharge grilles.
 - 3. Stack Unit Discharge and Return Grille: Aluminum double-deflection discharge grille and louvered- or panel-type return grille; color as selected by Architect from manufacturer's custom colors. Return grille shall provide maintenance access to fan coil unit.
 - 4. Steel recessing flanges for recessing fan coil units into ceiling or wall.
- H. Outdoor-Air Wall Box: Minimum 0.1265-inch- thick, aluminum, rain-resistant louver and box with integral eliminators and bird screen.
 - 1. Louver Configuration: Horizontal, rain-resistant louver.
 - 2. Louver Material: Aluminum.
 - 3. Bird Screen: 0.5-inch mesh screen on interior side of louver.
 - 4. Decorative Grille: On outside of intake.
 - 5. Finish: Anodized aluminum, color as selected by Architect from manufacturer's custom colors.
- I. Outdoor-Air Damper: Galvanized-steel blades with edge and end seals and nylon bearings; with electronic, modulating actuators.
- J. Filters: Minimum air resistance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
 - 1. Recirculating fan coil units require pre-filter and MERV 13 final filter,

2. Fan coil units with outside air connections refer to Division 23 Section 23 40 00 "HVAC Air Cleaning Devices" for requirements that include activated carbon filters.
- K. Hydronic Coils: 0.375 in. diameter, copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.
- L. Fan and Motor:
1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Galvanized steel or aluminum wheels, and aluminum, or galvanized-steel fan scrolls.
 2. Motor: Permanently lubricated, variable speed resiliently mounted on removable motor board. Comply with electrical equipment requirements of Division 23 Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
 3. Wiring Termination: Connect motor to chassis wiring with twist lock plug connection.
- M. Unit Control Box: Integral unit cabinet to include:
1. Fan starter and electric heating coil circuit breakers.
 2. Disconnect switches
 3. Control circuit transformer for 24 volt control circuit, fused on primary and secondary sides.
 4. All controls factory installed and prewired.
 5. Single point power entry
 6. Numbered Terminal strips.
- N. Factory, Hydronic Piping Package: ASTM B88, Type L (ASTM B88M, Type B) copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet, and outlet.
1. Two-way, modulating control valve for dual-temperature coil.
 2. Hose Kits: Minimum 400-psig working pressure, and operating temperatures from 33 to 211 deg F Tag hose kits to equipment designations.
 3. Length: 36 inches.
 4. Minimum Diameter: Equal to fan coil unit connection size.
 5. Two-Piece Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600 psig minimum CWP rating and blowout-proof stem.
 6. Calibrated-Orifice Balancing Valves: Bronze body, ball type; 125 psig working pressure, 250 deg F maximum operating temperature; with calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, threaded ends, and equipped with a memory stop to retain set position.

7. Automatic Flow-Control Valve: Brass or ferrous-metal body; 300 psig working pressure at 250 deg F with removable, corrosion-resistant, tamperproof, self-cleaning piston spring; factory set to maintain constant indicated flow with plus or minus 10 percent over differential pressure range of 2 to 80 psig
 8. Y-Pattern Hydronic Strainers: Cast-iron body (ASTM A126, Class B); 125 psig working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 0.5inch hose-end, full- port, ball-type blowdown valve in drain connection.
 9. Wrought-Copper Unions: ASME B16.22.
 10. Risers: ASTM B88, Type L (ASTM B88M, Type B) copper pipe with hose and ball valve for system flushing.
- O. Control devices and operational sequences are specified in Division 25 Sections "Terminal Building Automation System".
- P. Basic Unit Controls:
1. Control voltage transformer.
 2. Wall-mounting thermostat with the following features:
 - a. Heat-cool-off switch.
 - b. Fan on-auto switch.
 - c. Fan-speed switch.
 - d. Automatic changeover.
 - e. Adjustable dead band.
 - f. Exposed set point.
 - g. Exposed indication.
 - h. Degree F indication.
 3. Wall-mounting temperature sensor.
 4. Unoccupied-period-override push button.
 5. Data entry and access port.
 - a. Input data includes room temperature, and humidity set points and occupied and
 - b. unoccupied periods.
 - c. Output data includes room temperature and humidity, supply-air temperature, entering-water temperature, operating mode, and status.

Q. DDC Terminal Controller:

1. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.
2. Unoccupied Period Override Operation: Two hours.
3. Unit Supply-Air Fan Operation:
 - a. Occupied Periods: Fan runs continuously.
 - b. Unoccupied Periods: Fan cycles to maintain room setback temperature.
4. Dual-Temperature Hydronic-Coil Operation:
 - a. Occupied Periods: When chilled water is available, modulate control valve if room temperature exceeds thermostat set point. When hot water is available, open control valve if temperature falls below thermostat set point.
 - b. Unoccupied Periods: When chilled water is available, close control valve. When hot water is available, modulate control valve if room temperature falls below thermostat setback temperature.
5. Reheat-Coil Operation:
 - a. Occupied Periods:
 - (1) Heating Operations: Modulate control valve to provide heating if room temperature falls below thermostat set point.
 - b. Unoccupied Periods: Start fan and modulate control valve if room temperature falls below setback temperature. Humidity control is not available.
6. Outdoor-Air Damper Operation:
 - a. Occupied Periods:
 - (1) Outdoor-Air Temperature below Room Temperature: If room temperature is above thermostat set point, modulate outdoor-air damper to maintain room temperature (outdoor-air economizer). If room temperature is below thermostat set point, position damper to fixed minimum position.
 - (2) Outdoor-Air Temperature above Room Temperature: Position damper to fixed minimum position for 25 percent outdoor air.
 - b. Unoccupied Periods: Close damper.
7. Controller shall have volatile-memory backup.

R. BAS Interface Requirements:

1. Interface relay for scheduled operation.

2. Interface relay to provide indication of fault at the central workstation.
3. Provide BACnet interface for central BAS workstation for the following functions:
 - a. Adjust set points.
 - b. Fan coil unit start, stop, and operating status.
 - c. Data inquiry, including outdoor-air damper position, supply- and room-air temperature.
 - d. Occupied and unoccupied schedules.
- S. Electrical Connection: Factory wire motors and controls for a single electrical connection.
- T. Capacities and Characteristics: As scheduled on drawings.

PART 3 - EXECUTION

3.1 STORAGE AND HANDLING

- A. Comply with manufacturer's installation instructions for rigging, unloading and transporting units.
- B. All fan coil units shall be received and stored on the job site with the wooden shipping skids in place. Under no condition shall the units be stored on such a way that metal components are in direct contact with the ground.
- C. Unit delivery shall be coordinated with building construction and units shall be delivered to the job site just prior to their installation. Cover air handling units stored on the job site with 6 mil polyethylene sheet, taped in place, to protect the units from damage and the weather. Units that receive water damage due to improper handling or storage shall be removed from the site and new ones furnished at no additional charge to LAWA.

3.2 INSTALLATION

- A. Examine areas to receive fan coil units for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before fan coil unit installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Install fan coil units level and plumb.
- E. Install fan coil units to comply with NFPA 90A.
- F. Suspend fan coil units from structure with elastomeric hangers and at least four 3/8 inch) galvanized threaded support rods. Vibration isolators are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

- G. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above finished floor.
- H. Install new filters in each fan coil unit within two weeks after Substantial Completion.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 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 full size but not less than 3/4 inch indirect waste.
 - a. Install condensate trap of adequate depth to seal against the pressure of fan.
 - b. Install cleanouts in piping at changes of direction.
- B. Connect supply and return ducts to fan coil units with flexible duct connectors specified in Division 23 Section "Air Duct Accessories." Comply with safety requirements in UL1995 for duct connections.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 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.
- C. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.

- B. Occupancy Adjustments: When requested within 12 months of date of LAWA final acceptance, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.
- C. Engage a factory-authorized service representative to train LAWA Facilities and Maintenance personnel to adjust, operate, and maintain fan coil units.

3.6 TRAINING

- A. See LAWA DCH Guide Specification 01 79 00 "Demonstration and Training" for demonstration and training requirements.
- B. Provide minimum of 8 hours each (3 shifts) of classroom and hands on training to LAWA Facilities and Maintenance personnel.

END OF SECTION

SECTION 23 84 13.23
DIRECT-STEAM-INJECTION HUMIDIFIERS

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. Direct-steam-injection distributor tube humidifiers.
 - 2. Direct-steam-injection panel distribution manifold humidifiers.

1.3 DEFINITIONS

- A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail fabrication and installation of humidifiers. Include piping details, plans, elevations, sections, details of components, distributor tubes/manifolds, and attachments to other work.
 - 1. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Detail humidifiers and adjacent equipment. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Structural members to which humidifiers will be attached.
 - 2. Size and location of initial access modules for acoustical tile.
- B. Seismic Qualification Data: Certificates, for humidifiers, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - C. Field quality-control reports.
- 1.6 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For humidifiers to include in operation and maintenance manuals.
- 1.7 COORDINATION
- A. Coordinate location and installation of humidifiers with distributor tubes/manifolds in ducts and plenums or occupied space. Revise locations and elevations to suit field conditions and to ensure proper humidifier operation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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 AHRI 640.
- C. Seismic Performance: Direct-steam-injection humidifiers shall withstand the effects of earthquake motions determined according to ASCE/SEI7.

2.2 DIRECT-STEAM-INJECTION DISTRIBUTER TUBE HUMIDIFIERS

- A. Steam Distributer Tube(s): Single or multiple, steam-jacketed tubes suitable for pressurized steam applications.
- B. Material: Stainless steel.
- C. Insulation: Insulated`.
- D. Steam Separator: Stainless Steel.
- E. Humidifier Control Valve:
 1. Actuator: Electric modulating with spring return.
 2. Body: Bronze.
- F. Steam Trap:
 1. Material: Cast iron.
 2. Type: Inverted-bucket or float and thermostatic.
 3. Capacity: Sized for a minimum of 3 times the maximum rated condensate flow of humidifier at 1/2-psig differential pressure.

G. Accessories:

1. Humidistat wall mounted.
2. Duct-mounted high-limit humidity sensor.
3. Temperature sensor mounted on steam condensate return piping to prevent cold operation of humidifier.
4. In-Line Strainer, Y-Pattern: Stainless steel body with 20-mesh, Type 304 stainless-steel screen.
5. Airflow switch for preventing humidifier operation without airflow.
6. Humidifier Controller:
 - a. Digital, with keypad and display.
 - b. Building Automation System Interface:
 - 1) Full Communication Interface: BACnet.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine ducts, air-handling units, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before humidifier installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install humidifiers with required clearance for service and maintenance.
- B. Seal all duct and plenum penetrations with flange.
- C. Install humidifier assemblies in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."
- D. Install stainless-steel drain pan under each manifold mounted in duct.
 1. Construct drain pans with connection for drain; insulated.
 2. Connect to condensate trap and drainage piping.
 3. Extend drain pan upstream and downstream from humidifier tube(s)/manifold a minimum distance recommended by manufacturer.
- E. Install drip leg upstream from steam trap a minimum of 12-inches tall for proper operation of trap.

F. Equipment Mounting:

1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

G. Install all manufacturer-furnished accessories in accordance with manufacturer's written installation instructions.

3.3 PIPING CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

1. Install piping adjacent to humidifiers to allow service and maintenance.
2. Where condensate drain cooler is used, install shutoff valve, strainer, backflow preventer, and union in tempering water makeup piping.

B. Install piping specialties furnished by manufacturer but not factory mounted.

C. Provide P-trap in atmospheric drain piping serving area humidifiers in accordance with manufacturer recommendations.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs as layers of black with engraved white letters at least 1/2 inch (13 mm) high.
3. Locate nameplate where easily visible.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring between humidity sensors, high-limit humidity sensors, condensate temperature sensors, and DDC Control System.

C. Connect control wiring between humidistats, thermostats, and control devices.

D. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following 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.
- D. Humidifier will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION

SECTION 26 05 00
BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Requirements applicable to all Division 26 Sections. Also refer to Division 1 - General Requirements.
- B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced herein and within each specification section.

1.2 REFERENCES

- A. HCAI (formally OSHPD) – Health Care Access and Information (California)
- B. CCR California Code of Regulation
- C. CBC California Building Code
- D. CFC California Fire Code
- E. CEC California Electric Code
- F. CMC California Mechanical Code
- G. CPC California Plumbing Code
- H. California Title 24 - Building Energy Efficiency Standards
- I. SCAQMD South Coast Air Quality Management District

1.3 SCOPE OF WORK

- A. This Specification and the associated drawings govern furnishing, installing, testing and placing into satisfactory operation the Electrical Systems.
- B. The Contractor shall furnish and install all new materials as indicated on the drawings, and/or in these specifications, and all items required to make the portion of the Electrical Work a finished and working system.
- C. Description of Systems shall be as follows:
 - 1. Electrical power system to and including luminaires, equipment, motors, devices, etc.
 - 2. Grounding system.
 - 3. Wiring system for temperature control system as shown on the drawings.
 - 4. Wiring of equipment furnished by others.
 - 5. Removal work and/or relocation and reuse of existing systems and equipment.
- D. Work Not Included:

1. Temperature control wiring for plumbing and HVAC equipment (unless otherwise indicated) will be by other Contractors.
- E. The Owner will supply manufacturer's installation data for Owner-purchased equipment for this project.
- F. This Contractor shall make all electrical system connections shown on the drawings or required for fully functional units.
- G. This Contractor is responsible for all damage to Owner furnished equipment caused during installation.

1.4 WORK SEQUENCE

- A. All work that will produce excessive noise or interference with normal building operations, as determined by the Owner, shall be scheduled with the Owner. It may be necessary to schedule such work during unoccupied hours. The Owner reserves the right to determine when restricted construction hours are required.

1.5 DIVISION OF WORK BETWEEN MECHANICAL, ELECTRICAL, and CONTROL CONTRACTORS

- A. Division of work is the responsibility of the Prime Contractor. Any scope of work described at any location on the contract document shall be sufficient for including said requirement in the project. The Prime Contractor shall be solely responsible for determining the appropriate subcontractor for the described scope. In no case shall the project be assessed an additional cost for scope that is described on the contract documents on bid day. The following division of responsibility is a guideline based on typical industry practice.
- B. Definitions:
 1. "Mechanical Contractors" refers to the Contractors listed in Division 21/22/23 of this Specification.
 2. Motor Power Wiring: The single phase or 3 phase wiring extending from the power source (transformer, panelboard, feeder circuits, etc.) through disconnect switches and motor controllers to, and including the connections to the terminals of the motor.
 3. Motor Control Wiring: The wiring associated with the remote operation of the magnetic coils of magnetic motor starters or relays, or the wiring that permits direct cycling of motors by means of devices in series with the motor power wiring. In the latter case, the devices are usually single phase, have "Manual-Off- Auto" provisions, and are usually connected into the motor power wiring through a manual motor starter.
 4. Control devices such as start-stop push buttons, thermostats, pressure switches, flow switches, relays, etc., generally represent the types of equipment associated with motor control wiring.
 5. Motor control wiring is single phase and usually 120 volts. In some instances, the voltage will be the same as the motor power wiring. When the motor power wiring exceeds 120 volts, a control transformer is usually used to give a control voltage of 120 volts.
 6. Temperature Control Wiring: The wiring associated with the operation of a motorized damper, solenoid valve or motorized valve, etc., either modulating or two-position, as opposed to wiring that directly powers or controls a motor used to drive equipment such as fans, pumps, etc. This wiring will be from a 120-volt source and may continue as 120 volt, or be reduced in voltage (24 volt), in which case a control transformer shall be furnished as part of the temperature control wiring.

7. Control Motor: An electric device used to operate dampers, valves, etc. It may be two-position or modulating. Conventional characteristics of such a motor are 24 volts, 60 cycles, 1 phase, although other voltages may be encountered.
8. Low Voltage Technology Wiring: The wiring associated with the technology systems, used for analog or digital signals between equipment.
9. Telecommunications/Technology Rough-in: Relates specifically to the backboxes, necessary plaster rings and other miscellaneous hardware required for the installation or mounting of telecommunications/technology information outlets.

C. General:

1. The purpose of these Specifications is to outline the Electrical and Mechanical Contractors' responsibilities related to electrical work required for items such as temperature controls, mechanical equipment, fans, chillers, compressors, etc. The exact wiring requirements for much of the equipment cannot be determined until the systems have been selected and submittals approved. Therefore, the electrical drawings show only known wiring related to such items. All wiring not shown on the electrical drawings, but required for mechanical systems, is the responsibility of the Mechanical Contractor.
2. Where the drawings require the Electrical Contractor to wire between equipment furnished by the Mechanical Contractor, such wiring shall terminate at terminals provided in the equipment. The Mechanical Contractor shall furnish complete wiring diagrams and supervision to the Electrical Contractor and designate the terminal numbers for correct wiring.
3. Control low (24V) and control line (120V) voltage wiring, conduit, and related switches and relays required for the automatic control and/or interlock of motors and equipment, including final connection, are to be furnished and installed under Divisions 21, 22 and 23. Materials and installation to conform to Class 1 or 2 requirements, California Code of Regulation Title 24, Article E725.
4. The Electrical Contractor shall establish electrical utility elevations prior to fabrication and installation. The Electrical Contractor shall coordinate utility elevations with other trades. When a conflict arises, priority shall be as follows:
 - a. Luminaires.
 - b. Gravity flow piping, including steam and condensate.
 - c. Sheet metal.
 - d. Other piping.
 - e. Conduits and wireway.

D. Mechanical Contractor's Responsibility:

1. Assumes responsibility for internal wiring of all equipment furnished by the Mechanical Contractor.
2. Assumes all responsibility for miscellaneous items furnished by the Mechanical Contractor that require wiring but are not shown on the electrical drawings or specified in the Electrical Specification. If items such as relays, flow switches, or interlocks are required to make the mechanical system function correctly or are required by the manufacturer, they are the responsibility of the Mechanical Contractor.
3. Assumes all responsibility for Temperature Control wiring, if the Temperature Control Contractor is a Subcontractor to the Mechanical Contractor.
4. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

E. Temperature Control Contractor's or Subcontractor's Responsibility:

1. Wiring of all devices needed to make the Temperature Control System functional.

2. Verifying any control wiring on the electrical drawings as being by the Electrical Contractor. All wiring required for the Control System, but not shown on the electrical drawings, is the responsibility of the Temperature Control Contractor or Subcontractor.
 3. Coordinating equipment locations (such as PE's, EP's, relays, transformers, etc.) with the Electrical Contractor, where wiring of the equipment is by the Electrical Contractor.
- F. Electrical Contractor's Responsibility:
1. Furnishes and installs all combination starters, manual starters and disconnect devices shown on the Electrical Drawings or indicated to be by the Electrical Contractor in the Mechanical Drawings or Specifications.
 2. Installs and wires all remote-control devices furnished by the Mechanical Contractor or Temperature Control Contractor when so noted on the Electrical Drawings.
 3. Furnishes and installs motor control and temperature control wiring, when noted on the drawings.
 4. Furnishes, installs, and connects all relays, etc., for automatic shutdown of certain mechanical equipment (supply fans, exhaust fans, etc.) upon actuation of the Fire Alarm System.
 5. This Contractor is responsible for coordination of utilities with all other Contractors. If any field coordination conflicts are found, the Contractor shall coordinate with other Contractors to determine a viable layout.

1.6 COORDINATION DRAWINGS

- A. Definitions:
1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.
 - a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, medical gas systems, hydronic piping, steam and steam condensate piping, and any item that may impact coordination with other disciplines.
 - b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
 - c. Maintenance clearances and code-required dedicated space shall be included.
 - d. The coordination drawings shall include all underground, underfloor, in- floor, in chase, and vertical trade items.
 2. Spaces with open/cloud ceiling architecture shall indicate the overhead utilities and locate equipment as required to maintain clearance above lights. The intent for the installation is to maintain a maximum allowable vertical clearance and an organized/clean manner in the horizontal. Notify Architect/Engineer of the maximum clearance which can be maintained. Failure to comply will result in modifications with no cost to Owner.
 - a. In cloud ceiling architecture, when open cabling/wire and/or cable tray crosses gaps between ceiling clouds and/or walls, cabling is to transition to conduits to span the gaps in order to conceal cabling from below.
 3. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.
- B. Participation:
1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.

2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process. The Coordinating Contractor for this project shall be the General Contractor.
 - a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.
 3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. IMEG will provide electronic file copies of ventilation drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by IMEG. IMEG will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.
- C. Drawing Requirements:
1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.
 - a. Scale of drawings:
 - 1) General plans: 1/4 Inch = 1'-0" (minimum).
 - 2) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
 - 3) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
 - 4) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1'-0" (minimum).
 - 5) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).
 2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
 3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
 4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the A/E for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.
- D. General:
1. Coordination drawing files shall be made available to the A/E and Owner's Representative. The A/E will only review identified conflicts and give an opinion, but will not perform as a coordinator.
 2. A plotted set of coordination drawings shall be available at the project site.
 3. Coordination drawings are not shop drawings and shall not be submitted as such.
 4. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.
 5. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
 6. The A/E reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
 7. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the A/E.
 8. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.
 - a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
 - b. Potential layout changes shall be made to avoid additional access panels.

- c. Additional access panels shall not be allowed without written approval from the A/E at the coordination drawing stage.
 - d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the A/E and the Owner's Representative.
 - e. When additional access panels are required, they shall be provided without additional cost to the Owner.
- 9. Complete the coordination drawing process and obtain sign-off of the drawings by all contractors prior to installing any of the components.
 - 10. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
 - 11. Updated coordination drawings that reflect as-built conditions may be used as record documents.

1.7 QUALITY ASSURANCE

A. Contractor's Responsibility Prior to Submitting Pricing/Bid Data:

- 1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guides, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Architect/Engineer any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
- 2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Architect/Engineer will be done at the Contractor's risk.

B. Qualifications:

- 1. Only products of reputable manufacturers as determined by the Architect/Engineer are acceptable.
- 2. All Contractors and subcontractors shall employ only workmen who are skilled in their trades. At all times, the number of apprentices at the job site shall be less than or equal to the number of journeymen at the job site.

C. Compliance with Codes, Laws, Ordinances:

- 1. Conform to all requirements of Ventura County and State of California Codes, Laws, Ordinances and other regulations having jurisdiction.
- 2. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
- 3. If the Contractor notes, at the time of bidding, that any parts of the drawings or specifications do not comply with the codes or regulations, Contractor shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, Contractor shall submit with the proposal a separate price to make the system comply with the codes and regulations.
- 4. All changes to the system made after the letting of the contract to comply with codes or the requirements of the Inspector, shall be made by the Contractor without cost to the Owner.
- 5. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.

6. If there are no local codes having jurisdiction, the current issue of the NEC shall be followed.
- D. Permits, Fees, Taxes, Inspections:
1. Procure all applicable permits and licenses.
 2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
 3. Pay all charges for permits or licenses.
 4. Pay all fees and taxes imposed by State, Municipal, and other regulatory bodies.
 5. Pay all charges arising out of required inspections by an authorized body.
 6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
 7. Where applicable, all fixtures, equipment and materials shall be listed by Underwriter's Laboratories, Inc. or a nationally recognized testing organization.
 8. Pay all telephone company charges related to the service or change in service.
- E. Examination of Drawings:
1. The drawings for the electrical work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
 2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of raceways to best fit the layout of the job. Conduit entry points for electrical equipment including, but not limited to, panelboards, switchboards, switchgear and unit substations, shall be determined by the Contractor unless noted in the contract documents.
 3. Scaling of the drawings will not be sufficient or accurate for determining these locations.
 4. Where job conditions require reasonable changes in arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
 5. Because of the scale of the drawings, certain basic items, such as junction boxes, pull boxes, conduit fittings, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
 6. If an item is either shown on the drawings or called for in the specifications, it shall be included in this contract.
 7. The Contractor shall determine quantities and quality of material and equipment required from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater and better-quality number shall govern.
 8. Where used in electrical documents the word "furnish" shall mean supply for use, the word "install" shall mean connect up complete and ready for operation, and the word "provide" shall mean to supply for use and connect up complete and ready for operation.
 9. Any item listed as furnished shall also be installed unless otherwise noted.
 10. Any item listed as installed shall also be furnished unless otherwise noted.
- F. Electronic Media/Files:
1. Construction drawings for this project have been prepared utilizing Revit.
 2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
 3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by IMEG.
 4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
 5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.

6. The drawings prepared by IMEG for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
8. The information is provided to expedite the project and assist the Contractor with no guarantee by IMEG as to the accuracy or correctness of the information provided. IMEG accepts no responsibility or liability for the Contractor's use of these documents.

G. Field Measurements:

1. Verify all pertinent dimensions at the job site before ordering any conduit, conductors, wireways, bus duct, fittings, etc.

1.8 SUBMITTALS

A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

1. Submittals list:

Referenced Specification Section	Submittal Item	Coordination Drawing
26 05 03	Through Penetration Firestopping	
26 05 13	Wire and Cable	
26 05 26	Grounding and Bonding	
26 05 33	Conduit and Boxes	+> 1.5"
26 05 48	Seismic Requirements for Equipment and Supports	
26 05 53	Electrical Identification	
26 24 16	Panelboards	Yes
26 27 16	Cabinets and Enclosures	Yes
26 27 26	Wiring Devices	Ceiling mount
26 28 13	Fuses	
26 28 16	Disconnect Switches	Yes
26 51 91	LED Lighting	

B. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:

1. Transmittal: Each transmittal shall include the following:
 - a. Date
 - b. Project title and number
 - c. Contractor's name and address
 - d. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)
 - e. Description of items submitted and relevant specification number
 - f. Notations of deviations from the contract documents
 - g. Other pertinent data
2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:

- a. Date
 - b. Project title and number
 - c. Architect/Engineer
 - d. Contractor and subcontractors' names and addresses
 - e. Supplier and manufacturer's names and addresses
 - f. Division of work (e.g., electrical, plumbing, heating, ventilating, etc.)
 - g. Description of item submitted (using project nomenclature) and relevant specification number
 - h. Notations of deviations from the contract documents
 - i. Other pertinent data
 - j. Provide space for Contractor's review stamps
3. Composition:
- a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
 - b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
 - c. All sets shall contain an index of the items enclosed with a general topic description on the cover.
4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
5. Contractor's Approval Stamp:
- a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
 - b. Unstamped submittals will be rejected.
 - c. The Contractor's review shall include, but not be limited to, verification of the following:
 - 1) Only approved manufacturers are used.
 - 2) Addenda items have been incorporated.
 - 3) Catalog numbers and options match those specified.
 - 4) Performance data matches that specified.
 - 5) Electrical characteristics and loads match those specified.
 - 6) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
 - 7) Dimensions and service clearances are suitable for the intended location.
 - 8) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
 - 9) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, sinks fit into countertops, etc.).
 - d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
 - e. The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.

6. Submittal Identification and Markings:
 - a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
 - b. The Contractor shall clearly indicate the size, finish, material, etc.
 - c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
 - d. All marks and identifications on the submittals shall be unambiguous.
7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.
12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer before releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
 - a. Submittal file name: 26 XX XX.description.YYYYMMDD
 - b. Transmittal file name: 26 XX XX.description.YYYYMMDD
5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.

1.9 CHANGE ORDERS

- A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders with inadequate breakdown will be rejected.
- B. Change order work shall not proceed until authorized.

1.10 PRODUCT DELIVERY, STORAGE, HANDLING and MAINTENANCE

- A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage.
- B. Keep all materials clean, dry and free from damaging environments.

- C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Electrical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.
- D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate the work with other trades.

1.11 WARRANTY

- A. Provide one-year warranty for all fixtures, equipment, materials, and workmanship.
- B. The warranty period for all work in this specification Division shall commence on the date of Substantial Completion or successful system performance whichever occurs later. The warranty may also commence if a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization of the Owner. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.
- C. Warranty requirements extend to correction, without cost to the Owner, of all work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage due to defects or nonconformance with contract documents excluding repairs required as a result of improper maintenance or operation, or of normal wear as determined by the Architect/Engineer.

1.12 INSURANCE

- A. This Contractor shall maintain insurance coverage as set forth in Division 1 of these specifications.

1.13 CONTINGENCY

- A. Include in the Base Bid a contingency of one percent (1%) to be used only by change orders issued by the Architect/Engineer. The unused portion of the contingency shall be deducted from the Contract price before final payment is made.

1.14 MATERIAL SUBSTITUTION

- A. Where several manufacturers' names are given, the manufacturer for which a catalog number is given is the basis of design and establishes the quality required.
- B. Equivalent equipment manufactured by the other named manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications and fit in the allocated space. The Architect/Engineer shall make the final determination of whether a product is equivalent.

- C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer via addendum. The Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on the Contractors part or on the part of other Contractors whose work is affected.
- D. Voluntary add or deduct prices for alternate materials may be listed on the bid form. These items will not be used in determining the low bidder. This Contractor assumes all costs incurred as a result of using the offered material or equipment on the Contractors part or on the part of other Contractors whose work is affected.
- E. All material substitutions requested after the final addendum must be listed as voluntary changes on the bid form.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All items of material having a similar function (e.g., safety switches, panelboards, switchboards, contactors, motor starters, dry type transformers) shall be of the same manufacturer unless specifically stated otherwise on drawings or elsewhere in specifications.

PART 3 - EXECUTION

3.1 JOBSITE SAFETY

- A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or the employees and subconsultants at a construction site, shall relieve the Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

3.2 ARCHITECT/ENGINEER OBSERVATION OF WORK

- A. The contractor shall provide seven (7) calendar days' notice to the Architect/Engineer prior to:
 - 1. Placing fill over underground and underslab utilities.
 - 2. Covering exterior walls, interior partitions and chases.
 - 3. Installing hard or suspended ceilings and soffits.
- B. The Architect/Engineer will review the installation and provide a written report noting deficiencies requiring correction. The contractor's schedule shall account for these reviews and show them as line items in the approved schedule.

- C. Above-Ceiling Final Observation:
1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:
 - a. All junction boxes are closed and identified in accordance with Section 26 05 53 Electrical Identification.
 - b. Luminaires, including ceiling-mounted exit and emergency lights, are installed and operational.
 - c. Luminaire whips are supported above the ceiling.
 - d. Conduit identification is installed in accordance with Section 26 05 53 Electrical Identification.
 - e. Luminaires are suspended independently of the ceiling system when required by these contract documents.
 - f. All wall penetrations have been sealed.
 2. To prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
 3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to seven days elapsing, the Architect/Engineer may not recommend further payments to the contractor until full access has been provided.

3.3 PROJECT CLOSEOUT

- A. The following paragraphs supplement the requirements of Division 1.
- B. Final Jobsite Observation:
1. To prevent the Final Jobsite Observation from occurring too early, the Contractor shall review the completion status of the project and certify that the job is ready for the final jobsite observation.
 2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review. The Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
 3. It is understood that if the Architect/Engineer finds the job not ready for the final observation and additional trips and observations are required to bring the project to completion, the cost of the additional time and expenses incurred by the Architect/Engineer will be deducted from the Contractor's final payment.
- C. The following must be submitted before Architect/Engineer recommends final payment:
1. Operation and maintenance manuals with copies of approved shop drawings.
 2. Record documents including reproducible drawings and specifications.
 3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of this Contractor and shall be signed by the Owner's representatives.
 4. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed and submit receipt to Architect/Engineer.
 5. Inspection and testing report by the fire alarm system manufacturer.
 6. Start-up reports on all equipment requiring a factory installation or start-up.
- D. Circuit Directories:
1. Provide custom typed circuit directory for each branch circuit panelboard. Provide updated custom typed circuit directory for each existing branch circuit panelboard with new or revised circuits per the scope of work. Label shall include equipment name or final

approved room name, room number, and load type for each circuit (examples: SUMP SP-1 or ROOM 101 RECEPT). Revise directory to reflect circuit changes required to balance phase loads. Printed copies of the bid document panel schedules are not acceptable as circuit directories.

3.4 OPERATION AND MAINTENANCE MANUALS

A. General:

1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:

1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
 - a. O&M file name: O&M.div26.contractor.YYYYMMDD
 - b. Transmittal file name: O&Mtransmittal.div26.contractor.YYYYMMDD
5. File Size: Files shall be transmitted via a pre-approved method. Larger files may require an alternative transfer method, which shall also be pre-approved.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copies of all factory inspections and/or equipment startup reports.
5. Copies of warranties.

6. Schematic wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
7. Dimensional drawings of equipment.
8. Detailed parts lists with lists of suppliers.
9. Operating procedures for each system.
10. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
11. Repair procedures for major components.
12. Replacement parts and service material requirements for each system and the frequency of service required.
13. Instruction books, cards, and manuals furnished with the equipment.
14. Include record drawings of the one-line diagrams for each major system. The graphic for each piece of equipment shown on the one-line diagram shall be an active link to its associated Operation & Maintenance data.
15. Copies of all panel schedules in electronic Microsoft Excel spreadsheet (.xlsx) file. Each panelboard shall be a separate tab in the workbook.

3.5 INSTRUCTING THE OWNER'S REPRESENTATIVE

- A. Adequately instruct the Owner's designated representatives in the maintenance, care, and operation of the complete systems installed under this contract.
- B. Provide verbal and written instructions to the Owner's representatives by FACTORY PERSONNEL in the care, maintenance, and operation of the equipment and systems.
- C. Contractor shall make a DVD video recording of instructions to the Owner while explaining the system so additional personnel may view the instructions at a later date. The video recording shall be the property of the Owner.
- D. The Owner has the option to make a video recording of all instructions. Coordinate schedule of instructions to facilitate this recording.
- E. The instructions shall include:
 1. Maintenance of equipment.
 2. Start-up procedures for all major equipment.
 3. Description of emergency system operation.
- F. Notify the Architect/Engineer of the time and place for the verbal instructions to be given to the Owner's representative so a representative can be present if desired.
- G. Minimum hours of instruction time for each item and/or system shall be as indicated in each individual specification section.
- H. Operating Instructions:
 1. Contractor is responsible for all instructions to the Owner's representatives for the electrical and specialized systems.
 2. If the Contractor does not have staff that can adequately provide the required instructions, the Contractor shall include in the bid an adequate amount to reimburse the Owner for the Architect/Engineer to perform these services.

3.6 RECORD DOCUMENTS

- A. The following paragraphs supplement Division 1 requirements.
- B. Maintain at the job site a separate and complete set of electrical drawings and specifications with all changes made to the systems clearly and permanently marked in complete detail.
- C. Mark drawings and specifications to indicate approved substitutions; Change Orders, and actual equipment and materials used. All Change Orders, RFI responses, Clarifications and other supplemental instructions shall be marked on the documents. Record documents that merely reference the existence of the above items are not acceptable. Should this Contractor fail to complete Record Documents as required by this contract, this Contractor shall reimburse Architect/Engineer for all costs to develop record documents that comply with this requirement. Reimbursement shall be made at the Architect/Engineer's hourly rates in effect at the time of work.
- D. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.
- E. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.
- F. Record actual routing of conduits exceeding 2 inches.

3.7 PAINTING

- A. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available. All equipment shall have a finished coat of paint applied unless specifically allowed to be provided with a prime coat only.
- B. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, the Contractor shall have the equipment and all its supports, hangers, etc., painted to match the room decor. Painting shall be performed as described in project specifications.
- C. Equipment cabinets, casings, covers, metal jackets, etc., located in equipment rooms or concealed spaces, shall be furnished in standard finish, free from scratches, abrasions, chippings, etc.
- D. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chipping, etc. If color option is specified or is standard to the unit, verify with the Architect the color preference before ordering.
- E. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, and storage rooms. Equipment furnished with a suitable factory finish need not be painted; provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.
- F. All electrical conduit and equipment, fittings, hangers, structural supports, etc., in unfinished areas, such as equipment and storage room area, shall be painted two (2) coats of oil paint of colors selected by the Architect.

- G. Do NOT paint electric conduits in crawl spaces, tunnels, or spaces above suspended ceilings except that where conduit is in a damp location give exposed threads at joints two coats of sealer after joint is made up.
- H. After surfaces have been thoroughly cleaned and are free of oil, dirt or other foreign matter, paint all raceway and equipment with the following:
 - 1. Bare Metal Surfaces - Apply one coat of metal primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
 - 2. Plastic Surfaces - Paint plastic surfaces with two coats of semi-gloss acrylic latex paint.

3.8 ADJUST AND CLEAN

- A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project.
- B. Clean all foreign paint, grease, oil, dirt, labels, stickers, etc. from all equipment.
- C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

3.9 SPECIAL REQUIREMENTS

- A. Coordinate the installation of all equipment, controls, devices, etc., with other trades to maintain clear access area for servicing.
- B. Install all equipment to maximize access to parts needing service or maintenance. Review the final location, placement, and orientation of equipment with the Owner's representative prior to setting equipment.
- C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's representative will result in removal and reinstallation of the equipment at the Contractor's expense.
- D. Raceway and Cable routing restrictions: Raceways and cable are restricted from being routed in the following locations, unless serving the space or permitted by the authority having jurisdiction.
 - 1. Exit enclosures.
 - 2. Other areas restricted by code.
 - 3. Normal power in emergency power equipment rooms: Limited to feeders and branch circuits serving the emergency power equipment located in the room.
 - 4. Emergency power in normal power equipment rooms: Limited to feeders and branch circuits serving the normal power equipment located in the room.
- E. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standard:
 - 1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.
 - 2. South Coast Air Quality Management District Rule 1168 - Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.
 - 3. South Coast Air Quality Management District Rule SCAQMD 1113 - Wet Applied Paints and Coatings. All paints and coatings wet-applied on site must meet the applicable VOC limits of SCAQMD Rule 1113.

- F. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:
1. General Contractor shall erect and maintain dust barriers throughout the construction work. These barriers shall be reasonably airtight and shall prevent entry into the construction zone by unauthorized persons. Reasonably airtight means construction equivalent to full-height temporary or permanent walls with joints taped or sealed, and shafts and other penetrations sealed as well as possible. Fire resistant polyethylene is acceptable; if flame spread/smoke developed ratings are demonstrated to conform to the applicable building codes and licensing acts.

3.10 SYSTEM STARTING AND ADJUSTING

- A. The electrical systems shall be complete and operating. System startup, testing, adjusting, and balancing to obtain satisfactory system performance is the responsibility of the Contractor. This includes all calibration and adjustment of electrical controls, balancing of loads, troubleshooting and verification of software, and final adjustments that may be needed.
- B. Complete all manufacturer-recommended startup procedures and checklists to verify proper equipment operation and does not pose a danger to personnel or property.
- C. All operating conditions and control sequences shall be tested during the start-up period. Testing all interlocks, safety shut-downs, controls, and alarms.
- D. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

3.11 FIELD QUALITY CONTROL

- A. General:
1. Conduct all tests required during and after construction. Submit test results in NETA format, or equivalent form, that shows the test equipment used, calibration date, tester's name, ambient test conditions, humidity, conductor length, and results corrected to 40°C.
 2. Supply necessary instruments, meters, etc., for the tests. Supply competent technicians with training in the proper testing techniques.
 3. All cables and wires shall be tested for shorts and grounds following installation and connection to devices. Replace shorted or grounded wires and cables.
 4. Any wiring device, electrical apparatus or luminaire, if grounded or shorted on any integral "live" part, shall have all defective parts or materials replaced.
 5. Test cable insulation of service and panel feeder conductors for proper insulation values. Tests shall include the cable, all splices, and all terminations. Each conductor shall be tested and shall test free of short circuits and grounds and have an insulation value not less than CEC Standards. Take readings between conductors, and between conductors and ground.

6. If the results obtained in the tests are not satisfactory, make adjustments, replacements, and changes as needed. Then repeat the tests, and make additional tests, as the Architect/Engineer or authority having jurisdiction deems necessary.
- B. Ground Resistance:
1. Conduct service ground resistance tests using an approved manufactured ground resistance meter. Submit to the Architect/Engineer a proposed test procedure including type of equipment to be used. (The conventional ohmmeter is not an acceptable device.)
 2. Make ground resistance measurements during normal dry weather and not less than 48 hours after a rain. Ground resistance values shall be verified by the Architect/Engineer at the time the readings are taken.
 3. If the ground resistance value obtained is more than the value set forth in Section 26 05 26, the following shall be done to obtain the value given:
 - a. Verify that all connections in the service ground system are secure.
 - b. Increase the depth to which ground rods are driven by adding section lengths to the rods and retest. If the resistance is still excessive increase the depth by adding an additional rod section and retest.
 - c. If the resistance is still excessive, furnish and install additional ground rods, spaced not less than 20 feet from other ground rods unless otherwise noted on plans, and connect into the ground electrode system. Retest.
 - d. Review results with the Architect/Engineer.
 4. Before final payment is made to the Contractor submit a written report to the Architect/Engineer including the following:
 - a. Date of test.
 - b. Number of hours since the last rain.
 - c. Soil condition at the time of the test in the ground electrode location. That is: dry, wet, moist, sand, clay, etc.
 - d. Diagram of the test set-up showing distances between test equipment, ground electrode, auxiliary electrodes, etc.
 - e. Make, model, and calibration date of test equipment.
 - f. Tabulation of measurements taken and calculations made.
- C. Ground-Fault Equipment Performance Testing:
1. Report: Provide copy of test result report with Operation and Maintenance manuals. Provide report to Authority Having Jurisdiction when requested.
- D. Other Equipment:
1. Give other equipment furnished and installed by the Contractor all standard tests normally made to assure that the equipment is electrically sound, all connections properly made, phase rotation correct, fuses and thermal elements suitable for protection against overloads, voltage complies with equipment nameplate rating, and full load amperes are within equipment rating.
- E. If any test results are not satisfactory, make adjustments, replacements and changes as needed and repeat the tests and make additional tests as the Architect/Engineer or authority having jurisdiction deem necessary.
- F. Contractor shall thermographic study all electrical gear, switchboard, panelboards, etc. at the end of construction to identify any unusual conditions/heating within the equipment. Coordinate with Owner/Architect/Engineer to have an Owner/Architect/Engineer representative present during testing.
- G. Report shall include color printouts, in binder, of pictures taken to use as a baseline reading after building is occupied.

- H. Upon completion of the project, the Contractor shall provide amperage readings for all panelboards and switchboards and turn the results over to the Owner for "benchmark" amperages.

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

To prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

1. Penetrations of fire-rated construction fire sealed in accordance with specifications.
2. Electrical panels have typed circuit identification.
3. Per Section 26 05 00, cable insulation test results have been submitted.
4. Per Section 26 05 00, ground resistance test results have been submitted.
5. Operation and Maintenance manuals have been submitted as per Section 26 05 00.
6. Bound copies of approved shop drawings have been submitted as per Section 26 05 00.
7. Report of instruction of Owner's representative has been submitted as per Section 26 05 00.
8. Start-up reports from factory representative have been submitted as per Section 26 05 00.

Accepted by:

Prime Contractor _____

By _____ Date _____

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

END OF SECTION 26 05 00

SECTION 26 05 03
THROUGH PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Through-Penetration Firestopping.

1.2 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.
- B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

1.3 REFERENCES

- A. UL 263 - Fire Tests of Building Construction and Materials.
- B. UL 723 - Surface Burning Characteristics of Building Materials
- C. ANSI/UL 1479 - Fire Tests of Through Penetration Firestops
- D. UL 2079 - Tests for Fire Resistance of Building Joint Systems
- E. UL Fire Resistance Directory Through Penetration Firestop Systems (XHEZ)
- F. Intertek / Warnock Hersey - Directory of Listed Products
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- H. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops
- I. The Building Officials and Code Administrators National Building Code
- J. NFPA 5000 - Building Construction Safety Code
- K. OSHPD - Office of State Wide Health Planning and Development (California)
- L. CBC California Building Code

1.4 SUBMITTALS

- A. Submit under provisions of Section 26 05 00
- B. Submit Firestopping Installers Certification for all installers on the project.
- C. Through-Penetration Firestop System Schedule: Indicate locations of each through- penetration firestop system, along with the following information:
 - 1. Types of penetrating items.

2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
 4. F ratings for each firestop system.
- D. Maintain a notebook on the job site at all times that contains copies of approved submittals for all through penetration firestopping to be installed. Notebook shall be made available to the Authority Having Jurisdiction at their request and turned over to the Owner at the end of construction as part of the O&M Manuals.
- E. Submit VOC rating of firestopping material in g/L (less water) with documentation that it meets the limits set forth in SCAQMD Rule 1168.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer's instructions for storage.
- B. Install material prior to expiration of product shelf life.
- 1.6 PERFORMANCE REQUIREMENTS
- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.
 2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:
1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
- C. For through-penetration firestop systems exposed to light, traffic, moisture, or physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
- D. For through-penetration firestop systems exposed to view, provide products with flame- spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. For through-penetration firestop systems in air plenums, provide products with flame- spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

- F. Adhesives and Sealants: All sealers, adhesives, and sealants shall comply with the low emitting material limits of the following standards:
1. CDPH Standard Method V1.1-2010 - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions VOC from Indoor Sources Using Environmental Chambers Version 1.1.
 2. South Coast Air Quality Management District Rule 1168 - Adhesive and Sealant Applications. All adhesives and sealants wet-applied on site shall comply with the applicable chemical content requirements of SCAQMD Rule 1168.
 3. South Coast Air Quality Management District Rule SCAQMD 1113 - Wet Applied Paints and Coatings. All paints and coatings wet-applied on site must meet the applicable VOC limits of SCAQMD Rule 1113.

1.7 WARRANTY

- A. Provide one year warranty on parts and labor.
- B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, general durability, or appear to deteriorate in any manner not clearly specified by the manufacturer as an inherent quality of the material.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through- penetration firestop systems indicated for each application that are produced by one of the following manufacturers. All firestopping systems installed shall be provided by a single manufacturer.
1. 3M; Fire Protection Products Division
 2. Hilti, Inc.

2.2 THROUGH PENETRATION FIRESTOP SYSTEMS

- A. Provide materials and systems classified by or listed by Intertek / Warnock Hersey to provide firestopping equal to time rating of construction being penetrated.
- B. All firestopping materials shall be free of asbestos, lead, PCB's, and other materials that would require hazardous waste removal.
- C. Firestopping shall be flexible to allow for normal penetrating item movement due to expansion and contraction.
- D. Provide firestopping systems capable of supporting floor loads where systems are exposed to possible floor loading or traffic.
- E. Provide firestopping systems allowing continuous insulation for all insulated pipes.
- F. Provide firestopping systems classified by UL or listed by Intertek / Warnock Hersey for penetrations through all fire rated construction. Firestopping systems shall be selected from the

UL or listed by Intertek / Warnock Hersey Fire Resistance Directory Category XHEZ based on substrate construction and penetrating item size and material and shall fall within the range of numbers listed:

1. Combustible Framed Floors and Chase Walls - 1 or 2 Hour Rated

a. F Rating = Floor/Wall Rating

Penetrating Item	UL System No.
No Penetrating Item	FC 0000-0999*
Metallic Pipe or Conduit	FC 1000-1999
Non-Metallic Pipe or Conduit	FC 2000-2999
Electrical Cables	FC 3000-3999
Cable Trays	FC 4000-4999
Insulated Pipes	FC 5000-5999
Bus Duct and Misc. Electrical Damper and Misc. Mechanical Penetrations	FC 6000-6999 Duct without FC 7000-7999 Multiple FC 8000-8999

2. Non-Combustible Framed Walls - 1 or 2 Hour Rated

a. F Rating = Wall Rating

Penetrating Item	UL System No.
No Penetrating Item	WL 0000-0999*
Metallic Pipe or Conduit	WL 1000-1999
Non-Metallic Pipe or Conduit	WL 2000-2999
Electrical Cables	WL 3000-3999
Cable Trays	WL 4000-4999
Insulated Pipes	WL 5000-5999
Bus Duct and Misc. Electrical	WL 6000-6999
Duct without Damper and Misc. Mechanical	WL 7000-7999
Multiple Penetrations	WL 8000-8999

3. Concrete or Masonry Floors and Walls - 1 or 2 Hour Rated

a. F Rating = Wall/Floor Rating

Penetrating Item	UL System No.
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Electrical Cables	CAJ 3000-3999
Insulated Pipes	CAJ 5000-5999
Duct without Damper and Misc. Mechanical Penetrations	CAJ 7000-7999 Multiple CAJ 8000-8999

*Alternate method of firestopping is patching opening to match original rated construction.

- B. Any opening in walls or floors not covered by the listed series of numbers shall be coordinated with the firestopping manufacturer.
- C. Any openings in floors or walls not described in the UL or listed by Intertek / Warnock Hersey Fire Resistance Directory, or outlined in manufacturer's information shall be sealed in a manner agreed upon by the Firestopping Manufacturer, Owner, and the Authority Having Jurisdiction.

PART 3 - EXECUTION

3.2 EXAMINATION

- A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose materials. Clean and repair surfaces as required. Remove laitance and form- release agents from concrete.
- B. Ensure substrate and penetrating items have been permanently installed prior to installing firestopping systems. Ensure penetrating items have been properly spaced and have proper clearance prior to installing firestopping systems.
- C. Surfaces to which sealing materials are to be installed must meet the selected UL or Intertek / Warnock Hersey system substrate criteria.
- D. Prime substrates where recommended in writing by through-penetration firestop system manufacturer. Confine primer to area of bond.

3.3 INSTALLATION

- A. In existing construction, provide firestopping of openings prior to and after installation of penetrating items. Remove any existing coatings on surfaces prior to firestopping installation. Temporary firestopping shall consist of packing openings with fire resistant mineral wool for the full thickness of substrate, or an alternate method approved by the Authority Having Jurisdiction. All openings shall be temporarily firestopped immediately upon their installation and shall remain

so until the permanent UL or listed by Intertek / Warnock Hersey listed firestopping system is installed.

- B. Install penetration seal materials in accordance with printed instructions of the UL or Intertek / Warnock Hersey Fire Resistance Directory and with the manufacturer's printed application instructions.
- C. Install dams as required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating. Remove combustible damming after appropriate curing.

3.4 CLEANING AND PROTECTING

- A. Clean excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not cause damage.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.5 IDENTIFICATION

- A. Provide and install labels adjacent to each firestopping location. Label shall be provided by the firestop system supplier and contain the following information in a contrasting color:
 - 1. The words "Warning - Through Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Firestop System Supplier; UL or listed by Intertek / Warnock Hersey system number; date installed; contractor name and phone number; manufacturer's representative name, address, and phone number.

3.6 INSPECTION

- A. All penetrations shall be inspected by the manufacturer's representative to ensure proper installation.
- B. Access to firestop systems shall be maintained for examination by the Authority Having Jurisdiction at their request.
- C. Proceed with enclosing through-penetration firestop system with other construction only after inspection reports are issued and firestop installations comply with requirements.
- D. The contractor shall allow for visual destructive review of 5% of installed firestop systems (minimum of one) to prove compliance with specifications and manufacturer's instructions and details. Destructive system removal shall be performed by the contractor and witnessed by the Architect/Engineer and manufacturer's factory representative. The Architect/Engineer shall have sole discretion of which firestop system installations will be reviewed. The contractor is responsible for all costs associated with this requirement including labor and material for removing and replacing the installed firestop system. If any firestop system is found to not be installed per manufacturer's specific instructions and details, all firestop systems are subject to destructive review and replacement at the Architect/Engineer's discretion and the contractor's expense.

END OF SECTION

SECTION 26 05 05
ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical demolition

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work shall be as specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK REQUIRED AND DO NOT INDICATE EVERY BOX, CONDUIT, OR WIRE THAT MUST BE REMOVED. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING A BID AND VERIFY EXISTING CONDITIONS.
- B. Where walls, ceilings, structures, etc., are indicated as being removed on general or electrical drawings, the Contractor shall be responsible for the removal of all electrical equipment, devices, fixtures, raceways, wiring, systems, etc., from the removed area.
- C. Where ceilings, walls, structures, etc., are temporarily removed and replaced by others, this Contractor shall be responsible for the removal, storage, and replacement of equipment, devices, fixtures, raceways, wiring, systems, etc.
- D. Where mechanical or technology equipment is indicated as being removed on electrical, mechanical, or technology drawings, the Contractor shall be responsible for disconnecting the equipment and removing all starters, VFD, controllers, electrical equipment, raceways, wiring, etc. associated with the device.
- E. Verify that abandoned wiring and equipment serve only abandoned equipment or facilities. Extend conduit and wire to facilities and equipment that will remain in operation following demolition. Extension of conduit and wire to equipment shall be compatible with the surrounding area. Extended conduit and conductors to match existing size and material.
- F. Coordinate scope of work with all other Contractors and the Owner at the project site. Schedule removal of equipment and electrical service to avoid conflicts.
- G. Bid submittal shall mean the Contractor has visited the project site and has verified existing conditions and scope of work.

3.2 PREPARATION

- A. The Contractor shall obtain approval from the Owner before turning off power to circuits, feeders, panels, etc. Coordinate all outages with Owner.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations. Assume all equipment and systems must remain operational unless specifically noted otherwise on drawings.
- C. Disconnect electrical systems in walls, floors, structures, and ceilings scheduled for removal.
- D. Existing Power (Normal and Emergency) System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from the Owner at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work under provisions of Division 1 of Specifications and this Section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring and raceway to source of supply. Existing conduit in good condition may be reused in place by including an equipment ground conductor in reused conduit. Reused conduit and boxes shall have supports revised to meet current codes. Relocating conduit shall not be allowed.
- D. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove all associated clamps, hangers, supports, etc. associated with raceway removal.
- E. Disconnect and remove outlets and devices that are to be demolished. Remove outlet or devices' associated back box, supports, and conduit and conductors back to source. Patch opening created from removal of device to match surrounding finishes. Remove conduit, supports, and conductors back to source. Devices' back box and conduit mounted in walls that are to remain can be abandoned in place. Provide appropriate cover plate for all abandoned back boxes. Cover plates shall match existing plates used in the adjacent areas
- F. Disconnect and remove abandoned panelboards and distribution equipment.
- G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories. Ballasts in light fixtures installed prior to 1980 shall be incinerated in EPA approved incinerator or disposed of in EPA certified containers and deposited in an EPA landfill certified for PCB disposal or recycled by permitted ballast recycler. Punctured or leaking ballasts must be disposed of according to Federal Regulations under the Toxic Substance Control Act. Provide Owner and Architect/Engineer with a Certificate of Destruction to verify proper disposal.
- I. Repair adjacent construction and finishes damaged during demolition and extension work. Patch openings to match existing surrounding finishes.

- J. Maintain access to existing electrical installations that remain active. Modify installation or provide junction boxes and access panel as appropriate.
- K. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified. Extended conduit and conductors to match existing size and material.
- L. HID and fluorescent lamps, determined by the Toxicity Characteristic Leachate procedure (TCLP), to be hazardous waste shall be disposed of in an EPA-permitted hazardous waste disposal facility or by a permitted lamp recycler.
- M. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- N. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

3.4 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- C. Luminaires: Remove existing luminaires for cleaning as indicated on the drawings. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps and ballasts and broken electrical parts. Replacement parts shall match specified components for new luminaires of same type when applicable. Reinstall luminaire and connect to circuiting as indicated on drawings.
- D. ELECTRICAL ITEMS (E.G., LIGHTING FIXTURES, RECEPTACLES, SWITCHES, CONDUIT, WIRE, ETC.) REMOVED AND NOT RELOCATED REMAIN THE PROPERTY OF THE OWNER. CONTRACTOR SHALL PLACE ITEMS RETAINED BY THE OWNER IN A LOCATION COORDINATED WITH THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISPOSAL OF MATERIAL THE OWNER DOES NOT WANT.

3.5 INSTALLATION

- A. Install relocated materials and equipment under the provisions of Division 1 of Specifications.

END OF SECTION

SECTION 26 05 13
WIRE AND CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Building wire

1.2 RELATED WORK

- A. Section 26 05 53 - Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

1.3 REFERENCES

- A. NEMA WC 70 - Power Cables Rated 2,000V or Less for the Distribution of Electrical Energy
- B. California Electrical Code (CEC)
- C. UL 44 - Thermoset-Insulated Wires and Cables
- D. UL 83 - Thermoplastic-Insulated Wires and Cables
- E. UL 854 - Service-Entrance Cables
- F. UL 1581 - Standard for Electrical Wires, Cables, and Flexible Cords
- G. UL 2196 - Fire Resistive, Fire Resistant and Circuit Integrity Cables
- H. California Division of State Architect (DSA) Interpretation of Regulations

1.4 SUBMITTALS

- A. Submit manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

- A. Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600- volt insulation, THHN/THWN or XHHW-2.
- B. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600-volt insulation, THHN/THWN. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid or stranded conductor, unless otherwise noted on the drawings.
- C. Each 120 and 277-volt branch circuit shall have a dedicated neutral conductor. Neutral conductors shall be considered current-carrying conductors for wire derating.

PART 3 - EXECUTION

3.1 WIRE AND CABLE INSTALLATION SCHEDULE

- A. Above Accessible Ceilings:
 - 1. Building wire shall be installed in raceway.
- B. All Other Locations: Building wire in raceway.
- C. Above Grade: All conductors installed above grade shall be type "THHN".

3.2 CONTRACTOR CHANGES

- A. The basis of design is copper conductors installed in raceway based on ambient temperature of 30°C, CEC Table 310.15(B)(16).
- B. The Contractor shall be responsible for derating and sizing conductors and conduits to equal or exceed the ampacity of the basis of design circuits, if he/she chooses to use methods or materials other than the basis of design.
- C. Underground electrical duct ampacity rating shall be in accordance with CEC Table B.310.15(B)(2)(7) or calculated in accordance with Annex B Application Information for Ampacity Calculation. The calculations and a sketch of the proposed installation shall be submitted prior to any conduit being installed.
- D. Record drawing shall include the calculations and sketches.

3.3 GENERAL WIRING METHODS

- A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.
- B. Use no wire smaller than 18 AWG for low voltage control wiring (<100 volts>).
- C. Use 10 AWG conductor for 20 ampere, 120-volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277-volt branch circuit home runs longer than 200 feet.
- D. Use no wire smaller than 8 AWG for outdoor lighting circuits.
- E. The ampacity of multiple conductors in one conduit shall be derated per CEC 310. In no case shall more than 4 conductors be installed in one conduit to such loads as motors larger than 1/4 HP, panelboards, motor control centers, etc.
- F. Where installing parallel feeders, place an equal number of conductors for each phase of a circuit in same raceway or cable.
- G. Splice only in junction or outlet boxes.
- H. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- I. Make conductor lengths for parallel circuits equal.
- J. All conductors shall be continuous in conduit from last outlet to their termination.

- K. Terminate all spare conductors on terminal blocks, and label the spare conductors.
- L. Cables or wires shall not be laid out on the ground before pulling.
- M. Cables or wires shall not be dragged over earth or paving.
- N. Care shall be taken so as not to subject the cable or wire to high mechanical stresses that would cause damage to the wire and cable.
- O. At least six (6)-inch loops or ends shall be left at each outlet for installation connection of luminaires or other devices.
- P. All wires in outlet boxes not connected to fixtures or other devices shall be rolled up, spliced if continuity of circuit is required, and insulated.

3.4 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Pulling shall be continuous without unnecessary stops and starts with wire or cable only partially through raceway.
- D. Where reels of cable or wire are used, they shall be set up on jacks close to the point where the wire or cable enters the conduit or duct so that the cable or wire may be unreeled and run into the conduit or duct with a minimum of change in the direction of the bend.
- E. Conductors shall not be pulled through conduits until plastering or masonry work is completed and conduits are free from moisture. Care shall be taken so that long pulls of wire or pulls around several bends are not made where the wire may be permanently stretched and the insulation damaged.
- F. Only nylon rope shall be permitted to pull cables into conduit and ducts.
- G. Completely and thoroughly swab raceway system before installing conductors.
- H. Conductor Supports in Vertical Raceways:
 - 1. Support conductors in vertical raceways in accordance with CEC 300.19 and Table 300.19(A) Spacing of Conductors Supports.
 - 2. Supports shall be of insulated wedge type (OZ Gedney Type S, or equal) and installed in a tapered insulated bushing fitting or a metal woven mesh with a support ring that fits inside conduit fitting installed in an accessible junction box (Hubbell Kellems support grip or equal).

3.5 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage.
- B. Use suitable cable fittings and connectors.

- C. Run all open cable parallel or perpendicular to walls, ceilings, and exposed structural members. Follow the routing as illustrated on the drawings as closely as possible. Cable routing on drawings scaled 1/4"=1'-0" or less shall be considered diagrammatical, unless noted otherwise. The correct routing, when shown diagrammatically, shall be chosen by the Contractor based on information in the contract documents; in accordance with the manufacturer's written instructions, applicable codes, the NECA's "Standard of Installation", recognized industry standards; and coordinated with other contractors.

3.6 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice and tap only in accessible junction boxes.
- B. Use solderless, tin-plated copper, compression terminals (lugs) applied with circumferential crimp for conductor terminations, 8 AWG and larger.
- C. Use solderless, tin-plated, compression terminals (lugs) applied with indenter crimp for copper conductor terminations, 10 AWG and smaller.
- D. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.
- E. Use compression connectors applied with circumferential crimp for conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- F. Thoroughly clean wires before installing lugs and connectors.
- G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- H. Phase Sequence: All apparatus shall be connected to operate in the phase sequence A-B-C representing the time sequence in which the phase conductors so identified reach positive maximum voltage.
- I. As a general rule, applicable to switches, circuit breakers, starters, panelboards, switchgear and the like, the connections to phase conductors are intended thus:
 - 1. Facing the front and operating side of the equipment, the phase identification shall be:
 - a. Left to Right - A-B-C
 - b. Top to Bottom - A-B-C
- J. Connection revisions as required to achieve correct rotation of motors shall be made at the load terminals of the starters or disconnect switches.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Equipment grounding system
- B. Bonding system

1.2 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
- B. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association to supervise on-site testing specified in Part 3.
- C. 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.
- D. Comply with UL 467 Grounding and Bonding Equipment.
- E. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE/ANSI C2 National Electrical Safety Code (NESC).

1.3 REFERENCES

- A. California Electrical Code (CEC)
- B. NFPA 99 - Standard for Healthcare Facilities

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field Test Reports: Submit written test reports to include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- C. Indicate layout of ground field, location of system grounding electrode connections, and routing of grounding electrode conductor and ground ring.

1.5 SUMMARY

- A. This section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section 26 05 13 "Wire and Cable".
- B. Material: Copper.
- C. Equipment Grounding Conductors: Insulated. Refer to Section 26 05 53 for insulation color.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Copper Bonding Conductors: As follows:
 - 1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
 - 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
 - 3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTOR PRODUCTS

- A. Comply with UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.
- C. Bolted Connectors: Bolted-pressure-type connectors.

PART 3 - EXECUTION

3.1 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.

3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- C. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- D. :Use for underground connections, except those at test wells.
- E. Connections at back boxes, junction boxes, pull boxes, and equipment terminations: The equipment grounding conductor(s) associated with all circuits in the box shall be connected together and to the box using a suitable grounding screw. The removal of the respective receptacle, luminaire, or other device served by the box shall not interrupt the grounding continuity.
- F. Tighten screws and bolts for grounding and bonding 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
- G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.2 INSTALLATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage. Each grounding conductor that passes through a below grade wall must be provided with a waterstop.
- C. Grounding electrode conductor (GEC) shall be protected from physical damage by rigid polyvinyl chloride conduit (PVC) in exposed locations.
- D. In raceways, use insulated equipment grounding conductors.

3.3 EQUIPMENT GROUNDING SYSTEM

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits. Terminate each end on a grounding lug or bus.
- C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by CEC:

1. Lighting and receptacle circuits. Terminate each end on a grounding lug or bus.
 2. Single-phase and three-phase motor and appliance branch circuits.
 3. Flexible raceway runs, including FMC and LFMC.
 4. Armored and metal-clad cable runs.
- D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- E. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch- circuit runs from computer-area power panels or power-distribution units.
- F. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- 3.4 BONDING SYSTEM
- A. At building expansion joints, provide flexible bonding jumpers to connect to columns or beams on each side of the expansion joint.
- B. Exterior Metallic Pull and Junction Box Covers, Metallic Hand Rails: Bond to grounding system using flexible grounding conductors.
- C. Equipment Circuits: Install a bonding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, dampers, and heaters. Bond conductor to each unit and to air duct. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps or copper conductor sized equal to the equipment grounding conductor.
- D. Bond metal ducts of dust collectors, particulate conveying, fume hoods, and other hazardous materials to the equipment grounding conductors of associated pumps, fans, or blowers. Use braided-type bonding straps. Provide braided bare copper bonding conductor in nonmetallic dust collector ductwork to each equipment inlet location, and bond to equipment.
- E. Connect bonding conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter.
- F. Terminal Cabinets: Terminate bonding conductor on cabinet grounding terminal.
- 3.5 EQUIPOTENTIAL (MULTI-POINT) GROUNDING SYSTEM
- A. The non-current-carrying metal parts of equipment, raceways and other enclosures shall be bonded to the grounding system.

END OF SECTION

SECTION 26 05 27
SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Conduit and equipment supports
- B. Fastening hardware

1.2 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Allied Support Systems
- B. Cooper B-Line
- C. Erico, Inc.
- D. Hilti

2.2 MATERIAL

- A. Support Channel: Hot-dip galvanized; painted steel.
- B. Hardware: Corrosion resistant.
- C. Anchorage and Structural Attachment Components:
 - 1. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to Authorities Having Jurisdiction.
 - 2. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
- D. Conduit Sleeves and Lintels:
 - 1. Each Contractor shall provide, to the General Contractor for installation, lintels for all openings required for the Contractor's work in masonry walls and conduit sleeves for floors, unless specifically shown as being by others.
 - 2. Refer to Structural General Notes for lintel requirements in masonry construction.
 - 3. Refer to Structural plans and specifications for lintel requirements and sizes.
- E. Rooftop Support System:

1. Provide pre-fabricated roof supports for all conduit and equipment installed above the roof. Support all conduit and equipment a minimum of 4" above roof.
2. Support system shall be compatible with single ply, bituminous, metal, and spray foam roof systems. The base shall be rounded to prevent damage to the roof, and drainage holes shall prevent ponding of water in the support.
3. All metal components shall be hot dipped galvanized. Mounting hardware shall be stainless steel or hot dipped galvanized. Support shall be UV, corrosion, and freeze/thaw resistant. Support shall include orange paint, reflective safety orange accents, or similar markings for increased visibility.
4. Products:
 - a. Anvil International HBS-Base Series
 - b. Cooper B-Line Dura-Blok
 - c. Erico Caddy Pyramid 50, 150, 300, or 600 (to match load).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors in concrete and beam clamps on structural steel.
- B. Trapeze support installation: Cut hanger rods back at trapeze supports so they do not extend more than 3/4" below bottom face of lowest fastener and blunt any sharp edges.
- C. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- D. Do not fasten supports to ceiling systems, piping, ductwork, mechanical equipment, or conduit, unless otherwise noted.
- E. Do not use powder-actuated anchors without specific permission.
- F. Do not drill structural steel members.
- G. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- H. In wet locations and on all building floors below exterior earth grade install free-standing electrical equipment on concrete pads.
- I. Install cabinets and panelboards with minimum of four anchors. Provide horizontal backing/support framing in stud walls for rigid mounting. Provide steel channel supports to stand surface-mounted panelboard or cabinet one inch off wall.
- J. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

- K. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.
- L. Refer to Section 26 05 33 for special conduit supporting requirements.

3.2 FINISH

- A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and above suspended ceiling spaces are not considered exposed.
- B. Trim all ends of exposed field fabricated steel hangers, slotted channel and threaded rod to within 1" of support or fastener to eliminate potential injury to personnel unless shown otherwise on the drawings. Smooth ends and install elastomeric insulation with two coats of latex paint if exposed steel is within 6'-6" of finish floor and presents potential injury to personnel.

END OF SECTION

SECTION 26 05 33
CONDUIT AND BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Rigid metallic conduit and fittings (RMC)
- B. Intermediate metallic conduit and fittings (IMC)
- C. Electrical metallic tubing and fittings (EMT)
- D. Flexible metallic conduit and fittings (FMC)
- E. Liquidtight flexible metallic conduit and fittings (LFMC)
- F. Wall and ceiling outlet boxes
- G. Pull and junction boxes
- H. Accessories

1.2 RELATED WORK

- A. Section 26 05 53 - Electrical Identification: Refer to electrical identification for color and identification labeling requirements.

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated
 - 2. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated and Fittings
 - 3. ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing
 - 4. ANSI C80.6 - Intermediate Metal Conduit, Zinc Coated
 - 5. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports
 - 6. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports
- B. Federal Specifications (FS):
 - 1. A-A-50553A - Fittings for Conduit, Metal, Rigid, (Thick-Wall and Thin-Wall (EMT) Type
 - 2. A-A-55810 - Specification for Flexible Metal Conduit
- C. NECA "Standards of Installation"
- D. National Electrical Manufacturers Association (NEMA):

1. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
 2. RN 1 - Polyvinyl chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit, Rigid Aluminum Conduit, and Intermediate Metal Conduit
 3. TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit
 4. TC 9 - Fittings for PVC Plastic Utilities Duct for Underground Installation
- E. California Electrical Code (CEC)
- F. Underwriters Laboratories (UL): Applicable Listings
1. UL 1 - Flexible Metal Conduit
 2. UL 6 - Rigid Metal Conduit
 3. UL 360 - Liquid Tight Flexible Steel Conduit
 4. UL746A - Standard for Polymeric Materials - Short Term Property Evaluations
 5. UL797 - Electrical Metal Tubing
 6. UL1242 - Intermediate Metal Conduit
- G. Definitions:
1. Fittings: Conduit connection or coupling.
 2. Body: Enlarged fittings with opening allowing access to the conductors for pulling purposes only.
 3. Mechanical Spaces: Enclosed areas, usually kept separated from the general public, where the primary use is to house service equipment and to route services. These spaces generally have exposed structures, bare concrete and non-architecturally emphasized finishes.
 4. Finished Spaces: Enclosed areas where the primary use is to house personnel and the general public. These spaces generally have architecturally emphasized finishes, ceilings and/or floors.
 5. Concealed: Not visible by the general public. Often indicates a location either above the ceiling, in the walls, in or beneath the floor slab, in column coverings, or in the ceiling construction.
 6. Above Grade: Not directly in contact with the earth. For example, an interior wall located at an elevation below the finished grade shall be considered above grade but a wall retaining earth shall be considered below grade.
 7. Slab: Horizontal pour of concrete used for a floor or sub-floor.

PART 2 - PRODUCTS

2.1 RIGID METALLIC CONDUIT (RMC) AND FITTINGS

A. Manufacturers:

1. Allied
2. LTV
3. Steelduct
4. Wheatland Tube Co
5. O-Z Gedney
6. or approved equal.

B. Manufacturers of RMC Conduit Fittings:

1. Appleton Electric
2. O-Z/Gedney Co.
3. Electroline
4. Raco
5. Thomas & Betts
6. or approved equal.

C. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted.

D. Fittings and Conduit Bodies:

1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.
2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of 4 inches of movement. Fitting shall be watertight with an insulating bushing and a bonding jumper.
3. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. High impact phenolic threaded type bushings are not acceptable.
4. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.

2.2 INTERMEDIATE METALLIC CONDUIT (IMC) AND FITTINGS

A. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted.

B. Manufacturers:

1. Allied
2. LTV
3. Steelduct
4. Wheatland Tube Co
5. O-Z Gedney
6. or approved equal.

C. Fittings and Conduit Bodies:

1. End Bell Fittings: Malleable iron, hot dip galvanized, threaded flare type with provisions for mounting to form.
2. Expansion Joints: Malleable iron and hot dip galvanized providing a minimum of 4 inches of movement. Fitting shall be watertight with an insulating bushing and a bonding jumper.
3. Conduit End Bushings: Malleable iron type with molded-on high impact phenolic thermosetting insulation. Where required elsewhere in the contract documents, bushing shall be complete with ground conductor saddle and clamp. High impact phenolic threaded type bushings are not acceptable.
4. All other fittings and conduit bodies shall be of malleable iron construction and hot dip galvanized.

2.3 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. Minimum Size Electrical Metallic Tubing: 3/4 inch, unless otherwise noted.

B. Manufacturers of EMT Conduit:

1. Allied
2. Calbond Calpipe
3. LTV
4. Steelduct
5. Wheatland Tube Co
6. or approved equal.

C. Fittings and Conduit Bodies:

1. 2" Diameter or Smaller: Compression type of steel designed for their specific application.
2. 1/2" and 3/4" Conduit: Push-on connectors and couplers with locking ring and washer of zinc plated steel, listed for use in dry locations.
3. Larger than 2": Compression type of steel designed for their specific application.

4. Manufacturers of EMT Conduit Fittings:

- a. Appleton Electric
- b. O-Z/Gedney Co.
- c. Electroline
- d. Raco
- e. Bridgeport
- f. Midwest
- g. Regal
- h. Thomas & Betts
- i. Orbit Industries
- j. or approved equal.

2.4 FLEXIBLE METALLIC CONDUIT (FMC) AND FITTINGS

- A. Minimum Size Galvanized Steel: 3/4 inch, unless otherwise noted. Lighting branch circuit wiring to an individual luminaire may be a manufactured, UL listed 3/8" flexible metal conduit and fittings with #14 AWG THHN conductors and an insulated ground wire. Maximum length of 3/8" FMC shall be six (6) feet.
- B. Manufacturers:
 1. American Flex
 2. Alflex
 3. Electri-Flex Co
 4. or approved equal.
- C. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel. Provide a separate equipment grounding conductor when used for equipment where flexibility is required.
- D. Fittings and Conduit Bodies:
 1. Threadless hinged clamp type, galvanized zinc coated cadmium plated malleable cast iron.
 2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.
 3. Manufacturers:
 - a. O-Z/Gedney Co.
 - b. Thomas & Betts

- c. Appleton Electric
- d. Electroline
- e. Bridgeport
- f. Midwest
- g. Regal
- h. Orbit Industries
- i. or approved equal.

2.5 LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT (LFMC) AND FITTINGS

A. Manufacturers:

- 1. Anaconda Type UA
- 2. Electri-Flex Type LA
- 3. Alfalex
- 4. Carlon (Lamson & Sessions)
- 5. or approved equal.

B. Construction: Flexible steel, approved for conduit ground, zinc coated, threadless type formed from a continuous length of spirally wound, interlocked zinc coated strip steel and an extruded PVC cover.

C. Fittings and Conduit Bodies:

- 1. Watertight, compression type, galvanized zinc coated cadmium plated malleable cast iron, UL listed.
- 2. Fittings and conduit bodies shall include plastic or cast metal inserts supplied by the manufacturer to protect conductors from sharp edges.
- 3. Manufacturers:
 - a. Appleton Electric
 - b. O-Z/Gedney Co.
 - c. Electroline
 - d. Bridgeport
 - e. Thomas & Betts
 - f. Midwest
 - g. Regal

- h. Carlon (Lamson & Sessions)
- i. Orbit Industries
- j. or approved equal.

2.6 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, minimum of 14 gauge, with 1/2-inch male fixture studs where required.
- B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.
- C. Outlet boxes for luminaires to be not less than 1-1/2" deep, deeper if required by the number of wires or construction. The box shall be coordinated with surface luminaires to conceal the box from view or provide a finished trim plate.
- D. Switch outlet boxes for local light control switches, dimmers and occupancy sensors shall be 4 inches square by 2-1/8 inches deep, with raised cover to fit flush with finish wall line. Multiple gang switch outlets shall consist of the required number of gang boxes appropriate to the quantity of switches comprising the gang. Where walls are plastered, provide a plaster raised cover. Where switch outlet boxes occur in exposed concrete block walls, boxes shall be installed in the block cavity with a raised square edge tile cover of sufficient depth to extend out to face of block or masonry boxes.
- E. Outlet boxes for telephone substations in walls and columns shall be 4 inches square and 2-1/8 inches deep with single gang raised cover to fit flush with finished wall line equipped with flush telephone plate.
- F. Wall or column receptacle outlet boxes shall be 4 inches square with raised cover to fit flush with finished wall line. Boxes in concrete block walls shall be installed the same as for switch boxes in block walls.

2.7 JB; PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.
- B. Sheet metal boxes larger than 12 inches in any dimension that contain terminations or components: Continuous hinged enclosure with 1/4 turn latch and white back panel for mounting terminal blocks and electrical components.
- C. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.
- D. Flanged type boxes shall be used where installed flush in wall.

2.8 ACCESSORIES

- A. Fire Rated Moldable Pads: UL #9700, moldable sheet putty at required thickness on all five sides of back boxes. Kinetics Noise Control - IsoBacker Pad, SpecSeal - SSP Putty and Pads, 3M #MPP-4S or equal.

PART 3 - EXECUTION

3.1 CONDUIT INSTALLATION SCHEDULE AND SIZING

- A. In the event the location of conduit installation represents conflicting installation requirements as specified in the following schedule, a clarification shall be obtained from the Architect/Engineer. If this Contractor is unable to obtain a clarification as outlined above, concealed rigid galvanized steel conduit installed per these specifications and the CEC shall be required.
- B. Installation Schedule: Refer to drawings.
- C. Size conduit as shown on the drawings and specifications. Where not indicated in the contract documents, conduit size shall be according to CEC. Conduit and conductor sizing shall be coordinated to limit conductor fill to less than 40%, maintain conductor ampere capacity as required by the CEC (to include enlarged conductors due to temperature and quantity derating values) and to prevent excessive voltage drop and pulling tension due to long conduit/conductor lengths.
- D. Minimum Conduit Size (Unless Noted Otherwise):
 - 1. Above Grade: 3/4 inch. (The use of 1/2 inch would be allowed for installation conduit to individual light switches, individual receptacles and individual fixture whips from junction box.)
- E. Conduit sizes shall change only at the entrance or exit to a junction box, unless specifically noted on the drawings.

3.2 CONDUIT ARRANGEMENT

- A. In general, conduit shall be installed concealed in walls, in finished spaces and where possible or practical, or as noted otherwise. Conduit shall be installed parallel or perpendicular to walls, ceilings, and exposed structural members. In unfinished spaces, mechanical and utility areas, conduit may run either concealed or exposed as conditions dictate and as practical unless noted otherwise on drawings. Installation shall maintain headroom in exposed vicinities of pedestrian or vehicular traffic.
- B. Exposed conduit on exterior walls or above roof will not be allowed without prior written approval of Architect/Engineer. A drawing of the proposed routing and a photo of the location shall be submitted 14 days prior to start of conduit rough-in. Routing shall be shown on coordination drawings.
- C. Conduit arrangement in elevated slabs (restricted to applications specifically noted or shown on drawings):
 - 1. Conduit size shall not exceed one-third of the structural slab thickness. Place conduit between the top and bottom reinforcing with a minimum of 3" concrete cover.
 - 2. Parallel conduits shall be spaced at least 8 inches apart. Exception: Within 18 inches of commonly served floor boxes, junction boxes, or similar floor devices. Arrange conduits parallel or perpendicular to building lines and walls.
- D. Conduit shall not share the same cell as structural reinforcement in masonry walls.
- E. Conduit runs shall be routed as shown on large scale drawings. Conduit routing on drawings scaled 1/4"=1'-0" or less shall be considered diagrammatic, unless noted otherwise. The correct

routing, when shown diagrammatically shall be chosen by the Contractor based on information in the contract documents, in accordance with manufacturer's written instructions, applicable codes, the NECA's "Standard of Installation", in accordance with recognized industry standards, and coordinated with other contractors.

- F. Contractor shall adapt Contractor's work to the job conditions and make such changes as required and permitted by the Architect/Engineer, such as moving to clear beams and joists, adjusting at columns, avoiding interference with windows, etc., to permit the proper installation of other mechanical and/or electrical equipment.
- G. Contractor shall cooperate with all contractors on the project. Contractor shall obtain details of other contractor's work to ensure fit and avoid conflict. Any expense due to the failure of This Contractor to do so shall be paid for in full by Contractor. The other trades involved as directed by the Architect/Engineer shall perform the repair of work damaged as a result of neglect or error by This Contractor. The resultant costs shall be borne by This Contractor.

3.3 CONDUIT SUPPORT

- A. Conduit runs installed above a suspended ceiling shall be properly supported. In no case shall conduit rest on the suspended ceiling construction, nor utilize ceiling support system for conduit support.
 - 1. Support wire used to independently support raceway and wiring systems above suspending ceilings shall be supported on both ends, minimum 12 gauge suspended ceiling support wire, and distinguishable from ceiling support systems by color (field paint), tagging, or equivalent means.
- B. Conduit shall not be supported from ductwork, water, sprinkler piping, or other non- structural members, unless approved by the Architect/Engineer. All supports shall be from structural slabs, walls, structural members, and bar joists, and coordinated with all other applicable contractors, unless noted otherwise.
- C. Conduit shall be held in place by the correct size of galvanized one-hole conduit clamps, two-hole conduit straps, patented support devices, clamp back conduit hangers, or by other means if called for on the drawings.
- D. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- E. Spring-steel conduit clips specifically designed for supporting single conduits or tubing may be used in lieu of malleable-iron hangers for 1" and smaller raceways serving lighting and receptacle branch circuits above accessible ceilings and for securing raceways to slotted channel and angle supports.
- F. Group conduits in parallel runs where practical and use conduit racks or trapeze hangers constructed of steel channel, suspended with threaded solid rods or wall mounted from metal channels with conduit straps or clamps. Provide space in each rack or trapeze for 25% additional conduits.
- G. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (excludes concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and mechanical items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

- I. Supports for metallic conduit shall be no greater than 10 feet. A smaller interval may be used if necessitated by building construction, but in no event shall support spans exceed the CEC requirements. Conduit shall be securely fastened within 3 feet of each outlet box, junction box, device box, cabinet, or fitting.
- J. Supports of flexible conduit shall be within 12 inches of each outlet box, junction box, device box, cabinet, or fitting and at intervals not to exceed 4.5 feet.
- K. Supports for non-metallic conduit shall be at sufficiently close intervals to eliminate any sag in the conduit. The manufacturer's recommendations shall be followed, but in no event shall support spans exceed the CEC requirements.
- L. Where conduit is to be installed in poured concrete floors or walls, provide concrete- tight conduit inserts securely fastened to forms to prevent conduit misplacement.
- M. Finish:
 - 1. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and above suspended ceiling spaces are not considered exposed.
 - 2. Trim all ends of exposed field fabricated steel hangers, slotted channel and threaded rod to within 1" of support or fastener to eliminate potential injury to personnel unless shown otherwise on the drawings. Smooth ends and install elastomeric insulation with two coats of latex paint if exposed steel is within 6'-6" of finish floor and presents potential injury to personnel.

3.4 CONDUIT INSTALLATION

- A. Conduit Connections:
 - 1. Shorter than standard conduit lengths shall be cut square using industry standards. The ends of all conduits cut shall be reamed or otherwise finished to remove all rough edges.
 - 2. Metallic conduit connections in slab on grade installation shall be sealed and one coat of rust inhibitor primer applied after the connection is made.
 - 3. Where conduits with tapered threads cannot be coupled with standard couplings, then approved split or Erickson couplings shall be used. Running threads will not be permitted.
 - 4. Install expansion/deflection joints where conduit crosses structure expansion/seismic joints.
- B. Conduit terminations for all low voltage wiring shall have nylon bushings installed on each end of every conduit run.
- C. Conduit Bends:
 - 1. Use a hydraulic one-shot conduit bender or factory elbows for bends in conduit 2" in size or larger. All steel conduit bending shall be done cold; no heating of steel conduit shall be permitted.
 - 2. A run of conduit shall not contain more than the equivalent of four (4) quarter bends (360°), including those bends located immediately at the outlet or body.
- D. Conduit Placement:

1. Conduit shall be mechanically continuous from source of current to all outlets. Conduit shall be electrically continuous from source of current to all outlets, unless a properly sized grounding conductor is routed within the conduit. All metallic conduits shall be bonded per the CEC.
2. Route exposed conduit and conduit above suspended ceilings (accessible or not) parallel/perpendicular to the building structural lines, and as close to building structure as possible. Wherever possible, route horizontal conduit runs above water and steam piping.
3. Route conduit through roof openings provided for piping and ductwork where possible. If not provided or routing through provided openings is not possible, route through roof jack with pitch pocket. Coordinate roof penetrations with other trades.
4. Conduits, raceway, and boxes shall not be installed in concealed locations in metal deck roofing or less than 1.5" below bottom of roof decking.
5. Avoid moisture traps where possible. Where unavoidable, provide a junction box with drain fitting at conduit low point.
6. All conduits through walls shall be grouted or sealed into openings. Where conduit penetrates firewalls and floors, seal with a UL listed sealant. Seal penetrations with intumescent caulk, putty, or sheet installed per manufacturer's recommendations. All materials used to seal penetrations of firewalls and floors shall be tested and certified as a system per ASTM E814 Standard for fire tests or through-penetration fire stops as manufactured by 3M or approved equal
7. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPENINGS REQUIRED IN MASONRY OR EXTERIOR WALLS UNDER THIS DIVISION. A QUALIFIED MASON AT THE EXPENSE OF THIS CONTRACTOR SHALL REPAIR ALL OPENINGS TO MATCH EXISTING CONDITIONS.
8. Seal interior of conduit at exterior entries, air handling units, coolers/freezers, etc., and where the temperature differential can potentially be greater than 20°F, to prevent moisture penetration. Seal shall be placed where conduit enters warm space. Conduit seal fitting shall be a drain/seal, with sealing compound, identified for use with cable and raceway system, equal to O-Z/Gedney type EYD.
9. Horizontal conduit routing through slabs above grade
 - a. Conduits, if run in concrete structure, shall be in middle one-third of slab thickness, and leave at least 3" min. concrete cover. Conduits shall run parallel to each other and spaced at least 8" apart centerline to centerline. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement. Maximum conduit outside diameter 1".
 - b. No conduits are allowed in concrete on metal deck unless expressly approved in writing by the Structural Engineer.
 - c. No conduits are allowed to be routed horizontally through slabs above grade.
10. Do not route conduits across each other in slabs on grade.
11. Contractor shall provide suitable mechanical protection around all conduits stubbed out from floors, walls or ceilings during construction to prevent bending or damaging of stubs due to carelessness with construction equipment.

12. Contractor shall provide a polypropylene pull cord with 2000 lbs. tensile strength in each empty conduit (indoor and outdoor), except in sleeves and nipples.

3.5 CONDUIT TERMINATIONS

- A. Where conduit bonding is indicated or required in the contract documents, the bushings shall be a grounding type sized for the conduit and ground bonding conductor as manufactured by O-Z/Gedney, Appleton, Thomas & Betts, Burndy, Regal, Orbit Industries or approved equal.
- B. Conduits with termination fittings shall be threaded for one (1) lock nut on the outside and one (1) lock nut and bushing on the inside of each box.
- C. Where conduits terminate in boxes with knockouts, they shall be secured to the boxes with lock nuts and provided with approved screw type tinned iron bushings or fittings with plastic inserts.
- D. Where conduits terminate in boxes, fittings, or bodies with threaded openings, they shall be tightly screwed against the shoulder portion of the threaded openings.
- E. Conduit terminations to all motors shall be made with flexible metallic conduit (FMC), unless noted otherwise. Final connections to roof exhaust fans, or other exterior motors and motors in damp or wet locations shall be made with liquidtight flexible metallic conduit (LFMC). Motors in hazardous areas, as defined in the CEC, shall be connected using flexible conduit rated for the environment. Flexible conduit shall not exceed 6' in length. Route equipment ground conductors from circuit ground to motor ground terminal through flexible conduit.
- F. All conduit ends shall be sealed with plastic immediately after installation to prevent the entrance of any foreign matter during construction. The seals shall be removed and the conduits blown clear of all foreign matter prior to any wires or pull cords being installed.

3.6 RIGID POLYVINYL CHLORIDE CONDUIT (PVC) OVERHEAD CONDUIT INSTALLATION

- A. Conduit shall be installed away from high temperature piping and equipment.
- B. Conduit shall be installed to prevent exposure to ultraviolet radiation.
- C. Proper allowances shall be made for expansion and/or contraction of the conduit during installation.
- D. Expansion fittings shall be installed in any 100' continuous run of conduit and at each 100' thereafter.
- E. Supports shall be made from non-corroding materials and spacing shall not be greater than the listing in the CEC, but also shall not exceed the manufacturer's recommendations depending on the expected surface temperature.

3.7 BOX INSTALLATION SCHEDULE

- A. Galvanized steel boxes may be used in:
 1. Concealed interior locations above ceilings and in hollow studded partitions.
 2. Exposed interior locations in mechanical rooms and in rooms without ceilings; higher than 8' above the highest platform level.
 3. Direct contact with concrete except slab on grade.

4. Recessed in stud wall of kitchens and laundries.

3.8 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on the drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Electrical box locations shown on the Contract Drawings are approximate, unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.
- C. Locate and install boxes to allow access. Avoid interferences with ductwork, piping, structure, equipment, etc. Recessed luminaires shall not be used as access to outlet, pull, and junction boxes. Where installation is inaccessible, provide access doors. Coordinate locations and sizes of required access doors with the Architect/Engineer and General Contractor.
- D. Locate and install to maintain headroom and to present a neat appearance.
- E. Coordinate locations with Heating Contractor to avoid baseboard radiation cabinets.

3.9 OUTLET BOX INSTALLATION

- A. Do not install boxes back-to-back in walls.
 1. Provide a minimum horizontal separation of 6 inches between boxes installed on opposite sides of non-rated stud walls. When the minimum separation cannot be maintained, install sound insulation pads on all five sides of the back box in accordance with the manufacturer's instructions.
 2. Provide a minimum horizontal separation of 24 inches between boxes installed on opposite sides of fire-rated walls. When the minimum separation cannot be maintained, the box is greater than 16 square inches or the total box area (all trades) per 100 square feet is greater than or equal to 100 square inches, install fire-rated moldable pads to all five sides of the back box to maintain the fire rating of the wall. Install moldable pads in accordance with UL listing for the specific product. Sound insulation pads are not acceptable for use in fire-rated wall applications unless the product carries the necessary fire rating.
- B. Install sound insulation pads on all five sides of the back of all boxes in sound-rated wall assemblies. Sound-rated wall assemblies are defined as partition types carrying a Sound Transmission Class (STC) rating.
- C. The Contractor shall anchor switch and outlet box to wall construction so that it is flush with the finished masonry, paneling, drywall, plaster, etc. The Contractor shall check the boxes as the finish wall surface is being installed to assure that the box is flush. (Provide plaster rings as necessary.)
- D. Mount at heights shown or noted on the drawings or as generally accepted if not specifically noted.
- E. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.
- F. Provide knockout closures for unused openings.
- G. Support boxes independently of conduit.

- H. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- I. Install boxes in walls without damaging wall insulation.
- J. Coordinate mounting heights and locations of outlets mounted above counters, benches, backsplashes, and below baseboard radiation.
- K. Position outlets to locate luminaires as shown on reflected ceiling drawings.
- L. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.
- M. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioned to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- N. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
- O. Provide cast outlet boxes in exterior locations and wet locations, and where exposed rigid or intermediate conduit is used.

3.10 PULL AND JUNCTION BOX INSTALLATION

- A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.
- B. Support pull and junction boxes independent of conduit.
- C. Do not install boxes back-to-back in walls.
 - 1. Provide a minimum horizontal separation of 6 inches between boxes installed on opposite sides of non-rated stud walls. When the minimum separation cannot be maintained, install sound insulation pads on all five sides of the back box in accordance with the manufacturer's instructions.
 - 2. Provide a minimum horizontal separation of 24 inches between boxes installed on opposite sides of fire-rated walls. When the minimum separation cannot be maintained, the box is greater than 16 square inches or the total box area (all trades) per 100 square feet is greater than or equal to 100 square inches, install fire-rated moldable pads to all five sides of the back box to maintain the fire rating of the wall. Install moldable pads in accordance with UL listing for the specific product. Sound insulation pads are not acceptable for use in fire-rated wall applications unless the product carries the necessary fire rating.
- D. Install sound insulation pads on all five sides of the back of all boxes in sound-rated wall assemblies. Sound-rated wall assemblies are defined as partition types carrying a Sound Transmission Class (STC) rating.

3.11 EXPOSED BOX INSTALLATION

- A. Boxes shall be secured to the building structure with proper size screws, bolts, hanger rods, or structural steel elements.

- B. On brick, block and concrete walls or ceilings, exposed boxes shall be supported with no less than two (2) Ackerman-Johnson, Paine, Phillips, or approved equal screw anchors or expansion shields and round head machine screws. Cast boxes shall not be drilled.
- C. On steel structures, exposed boxes shall be supported to the steel member by drilling and tapping the member and fastening the boxes by means of round head machine screws.
- D. Boxes may be supported on steel members by APPROVED beam clamps if conduit is supported by beam clamps.
- E. Boxes shall be fastened to wood structures by means of a minimum of two (2) wood screws adequately large and long to properly support. (Quantity depends on size of box.)
- F. Wood, plastic, or fiber plugs shall not be used for fastenings.
- G. Explosive devices shall not be used unless specifically allowed.

END OF SECTION

SECTION 26 05 48
SEISMIC REQUIREMENTS FOR EQUIPMENT AND SUPPORTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Seismic Requirements.

1.2 QUALITY ASSURANCE

A. General:

1. The contractor shall retain a specialty consultant or equipment manufacturer to develop a seismic restraint and support system and perform seismic calculations in accordance with these specifications, state, and local codes.
2. Items used for seismic restraint of equipment and systems shall be specifically manufactured for seismic restraint.
3. These requirements are beyond those listed in Section 26 05 27 of these specifications. Where a conflict arises between the seismic requirements of this section and any other section, the Architect/Engineer shall be immediately notified for direction to proceed.

B. Manufacturer:

1. System Supports/Restraints: Company specializing in the manufacture of products specified in this Section.
2. Equipment: Each company providing equipment that must meet seismic requirements shall provide certification included in project submittals the equipment supplied for the project meets or exceeds the seismic requirements of the project.

- C. Testing Agency: An independent testing agency, acceptable to Authorities Having Jurisdiction, with experience and capability to conduct the testing indicated.

- D. Installer: Company specializing in performing the work of this Section.

1.3 REFERENCES

- A. California Building Code (CBC)
- B. California Office of Statewide Health Planning and Development (OSHPD)
- C. California Division of State Architect (DSA) Interpretation of Regulations
- D. ASCE 7-02, Chapter 9.
- E. ASCE 7-05, Chapter 13.
- F. ASCE 7-10, Chapter 13.
- G. ASCE 7-16, Chapter 13.

1.4 SUBMITTALS

- A. Submit under provisions of Section 26 05 00.
- B. Submittal to Code Official:
 - 1. Contractor shall submit copies of the seismic shop drawings to the governing code authority for approval.
- C. State of California OSHPD:
 - 1. The State of California requires certain equipment and components installed for this project to have special seismic certification. The Contractor and vendor shall provide the special seismic certification per OSHPD CAN 2-1708A.5.
 - 2. Seismic restraint calculations or OSHPD pre-approved seismic restraint tables (ISAT or equivalent) OSHPD series OPM pre-approval shall be provided. Calculations shall include restraint selections and installation details. Utilize ICC approved seismic brackets for suspended utilities.
 - 3. Seismic restraint design shall be sealed by a Structural Engineer licensed in the State of California. The Structural Engineer / vendor shall be OSHPD certified and include a copy of certification with submittals. Calculations shall substantiate equipment mountings and foundations and their seismic restraints can meet the required external forces, "G", load for all rigidly and resiliently supported equipment without failure and permanent displacement. Submit similar calculations for life safety equipment restraints for "G" loading. Restrain all resiliently mounted conduit with cable seismic bracing per OSHPD series OPM pre-approval.
 - 4. Anchor Bolts and Studs: Tabulate types and sizes, complete with report numbers and rated strength in tension and shear as evaluated by ICBO Evaluation Services.
- D. A seismic restraint designer shall be provided whether or not exceptions listed in the applicable building code are met. If seismic restraints are not provided for a system that requires seismic bracing, the seismic designer shall submit a signed and sealed letter to the Architect/Engineer and Authorities Having Jurisdiction stating the exceptions, along with code reference, utilized for each item. Seismic designer shall review system installation for general conformance to the exception requirements stated in the code and document, in writing, the system has been installed in accordance to the exception.

1.5 TESTING AND INSPECTION

- A. Special Inspection and Testing shall be done in accordance with Chapter 17 of the California Building Code.
- B. The Owner shall employ a Special Inspection Agency to perform the duties and responsibilities specified in Section 1704 and 1705.
- C. Work performed on the premises of a fabricator approved by the building official need not be tested and inspected. The fabricator shall submit a certificate of compliance that the work has been performed in accordance with the approved plans and specifications to the building official and the Architect and Engineer of Record.
- D. The Special Inspection Agency shall furnish inspection reports to the building official, the Owner, the Architect, the Engineer of Record, and the General Contractor. The reports shall be completed

and furnished within 48 hours of inspected work. A final signed report stating whether the work requiring special inspection was, to the best of the Special Inspection Agency's knowledge, in conformance with the approved plans and specifications shall be submitted.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site. Accept material on site in factory containers and packing. Inspect for damage. Protect from damage and contamination by maintaining factory packaging until installation. Follow manufacturer's instructions for storage.

1.7 DESIGN REQUIREMENTS

- A. This project is subject to the seismic bracing requirements of the International Building Code, 2019 edition.

1.8 COORDINATION

- A. Coordinate layout and installation of seismic bracing with building structural systems and architectural features, and with mechanical, fire-protection, electrical and other building features in the vicinity.
- B. Coordinate concrete bases with building structural system.

1.9 WARRANTY

- A. Provide one-year warranty on parts and labor for manufacturer defects and installation workmanship.

PART 2 - PRODUCTS

2.1 SUPPLIERS

- A. Following is a partial list of manufacturer/supplier contact information for seismic restraints:

1. B-Line Systems, Inc. (800) 851-7415, www.b-line.com.
2. Unistrut Corporation <http://www.unistrut.us/>
3. Kinetics Noise Control (877) 457-2695, www.kineticsnoise.com.
4. Mason Industries, Inc. www.mason-ind.com.
5. Loos & Co., Inc. (800) 321-5667, www.loosnaples.com.
6. Tolco (909) 737-5599, www.tolco.com
7. ISAT 877.523.6060, www.isatsb.com
8. Vibro-Acoustics (416) 291-7371, <https://virs.vibro-acoustics.com/>

2.2 SEISMIC DESIGN CRITERIA

- A. This section describes the requirements for seismic restraint of systems and equipment related to continued operation of the facility after a design seismic event.

B. Definitions:

1. Stay in Place:

- a. All systems and equipment shall be anchored and restrained such that the anchoring system is intended not to fail and equipment and/or system components will not fall.

2.3 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Seismic restraint designer shall coordinate all attachments with the Structural Engineer of Record; refer to submittal requirements.
2. The seismic restraint design shall be based on actual equipment data obtained from manufacturer's submittals or the manufacturer. The equipment manufacturer shall verify and provide written certification the attachment points on the equipment can accept the combination of seismic, weight, and other imposed loads.
3. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
4. Analysis shall detail anchoring methods, bolt diameter, embedment, and weld length.
5. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.
6. All seismic restraints and combination isolator/restraints shall have verification of their seismic capabilities witnessed by an independent testing agency.

B. Friction from gravity loads shall not be considered resistance to seismic forces.

C. Housekeeping Pads:

1. Reinforced housekeeping pads shall be provided to handle shear, tension, and compression forces with proper reinforcement, doweling, and attachments connecting the pad to the structural slab.

2.4 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.
2. Outdoors and Damp Locations: Galvanized steel.
3. Corrosive Locations: Stainless steel.

2.5 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength: Defined in reports by ICC Evaluation Service or another agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.

- B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type. Comply with IBC, ACI and ICC ES requirements for cracked concrete anchors.
- C. Concrete Inserts: Steel-channel type.
- D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM F3125, Grade A 325.
- E. Welding Lugs: Comply with MSS SP-69, Type 57.
- F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.
- G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.
- H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.6 SEISMIC BRACING COMPONENTS

- A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch-thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.
 - 1. Materials for Channel: ASTM A 1011, GR 33.
 - 2. Materials for Fittings and Accessories: ASTM A 635, ASTM A 576, or ASTM A 36.
 - 3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
 - 4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.
- B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.
- C. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to the applicable code sections and Authority Having Jurisdiction for the exact seismic restraint requirements of conduit, equipment, etc.
- B. Layout of transverse and longitudinal bracing shall follow recommendations of approved design standards listed in Part 1 of this specification section.
- C. All rigid floor mounted equipment shall have a resilient media between the equipment mounting hole and the anchor bolt in concrete.
- D. All seismic restraint systems shall be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.

- E. Installation of seismic restraints shall not cause any change in position of equipment lighting or conduits resulting in stresses or misalignment.
- F. No rigid connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.
- G. Do not install any equipment or conduit that makes rigid connections with the building unless isolation is not specified.
- H. Coordinate work with all other trades to avoid rigid contact with the building. Any conflicts with other trades that will result in rigid contact with equipment or conduit due to inadequate space or other unforeseen conditions shall be brought to the Architect/Engineer's attention prior to specific equipment selection.
- I. Prior to installation, bring to the Architect/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.
- J. Bracing may occur from flanges of structural beams, upper truss cords of bar joists, cast in place inserts, or International Code Council approved seismic anchors for installation in concrete.
- K. Cable restraints shall be installed slightly slack to avoid short-circuiting the isolated suspended equipment or conduit.
- L. Cable assemblies shall be installed taut on non-isolated systems. Solid braces may be used in place of cables on rigidly attached systems only.
- M. Do not install cables over sharp corners.
- N. Brace support rods when necessary to accept compressive loads. Welding of compression braces to the vertical support rods is not acceptable.
- O. Provide reinforced clevis bolts when required.
- P. The vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not acceptable.
- Q. Post-Installed anchors shall be provided to meet seismic requirements.
- R. Vertical conduit risers flexibly supported to accommodate thermal motion and/or conduit vibration shall be guided to maintain conduit stability and provide horizontal seismic restraint.
- S. Seismic restraints shall be mechanically attached to the system. Looping restraints around the system is not acceptable.
- T. Conduit crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the conduit, equipment connections, or support connections. Conduit offsets, loops, anchors, and guides shall be installed as required to provide required motion capability and limit motion of adjacent conduit.
- U. Do not brace a system to two different structures such as a wall and a ceiling.
- V. Provide appropriately sized openings in walls, floors, and ceilings for anticipated seismic movement. Provide fire seal systems in fire-rated walls.

- W. Positively attach all roof-mounted equipment to roof curbs. Positively attach all roof curbs to building structure.
- X. Exposed seismic supports in occupied areas shall be guarded or covered to protect occupants.

3.2 SEISMIC RESTRAINT EXCLUSIONS

- A. Refer to the applicable code sections and Authority Having Jurisdiction for allowable exclusions.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Adhesive Markings and Field Labels
- B. Nameplates and Signs
- C. Product Colors

1.2 REFERENCES

- A. ANSI C2 - National Electrical Safety Code
- B. California Electrical Code (CEC)
- C. ANSI A13.1 - Standard for Pipe Identification
- D. ANSI Z535.4 - Standard for Product Safety Signs and Labels

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Division 1 Specification Sections and under provisions of Section 26 05 00.
 - 1. Product Data for each type of product specified.
 - 2. Schedule of nomenclature to be used for identification signs and labels for each piece of equipment including, but not limited to, the following equipment types as specified in Division 26.
 - 3. Samples of each color, lettering style and other graphic representation required for identification materials including samples of labels and signs.
 - 4. Identification required in this section shall apply to equipment furnished in Division 26 and any other applicable Divisions including Division 21/22/23.

PART 2 - PRODUCTS

2.1 ADHESIVE MARKINGS AND FIELD LABELS

- A. Adhesive Marking Labels for Raceway: Pre-printed, flexible, self-adhesive vinyl labels with legend indicating voltage and service (Emergency, Lighting, Power, HVAC, Communications, Control, Fire).
 - 1. Label Size as follows:
 - a. Raceways: Kroy or Brother labels 1-inch high by 12-inches long (minimum).

2. Color: As specified for various systems.
- B. Colored Adhesive Marking Tape for banding Raceways, Wires, and Cables: Self- adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.
- C. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.
- D. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from -40°F to 185°F (-40°C to 85°C), type 2/2S or type 21/21S based on application. Provide ties in specified colors when used for color coding. Cable ties shall be listed and identified for the application, securement, and support.
- E. Indoor/Outdoor Number and Letters: Outdoor grade vinyl label with acrylic adhesive designed for permanent application in severe indoor and outdoor environments.
- F. Text Sizes:
 1. The following information shall be used for text heights, fonts, and size, unless otherwise noted.
 - a. Font: Normal 721 Swiss Bold
 - b. Adhesive Labels: 3/16 inch minimum text height
 - c. Vinyl / Plastic Laminate Labels: 3/4" inch minimum text height

2.2 NAMEPLATES AND SIGNS

- A. Engraved, Plastic-Laminated Labels, Signs and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8 inch thick for larger sizes. Labels shall be punched for mechanical fasteners.
- B. Text Sizes:
 1. The following information shall be used for text heights, fonts, and size, unless otherwise noted.
 - a. Text Height: 3/8 inch minimum
- C. Fasteners for Plastic-Laminated Signs; Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.

2.3 PRODUCT COLORS

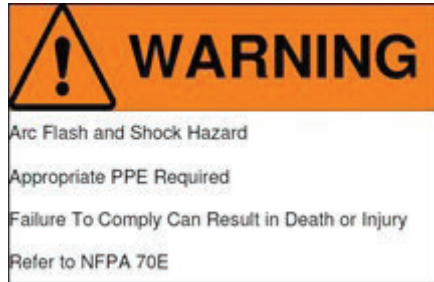
- A. Adhesive Markings and Field Labels:
 1. All Labels: Black letters on white face
 2. Normal Power and General Labels: Black letters on white face
 3. Control Labels: Black letters on white face
 4. Emergency: Red letters on white face

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals.
- B. Exposed Ceilings and Finished Spaces: The project includes exposed ceilings in finished spaces. The installation of colored raceways and labeling may not be aesthetically desirable in finished spaces. The contractor shall coordinate identification requirements in exposed ceilings of finished spaces with the A/E prior to installation and ordering of materials.
- C. Electrical System Color Chart: This Contractor shall furnish and install framed 8" x 12" charts of the color-coded identification scheme used for the electrical system in all electrical rooms and next to the main fire alarm panel.
- D. Install identification devices in accordance with manufacturer's written instruction and requirements of CEC.
- E. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work. All mounting surfaces shall be cleaned and degreased prior to identification installation.
- F. Circuit Identification: Tag or label conductors as follows:
 - 1. Multiple Power or Lighting Circuits in Same Enclosure: Where multiple branch circuits are terminated or spliced in a box or enclosure, label each conductor with source and circuit number.
 - 2. Multiple Control Wiring and Communication/Signal Circuits in Same Enclosure: For control and communications/signal wiring, use wire/cable marking tape at terminations in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tape.
 - 3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.
- G. Apply warning, caution and instruction signs as follows:
 - 1. Install warning, caution or instruction signs where required by CEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
 - 2. Emergency Operating Signs: Install, where required by CEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect, engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.
- H. Apply circuit/control/item designation labels of engraved plastic laminate for pushbuttons, pilot lights, alarm/signal components, and similar items, except where labeling is specified elsewhere.

- I. Install labels parallel to equipment lines at locations as required and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
- J. Install ARC FLASH WARNING signs on all switchboards, panelboards, industrial control panels, and motor control centers. Sign at a minimum shall contain:



END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Lighting and appliance branch circuit panelboards

1.2 RELATED SECTIONS AND WORK

- A. Refer to the One-Line Diagram and Panel Schedules for size, rating, and configuration.

1.3 REFERENCES

- A. NEMA AB 1 - Molded Case Circuit Breakers
- B. NEMA FU 1 - Low voltage cartridge fuses
- C. NEMA KS 1 - Enclosed Switches
- D. NEMA PB 1 - Panelboards
- E. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less
- F. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment
- G. UL 248 - Low-Voltage Fuses
- H. UL 67 - Panelboards

1.4 SUBMITTALS

- A. Arc Energy Reduction Documentation: Submit documentation to demonstrate the arc energy reduction system is set to operate at a value below the available arcing current.
- B. Submit manufacturer's instructions under provisions of Section 26 05 00.

1.5 SPARE PARTS

- A. Keys: Furnish four (4) each to the Owner.

PART 2 - PRODUCTS

2.1 RATINGS

- A. Definitions:
 - 1. Series rated equipment shall be defined as equipment that can achieve a required UL AIC rating with an upstream device such as a main breaker or a combination of devices to meet or exceed a required UL AIC rating. All series rated equipment shall have a permanently

attached nameplate indicating that device rating must be maintained. See Section 26 05 53 for additional requirements.

2. Fully rated equipment shall be defined as equipment where all devices in that equipment shall carry a minimum of the AIC rating that is specified.

- B. The panelboards for this project shall be fully rated unless otherwise specifically noted in the Drawings or Specifications.

2.2 BRANCH CIRCUIT PANELBOARDS

A. General

1. Manufacturers:

- a. Square D NQ, NF
- b. General Electric AQ, AE
- c. Siemens P1
- d. Cutler Hammer PRL1, PRL2

- B. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1; circuit breaker type.

- C. Enclosure: NEMA PB 1; Type 3R.

- D. Provide cabinet front with door-in-door construction, concealed hinge, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

- E. Provide panelboards with copper bus, ratings as scheduled on the drawings. Provide copper ground bus in all panelboards.

- F. All unlabeled circuits shown on the panelboard schedule shall be fully prepared spaces for future breakers.

- G. All multiple-section panelboards shall have the same dimensional back box and cabinet front size.

- H. Minimum Integrated Short Circuit Rating: As shown on the drawings.

- I. Provide handle lock-on devices for all breakers serving exit sign and lighting circuits with emergency battery units. Provide handle lock-on devices and red handles for breakers serving fire alarm panels.

- J. Molded Case Circuit Breakers: Bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on the drawings. Do not use tandem circuit breakers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Height: 6 feet to handle of highest device.

- B. Provide filler plates for unused spaces in panelboards.
- C. Provide custom typed circuit directory for each branch circuit panelboard. Provide updated custom typed circuit directory for each existing branch circuit panelboard with new or revised circuits per the scope of work. Label shall include equipment name or final approved room name, room number, and load type for each circuit (examples: SUMP SP-1 or ROOM 101 RECEPT). Revise directory to reflect circuit changes required to balance phase loads. Printed copies of the bid document panel schedules are not acceptable as circuit directories.
- D. Stub five (5) empty one-inch conduits to accessible location above ceiling out of each recessed panelboard.

3.2 FIELD QUALITY CONTROL

- A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.
- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

SECTION 26 27 16
CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Hinged cover enclosures
- B. Cabinets

1.2 REFERENCES

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- B. ANSI/NEMA ICS 1 - Industrial Control and Systems
- C. ANSI/NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems
- D. ANSI/NEMA ICS 6 - Enclosures for Industrial Control Equipment and Systems

1.3 SUBMITTALS

- A. Submit product data under provisions of Section 26 05 00.

PART 2 - PRODUCTS

2.1 HINGED COVER ENCLOSURES

- A. Construction: NEMA 250; Type 3R, 14 gauge steel.
- B. Finish: Manufacturer's standard polyester powder paint finish.
- C. Covers: Continuous hinge with stainless steel hinge pin. Covers longer than 24 inches shall have 3-point latching.
- D. Locks: Flush 1/4 turn cylinder key latch.
- E. Provide interior white painted metal panel for mounting terminal blocks and electrical components.

2.2 CABINETS

- A. Cabinet Boxes: Galvanized steel with removable endwalls, dimensions as indicated on the drawings.

2.3 FABRICATION

- A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.
- B. Provide conduit hubs and or knockouts on enclosures.

- C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.
- B. Provide accessory feet for free-standing equipment enclosures.
- C. Install trim plumb.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Device plates and box covers
- B. Receptacles

1.2 QUALITY ASSURANCE

- A. Provide similar devices from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the CEC Article 100, by a testing agency to Authorities Having Jurisdiction and marked for intended use.
- C. Comply with the CEC.

1.3 REFERENCES

- A. DSCC W-C-896F - General Specification for Electrical Power Connector
- B. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet
- C. NEMA WD 1 - General Color Requirements for Wiring Devices
- D. NEMA WD 6 - Wiring Devices - Dimensional Requirements
- E. California Electrical Code (CEC)
- F. UL 498 - Standard for Attachment Plugs and Receptacles
- G. UL 943 - Standard for Ground Fault Circuit Interrupters

1.4 COORDINATION

- A. Receptacles for Owner Furnished Equipment: Match plug configurations.
- B. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 DEVICE COLOR

- A. All switch, receptacle, and outlet, colors shall be white], unless indicated otherwise.

2.2 COVERPLATES

- A. All switches, receptacles, and outlets shall be complete with the following:

1. #302 stainless steel
2. Decorator Grade - Public: Decorator #302 stainless steel wallplates in public finished spaces where walls are finished.
 - a. Manufacturer:
 - 1) Leviton Decora
 - 2) Hubbell Decorator
 - 3) Cooper Decorator
 - 4) or approved equal
3. #302 stainless steel coverplates in unfinished spaces for flush boxes.
4. Galvanized steel coverplates in unfinished spaces for surface mounted boxes.
- B. Where several devices are ganged together, the coverplate shall be of the ganged style for the number of devices used.
- C. Install nameplate identification as indicated in Section 26 05 53.
- D. Plate securing screws shall be metal with head color matching the wall plate finish.
- E. Hospital Grade: Coverplate touch surfaces shall have an antimicrobial additive that suppresses the growth of harmful bacteria, mold, mildew, and fungi. Cover plate color shall match the device color.
 1. Manufacturers:
 - a. Cooper CuVerro
 - b. Leviton 84 series

2.3 RECEPTACLES

- A. Refer to Electrical Symbols List for device type.
- B. Devices that are shaded on the drawings shall be red.
- C. Devices that are shaded on the drawings shall be red and shall have an illuminated face or indicator light to indicate that there is power to the device.
- D. NEMA 5-20R Duplex Receptacle:
 1. Standard Grade: 125-volt, 20 amp, 3-wire grounding type with impact resistant thermoplastic face and steel back strap.
 - a. Manufacturers:
 - 1) Hubbell 5352A
 - 2) Leviton, 5362-S

- 3) Pass & Seymour 5362
 - 4) Cooper 5352
- 2. Spec Grade: 125-volt, 20 amp, 3-wire grounding type with impact resistant thermoplastic face and brass back strap.
 - a. Manufacturers:
 - 1) Hubbell 5352
 - 2) Leviton 5362-S
 - 3) Pass & Seymour 5362
 - 4) Cooper 5362
- 3. Heavy Duty: 125-volt, 20 amp, 3-wire grounding type heavy duty industrial grade with impact resistant thermoplastic face and one-piece brass back strap with integral ground contacts.
 - a. Manufacturers:
 - 1) Hubbell 5362
 - 2) Leviton 5362
 - 3) Pass & Seymour 5362A
 - 4) Cooper AH5362
- 4. Hospital Grade: 125-volt, 20 amp, 3-wire grounding type hospital grade with impact resistant thermoplastic face and one-piece nickel-plated brass back strap with integral ground contacts.
 - a. Manufacturers:
 - 1) Hubbell HBL8300
 - 2) Leviton 8300
 - 3) Pass & Seymour 8300
- E. NEMA 5-20R Ground Fault Duplex Receptacle:
 - 1. Standard Grade: 125-volt, 20 amp, 3-wire grounding type with test and reset buttons in impact resistant thermoplastic face.
 - a. Device shall perform self-test of GFCI circuitry in accordance with UL 943.
 - b. Manufacturers:
 - 1) Hubbell GF20L
 - 2) Leviton GFNT2

- 3) Pass & Seymour 2097
 - 4) Cooper SGF20
- 2. Hospital Grade: 125-volt, 20 amp, 3-wire grounding type hospital grade with test and reset buttons in impact resistant thermoplastic face.
 - a. Device shall perform self-test of GFCI circuitry in accordance with UL 943.
 - b. Manufacturers:
 - 1) Hubbell GFRST83
 - 2) Leviton GFNT2-HG
 - 3) Pass & Seymour 2097HG
 - 4) Cooper SGFH20
- F. REC-DUP-WP: NEMA 5-20R Weatherproof Ground Fault Duplex Receptacle:
 - 1. 125-volt, 20 amp, 3-wire grounding type with test and reset buttons in impact resistant thermoplastic face, weather resistant WR listed. Provide extra-duty NEMA 3R rated while-in-use cast aluminum cover.
 - 2. Device shall perform self-test of GFCI circuitry in accordance with UL 943.
 - a. Manufacturers:
 - 1) Hubbell GFTWRST20/(RW57300) WP826
 - 2) Leviton GFWT2/(5977-CL) M5979
- G. Back wired devices shall be complete with eight holes that are screw activated with metal clamps for connection to #12 or #10 copper conductors.
- H. Side wired devices shall have four binding screws that are undercut for positive wire retention.
- I. Ground fault circuit interrupter (GFCI) receptacles shall comply with UL 943 requiring increased surge immunity, improved corrosion resistance, improved resistance to false tripping and diagnostic indication for miswiring if the line and load conductors are reversed during installation.
- J. Isolated ground receptacles shall have the equipment ground contacts connected only to the green grounding screw terminal of the device with inherent electrical isolation from the mounting strap.
- K. Hazardous (Classified) location receptacles shall comply with NEMA FB 11.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install convenience receptacles at elevations indicated in the General Installation Notes on the contract drawings.

- B. Install specific-use receptacles at heights shown on the contract drawings. Install devices level, plumb, and square with building lines. Coordinate installation of adjacent devices of separate systems with common mounting heights, including lighting, power, systems, technology, and temperature control device rough-ins.
- C. Ground Fault Protection: Provide ground fault protection for all branch circuit breakers serving 120/208 receptacle outlets rated 21 - 50 amps single phase and 21-100 amps three phase in the following locations, as shown on drawings, or required by adopted code:
 - 1. Bathrooms, locker rooms, shower rooms
 - 2. Kitchens
 - 3. Rooftops
 - 4. Interior/Exterior locations subject to damp/wet conditions
 - 5. When located within 6 feet of sinks, bathtubs, and shower stalls
 - 6. Garages, accessory buildings, service bays
- D. Drill opening for poke-through fitting installation in accordance with manufacturer's instructions. This Contractor is responsible for taking any measures required to ensure no conduits or other services are damaged. This may include X-ray or similar
- E. non-destructive means.
- F. Install receptacles vertically with ground slot up or where indicated on the drawings, horizontally with ground slot to the left.
- G. Install decorative plates on switch, receptacle, and blank outlets in finished areas, using jumbo size plates for outlets installed in masonry walls.
- H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.
- I. Install devices and wall plates flush and level.
- J. Install nameplate identification to receptacle cover plates indicated. Identification shall identify panel name and circuit number. Refer to Specification Section 26 05 53 - Electrical Identification.
- K. Test receptacles for proper polarity, ground continuity and compliance with requirements.
- L. Healthcare devices shall be tested in accordance with NFPA 99 6.3.3 for grounding, voltage, and impedance measurements.

END OF SECTION

SECTION 26 28 13
FUSES

PART 1 - GENERAL

1.1 REFERENCES

- A. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Types
- B. UL 198E - Class R Fuses
- C. FS W-F-870 - Fuseholders (For Plug and Enclosed Cartridge Fuses)
- D. NEMA FU 1 - Low Voltage Cartridge Fuses
- E. California Electrical Code (CEC)

1.2 SUBMITTALS

- A. Submit product data under provisions of Section 26 05 00.

1.3 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40°F or more than 100°F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - FUSES

- A. Bussman, Division of Eaton
- B. Edison Fuse, Division of Cooper Industries
- C. Mersen
- D. Littelfuse Inc

2.2 FUSES

- A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
- B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.
- C. Fuses with ratings larger than 600 amperes: Class L (time delay), unless otherwise noted on the drawings.
- D. Fuses with ratings larger than 200 amperes but equal to or less than 600 amperes: Class RK-1 (time delay), unless otherwise noted on the drawings.
- E. Fuses with ratings less than or equal to 200 amperes (not including control transformer fuses): Class RK-5, unless otherwise noted on the drawings.

- F. Control transformer fuses: Class CC (time delay).
- G. Fuses for packaged equipment: Size and type as recommended by equipment manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fuses where indicated on the drawings and specifications.
- B. Install fuses in accordance with manufacturer's instruction.
- C. Install fuses in packaged equipment as required by equipment manufacturer.
- D. Install fuse with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 26 28 16
DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fusible switches

1.2 RELATED SECTIONS AND WORK

- A. Refer to the Disconnect and Starter Schedule for rating and configuration.

1.3 REFERENCES

- A. NEMA KS 1 - Enclosed Switches

1.4 SUBMITTALS

- A. Submit product data under provisions of Section 26 05 00.
- B. Product Data: For each type of enclosed switch, circuit breakers, accessory and component indicated, include dimensions, weights, and manufacturer's technical data on features, performance, and ratings.

1.5 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE AND NON-FUSIBLE SWITCHES

- A. Acceptable Manufacturers:
 - 1. Square D 3110 Series
 - 2. Eaton DH Series
 - 3. Siemens HNF / HF Series
- B. Fusible Switch Assemblies: NEMA KS 1; Type heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Class 'R' fuse clips only, unless indicated otherwise on the drawings.
- C. Enclosures: Type as indicated on the disconnect schedule.
- D. Accessories: As indicated on the disconnect schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches where indicated on the drawings.
- B. Install fuses in fusible disconnect switches.
- C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

3.2 MOBILE DIAGNOSTICS SERVICE DISCONNECT

- A. Coordinate installation with mobile medical equipment requirements and vendor.

3.3 ADJUSTING

- A. Set field-adjustable circuit breaker trip ranges.

END OF SECTION

SECTION 26 51 19
LED LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior luminaires and accessories
- B. Exterior luminaires and accessories
- C. Light-emitting diode (LED) luminaire systems
- D. Emergency exit signs

1.2 RELATED SECTIONS

- A. The lighting system design includes a combination of luminaire sources, lighting control components, programming sequences, and supplementary components for building and energy code compliance. The design uses performance-based specifications for portions of the lighting system to account for the limitation of comparable product solutions available by competitive manufacturers. The Contractor shall reference related specification sections, plans, schedules, and details prior to submitting pricing, submittals, and installation. The Contractor shall coordinate system component compatibility among various manufacturers and suppliers for a turnkey lighting system. Referenced sections include, but are not limited to, the following:

- 1. 26 09 33 Lighting Control Systems

1.3 REFERENCES

- A. ANSI C78.377 - Specifications for the Chromaticity of Solid State Lighting Products
- B. ANSI C82.16 - Light-Emitting Diode Drivers - Method of Measurement
- C. ANSI C82.77 - Standard for Harmonic Emission Limits and Related Power Quality Requirements for Lighting Equipment
- D. IEEE C2 - National Electrical Safety Code
- E. NEMA SSL1 - Electronic Drivers for LED Devices, Arrays or System
- F. UL 8750 - Light Emitting Diode (LED) Equipment for use in Lighting Products
- G. LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products
- H. LM-80 - Measuring Luminous Flux and Color Maintenance of LED
- I. FS W-L-305 - Light Set, General Illumination (Emergency or Auxiliary)
- J. UL 924 - Standard for Emergency Lighting and Power Equipment
- K. UL676 Standard for Underwater Luminaires and Submersible Junction Box

1.4 SUBMITTALS

- A. Submit product data under provisions of Section 26 05 00.
- B. Basic Requirements of Submittal:
 - 1. Submit product data sheets for luminaires, LED light engines, drivers and poles. Include complete product model number with all options as specified. Submittal shall be arranged with luminaires listed in ascending order, and with each luminaire's , LED light engine, driver, or pole information following luminaire's product data. Failure to organize submittal in this manner will result in the submittal being rejected.
 - 2. Submit lens product data, dimensions and weights if not included in product data sheet submittal.
 - 3. Include outline drawings, support points, weights, and accessory information for each luminaire.
 - 4. Submit manufacturer origin of LED chipset and driver.
- C. Submit utility rebate forms where offered at project location. Submit completed rebate forms within 30 days of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site. Store and protect under provisions of Section 26 05 00.
- B. Protect luminaire finishes, lenses, and trims from damage during storage and installation. Do not remove protective films until construction cleanup within each area is complete.
- C. Handle site lighting poles carefully to prevent breakage and damage to finish.

1.6 MOCKUP

- A. Provide and install luminaires with power and control connections in mockup rooms as identified in Division 1. Approved luminaires in mockup may be reused as part of complete work if in original condition.

1.7 WARRANTY

- A. The warranty period begins at the date of Substantial Completion.
- B. LED Light Engines and Drivers:
 - 1. LED Drivers and Dimming Drivers: Five (5) years
 - 2. Light Emitting Diode (LED) Light Engines: Five (5) years
- C. Emergency Lighting Units and Exit Signs:
 - 1. Emergency Lighting Units: Three (3) year, non-prorated
 - 2. Exit Signs: Three (3) year, non-prorated

3. Emergency Unit and Exit Sign Battery: Sealed lead acid or lead calcium cell, requiring no maintenance or replacement for ten (10) years under normal conditions.

1.8 REGULATORY REQUIREMENTS

- A. Conform to NFPA 101 for installation requirements

PART 2 - PRODUCTS

2.1 INTERIOR LUMINAIRES AND ACCESSORIES - GENERAL

- A. Painted reflector surfaces shall have a minimum reflectance of 90%.
- B. All painted components shall be painted after fabrication.

2.2 EXTERIOR LUMINAIRES AND ACCESSORIES - GENERAL

- A. Listed for wet or damp location as scheduled. Provide ingress protection (IP) rating when scheduled.
- B. Provide low temperature LED drivers, with reliable starting to -20°F.
- C. In-grade luminaires shall have lamp/optic separation to prevent surface temperature from exceeding 115°F. Compartment separation of wire entry and control gear/lamp chamber.
- D. Exterior LED luminaires shall contain separate, easily accessible and replaceable Category C surge protection device.

2.3 LIGHT EMITTING DIODE (LED) LUMINAIRE SYSTEMS

- A. Refer to the luminaire schedule for color temperature and minimum color rendering index CRI requirements. Provide light source color consistency by utilizing a binning tolerance within a maximum 3-step McAdam ellipse unless noted otherwise.
- B. LED chip arrays specified as color changing shall have chip colors as noted on the luminaire schedule.
- C. Rated life shall be minimum of 50,000 hours at L70.
- D. LED chips shall be wired so that failure of one chip does not prohibit operation of the remainder of the chip array.
- E. Luminaire delivered lumens is defined as the absolute lumens per the manufacturers LM-79-08 test report.
- F. LED luminaires shall be designed for ease of component replacement including modular replaceable boards or Zhaga sockets. Luminaires that are factory sealed and do not have field replaceable parts shall provide a 10-year warranty.
- G. LED light engine shall have a maximum LLD of 0.85 at 50,000 hours at 25°C ambient.

2.4 EMERGENCY EXIT SIGNS

- A. Exit Signs: Stencil face, 6-inch high letters, directional arrows as indicated, universal mounting type as indicated on the drawings.
- B. Directional Indicators: The directional indicator for exit signage shall be of a chevron type meeting all requirements of NFPA 101.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Securely fasten luminaires to the listed and labeled ceiling framing member by mechanical means such as bolts, screws, rivets or listed clips identified for use with the type of ceiling framing members. Provide a minimum of four (4) #12 gauge suspended ceiling support wires located on diagonal corners of luminaires. The architectural ceiling framing system may be used in lieu of independent support with prior written approval by the ceiling system manufacturer and Authority Having Jurisdiction (AHJ). Luminaires and wiring installed in fire-rated ceiling assemblies shall be independently supported for all applications
- B. Install recessed flanged luminaires to permit removal from below. Use manufacturer- supplied plaster frames and swing gate supports. Support luminaires independent of ceiling with a minimum of four (4) #12 gauge suspended ceiling support wires located on diagonal corners.
- C. Support surface-mounted luminaires directly from building structure. Install luminaires larger than eight square feet (8 ft²) or weighing more than 30 pounds independent of ceiling framing. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit, unless otherwise noted.
- D. Support wire used to independently support luminaires, raceways, and wiring systems shall be distinguishable from ceiling support systems by color (field paint), tagging or equivalent means.
- E. Provide seismic bracing of luminaires per IBC Chapter 16. Design pendant luminaires on a component seismic coefficient (C_c) of 0.67. Design vertical supports with a factor of safety of 4.0. Contractor shall verify the Seismic Hazard Exposure Group and Performance Criteria Factor.
- F. Fire-rated Ceilings: Support luminaires independent of ceiling system with a minimum of two (2) #12 gauge wires.
- G. Install lamps in lamp holders of luminaires.
- H. Adjust aimable luminaires to obtain lighting levels on objects and areas as directed to obtain desired lighting levels.

3.2 CONSTRUCTION USE OF PROJECT LUMINAIRES

- A. The Contractor shall provide temporary construction lighting per the requirements of Division 1.
- B. The project luminaires shown on the construction documents shall not be used for temporary construction purposes without providing a plan for Owner approval that addresses energy and luminaire operating hours.

3.3 EMERGENCY LIGHTING UNITS AND EXIT SIGNS

- A. Install units plumb and level.

- B. Aim directional lamp heads as directed.
- C. Test emergency lighting equipment for 60 minutes to determine proper operation, prior to Substantial Completion. Provide electronic copy of periodic test log form to Owner's Representative. Explain and instruct Owner's Representative of requirements for testing and maintenance. Refer to latest adopted NFPA 101 for testing and logging requirements.

3.4 RELAMPING

- A. Replace failed LED light engine modules or arrays at completion of work.

3.5 ADJUSTING AND CLEANING

- A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.
- B. Touch up luminaire and pole finish at completion of work.

3.6 LUMINAIRE SCHEDULE

- A. As shown on the drawings.

END OF SECTION

APPENDIX H

HCAI Testing, Inspection and Observation (TIO)



Testing, Inspection, and Observation Program

2019 California Building Standards Code - OSHPD 1

This program is prepared and submitted for an OSHPD 1 project. OSHPD 1 projects include all construction and remodel projects for: general acute care hospitals, acute psychiatric hospitals, and general acute care hospitals providing only acute medical rehabilitation center services.

SECTION A		PROJECT INFORMATION	
Facility #:	Facility Name:		Project #:
11162	Ventura County Medical Center		S220636-56-00
Street Address:	300 Hillmont Ave.		
City:	Ventura	County:	
Record Name (Scope of Project):		VCMC North Tower MRI	
Abbreviations: CAC: California Administrative Code AAMA: American Architectural Manufacturers Association CBC: California Building Code NFPA: National Fire Protection Association CEC: California Electrical Code FM: FM Approval Standards CMC: California Mechanical Code DPOR: Design Professional of Record CPC: California Plumbing Code			
Version: R03.7.8			

DESIGN PROFESSIONAL OF RECORD RESPONSIBILITY

The administration of the work of construction, including this TIO, shall be under the responsible charge of an architect and structural engineer. When a structural engineer is not substantially involved, the architect shall be solely responsible. Where neither structural nor architectural elements are substantially involved, a mechanical or electrical engineer registered in the branch of engineering most applicable to the project may be in responsible charge. (CAC 7-141(a))

Note: HCAI plan review staff must provide verification that the TIO program has been "Reviewed" prior to plan approval to confirm the applicability of the tests and inspections identified in the TIO program for work scope, building systems, and the construction materials shown in the design drawings. Field staff will issue subsequent "TIO Program Approval".

The "TIO Program Approval" from HCAI field staff must be obtained and included with the notice of start of construction required by CAC Section 7-137(a)4) and 7-145(a)5.A)

Construction shall not commence until the health facility has obtained from HCAI "TIO Program Approval". (CAC Section 7-135(a)3)



Testing, Inspection, and Observation Program

2019 California Building Standards Code - OSHPD 1

SECTION B				NOTE: Approved agencies, individuals, and all changes to the TIO program shall be identified, evaluated by the DPOR and approved by HCAI prior to proceeding with the related work.			
Facility #:		Facility Name:		Project #:			
11162		Ventura County Medical Center		S220636-56-00			
				Select with "X" or required information:			
Index #	REQUIRED (Select with "X")	TESTS	Samples of test & inspection reports included	OPAA No. and Expiration Date	RESPONSIBLE APPROVED AGENCY AND/OR INDIVIDUAL	COMPLIANCE VERIFICATION BY IOR (Initial/Date)	HCAI/FDD USE (Initial/Date)

STRUCTURAL TESTS

Concrete

B-C14	X	Post-installed anchors CBC 1910A.5 Installation verification test (includes adhesive, shot pins and mechanical anchors)					
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Steel

B-S1	X	Steel CBC 2202A.1 Identification test for structural steel and cold formed steel					
B-S2	X	Steel CBC 2213A.1 & 1705A.13.1 High strength bolts, nuts, and washers					
B-S4	X	Steel CBC 1705A.2.1 & 1705A.13.1.2 Nondestructive testing of welds					

Nonstructural Components, Supports and Attachments

B-N1	X	Nonstructural components CBC 1705A.13.2					
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ELECTRICAL TESTS

B-E6	X	Essential Electrical System Coordination Study CEC 517.31(G) & 700.32			TBD		
B-E9	X	Hospital Grade Receptacles 2018 NFPA 99 6.3.3.2.5			TBD		
B-E14	X	Insulation Testing CEC 110.7, 2018 NFPA 99 6.7.4.1.2.2			TBD		
B-E15	X	Torque Electrical Connections CEC 110.3(B) & 110.14(D)			TBD		
B-E21	X	Means of Egress Illumination CBC 1008.2 and 1008.3 Illumination and Emergency Power			TBD		

MECHANICAL TESTS

B-ME3	X	Refrigeration equipment CMC 1116.0			TBD		
B-ME7	X	Hydronics CMC 1205.2, 1220.2.6 & 1221.3 Pressure test of steam and water piping			TBD		



Testing, Inspection, and Observation Program

2019 California Building Standards Code - OSHPD 1

SECTION B			NOTE: Approved agencies, individuals, and all changes to the TIO program shall be identified, evaluated by the DPOR and approved by HCAI prior to proceeding with the related work.				
Facility #:		Facility Name:		Project #:			
11162		Ventura County Medical Center		S220636-56-00			
			Select with "X" or required information:				
Index #	REQUIRED (Select with "X")	TESTS	Samples of test & inspection reports included	OPAA No. and Expiration Date	RESPONSIBLE APPROVED AGENCY AND/OR INDIVIDUAL	COMPLIANCE VERIFICATION BY IOR (Initial/Date)	HCAI/FDD USE (Initial/Date)
B-ME8	X	Process piping CMC 1405.2.2 Pressure test			TBD		
B-ME9	X	Existing System Air Balance CMC 407.3.1 Pre-demolition Air Balance Test and Report					
B-ME10	X	Existing System Air Balance CMC 407.3.1 Air Balance Test and Report			TBD		
B-ME11	X	Ventilation system Air Balance CMC 407.3.1 & Table 4-A Areas tested and balanced			TBD		
B-ME12	X	Duct Leakage Test CMC 603.10.1 SMACNA HVAC Air Duct Leakage Test			TBD		
PLUMBING TESTS							
B-P1	X	Disinfection of potable water systems CPC 609.9			TBD		
B-P2	X	Medical gas and vacuum NFPA 99-2018 § 5.1.12 Gas and vacuum system performance testing			TBD		
B-P3	X	Medical gas and vacuum NFPA 99-2018 § 5.1.12 Gas and vacuum system verification testing			TBD		
B-P4	X	Existing sewers and drains CPC 102.4.1, 105.3, 105.3.2, & 712.0 Tested for conformance with requirements for new work			TBD		
B-P5	X	Water supply system CPC 105.3, 105.3.2, & 609.4 Pressure tested prior to covering or concealment			TBD		
B-P6	X	Plumbing, drainage, and venting systems CPC 105.3, 105.3.2, & 712.0 Water or air tested prior to use, covering or concealment. No air test for plastic piping.			TBD		
FIRE PROTECTION AND LIFE SAFETY SYSTEMS							
B-FP1	X	Fire Alarm CFC 901.5 & CFC 907.7 NFPA 72-2016 §14.4 Acceptance and Reacceptance Testing					
B-FP2	X	Fire and smoke dampers CFC 901.5 & CFC 907.8 Acceptance testing					
B-FP4	X	Smoke control system CFC 901.5, CFC 909.18 & CBC 1705.18 and 1705A.18 Acceptance testing					



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SECTION C				NOTE: Approved agencies, individuals, and all changes to the TIO program shall be identified, evaluated by the DPOR and approved by HCAI prior to proceeding with the related work.			
Facility #:		Facility Name:		Project #:		Sub #:	
11162		Ventura County Medical Center		S220636-56-00		0	
				Select with "X" or required information:			
Index #	REQUIRED (Select with "X")	ON-SITE SPECIAL INSPECTIONS	Samples of test & inspection reports included	OPAA No. and Expiration Date	RESPONSIBLE APPROVED AGENCY AND/OR INDIVIDUAL (IDENTIFY SPECIAL INSPECTOR)	COMPLIANCE VERIFICATION BY IOR (Initial/Date)	HCAI/FDD USE (Initial/Date)

STRUCTURAL SPECIAL INSPECTIONS

Steel

C-S1	X	Steel CBC 1705A.2.5 & 1705A.12.1 Automatic end-welded studs					
C-S2		Steel CBC 1705A.2.5 & 1705A.12.1 Shop and field welding					
C-S3	X	Steel AWS D1.1 3 & 4 and AWS D1.8 6.1 Shop and field welding - WPS / WPQR					
C-S4	X	Steel CBC 1705A.2 & 1705A.12.1 High strength bolt installation					
C-S5	X	Steel CBC 1705A.2, 1705A.11.2 & 1705A.12.3 Cold-formed steel light frame construction					

Nonstructural components, supports and attachments

C-N1	X	Architectural components CBC 1705A.12.5 & 1705A.16 Cladding, nonbearing walls and veneer					
C-N2	X	Ceiling CBC 1705A.12.5 Suspended ceiling systems and their anchorage					
C-N5	X	Plumbing, mechanical and electrical components CBC 1705A.12.6 Anchorage, bracing, and vibration isolators					

FIRE PROTECTION AND LIFE SAFETY SYSTEM SPECIAL INSPECTIONS

C-FP3	X	Penetration firestops CBC 1705A.17.1 Penetration firestop systems that are tested and listed					
C-FP6	X	Sprinkler system piping NFPA 13-2016 § 6.5.2 Welded pipe and fittings					



Testing, Inspection, and Observation Program

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SECTION D				NOTE: Approved agencies, individuals, and all changes to the TIO program shall be identified, evaluated by the DPOR and approved by HCAI prior to proceeding with the related work.			
Facility #:		Facility Name:		Project #:		Sub #:	
11162		Ventura County Medical Center		S220636-56-00		0	
				Select with "X" or required information:			
Index #	REQUIRED (Select with "X")	OFF-SITE SPECIAL INSPECTIONS	Samples of test & inspection reports included	OPAA No. and Expiration Date	RESPONSIBLE APPROVED AGENCY AND/OR INDIVIDUAL (IDENTIFY SPECIAL INSPECTOR)	COMPLIANCE VERIFICATION BY IOR (Initial/Date)	HCAI/FDD USE (Initial/Date)
Steel							
D-S1	X	Steel CBC 1705A.2 & 1705A.12.1, AISC-360 & AISC-341 Steel shop fabrication					
D-S3	X	Steel CBC 1705A.2.5 & 1705A.12.1 Shop welding					
D-S4	X	Steel AWS D1.1 3 & 4 and AWS D1.8 6.1 Shop and field welding - WPS / WPQR					
D-S5	X	Steel CBC 1705A.2 & 1705A.12.1 High strength bolt installation					
D-S6	X	Steel CBC 1705A.2, 1705A.11.2 & 1705A.12.3 Cold-formed steel light frame construction					
Nonstructural components, supports and attachments							
D-N1	X	Architectural components CBC 1705A.12.5 & 1705A.16 Cladding, nonbearing walls and veneer					
D-N2	X	Ceiling CBC 1705A.12.5 Suspended ceiling systems and their anchorage					
D-N5	X	Plumbing, mechanical and electrical components CBC 1705A.12.6 Anchorage, bracing, and vibration isolators					
FIRE PROTECTION AND LIFE SAFETY SYSTEMS SPECIAL INSPECTIONS							
D-FP3	X	Penetration firestops CBC 1705A.17.1 Penetration firestop systems that are tested and listed					
D-FP6	X	Sprinkler system piping NFPA 13-2016 § 6.5.2 Welded pipe and fittings					



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SECTION F		CONSTRUCTION VERIFICATION											
Facility #:	Facility Name:							Project #:				Sub #:	
11162	Ventura County Medical Center							S220636-56-00					
VERIFIED CONSTRUCTION INSPECTION AND OBSERVATION REPORTING													FOR HCAI USE ONLY
REFERENCE NUMBER	PROJECT MILESTONE OR INTERVAL	VERIFIED COMPLIANCE REPORT REQUIRED AS INDICATED (Form OSH-FD-123) (See "PERSONAL KNOWLEDGE" as defined in California Administrative Code, Section 7-151)											
		GEOR	AOR	SEOR	MEOR	EEOR	CONT	IOR	SP INSP	TEST LAB		HCAI FDD	
	Clear all plan review Outstanding Items List (OIL) Items												
	Installation of temporary equipment												
	Removal of temporary equipment												
	Substantial Compliance (Remodel, Renovations, Maintenance projects, Equipment Replacement)		X	X	X	X							
	Certificate of Occupancy (New Buildings, Additions, Changes in Occupancy)												
	Construction Final		X	X	X	X	X	X	X	X			
ABBREVIATIONS:		GEOR - Geotechnical Engineer of Record			AOR - Architect of Record			SEOR - Structural Engineer of Record					
		MEOR - Mechanical Engineer of Record			EEOR - Electrical Engineer of Record			CONT O/B - Contractor or Owner/Builder					
		SP. INSP - Special Inspector			IOR - Inspector of Record			Test Lab – Engr. For the approved agency					



Testing, Inspection, and Observation Program

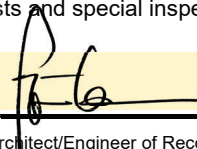
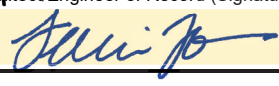

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[illegible]



Testing, Inspection, and Observation Program

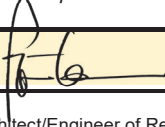
2019 California Building Standards Code - OSHPD 1

SECTION H		HCAI REVIEWED	
Facility #:	Facility Name:	Project #:	Sub #:
11162	Ventura County Medical Center	S220636-56-00	
NOTE: When a structural engineer has been delegated responsibility for a portion of this project his or her signature is also required. For testing, Inspection and Observation Program Instructions visit: https://HCAI.ca.gov/construction-finance/resources/forms-applications-reminder-lists/#TIO			
Submitted By:			
I have reviewed the approved construction documents for this project and all tests and special inspections required by Code are marked as "required" on this form.			
Stephen Wen			10/20/22
Architect/Engineer of Record (Print Name)		Architect/Engineer of Record (Signature)	Date
Leslie Tso			10/20/22
Structural Engineer of Record (Print Name)		Structural Engineer of Record (Signature)	Date
FOR HCAI USE			
Reviewed by HCAI Plan Review Staff:			
 <div style="border: 2px solid blue; padding: 10px; margin: 10px auto; width: 150px;"> <div style="text-align: center;"> <b style="color: red;">TIO REVIEWED with comments </div> <div style="text-align: center; font-size: small;"> Department of Health Care Access and Information FACILITIES DEVELOPMENT DIVISION 11/17/2022, 7:32:20 AM S220636-56-00 Lynn Wang </div> </div>		<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="text-align: center;"> <input type="checkbox"/> REVIEWED </div> <div style="text-align: center;"> <input type="checkbox"/> REVIEWED WITH COMMENTS </div> </div>	
Signature		Date	
Note: HCAI plan review staff must provide verification that the TIO program has been "Reviewed" prior to plan approval to confirm the applicability of the tests and inspections identified in the TIO program for work scope, building systems, and the construction materials shown in the design drawings. Field staff will issue subsequent "TIO Program Approval".			



Testing, Inspection, and Observation Program

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SECTION I		TIO PROGRAM APPROVAL	
Facility #:	Facility Name:	Project #:	Sub #:
11162	Ventura County Medical Center	S220636-56-00	
NOTE: For testing, Inspection and Observation Program Instructions visit: www.HCAI.ca.gov			
This program is prepared and submitted for an OSHPD 1 project. OSHPD 1 projects include all construction and remodel projects for: general acute care hospitals, acute psychiatric hospitals, and general acute care hospitals providing only acute medical rehabilitation center services.			
Samples of Test and Inspection Reports are: (NOT required for test performed by laboratories approved through OPAA Program)			
<i>All test and special inspection reports shall be submitted to the IOR, hospital owner, architect in responsible charge, and the structural engineer by the testing agency per CAC 7-149(a).</i>			
<i>Verified compliance reports shall be signed by the individual who performed the special inspection(s) as outlined in CAC 7-151 (c). All reports shall clearly state whether the tests or special inspections were performed in accordance with the HCAI stamped approved documents and whether the results indicate compliance with those documents per CAC 7-149 (a). All IORs performing special inspections shall hold the appropriate certification and equipment and shall obtain approval from the design professional of record and HCAI prior to perform such work.</i>			
NOTE: This Test Inspection and Observation Report shall be approved by HCAI field personnel prior to start of construction.			
Stephen Wen	C15631		10/20/22
Architect/Engineer of Record (Print Name)	Professional License #	Architect/Engineer of Record (Signature)	Date
FOR HCAI FIELD STAFF USE			
TIO Program Approved by HCAI Field Staff:			
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Signature _____ Date _____ </div> <div style="width: 45%; text-align: center;"> <div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> <div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">APPROVED</div> <div style="text-align: center;">APPROVED WITH COMMENTS</div> </div> </div> </div>			
Note: HCAI plan review staff must provide verification that the TIO program has been "Reviewed" prior to plan approval to confirm the applicability of the tests and inspections identified in the TIO program for work scope, building systems, and the construction materials shown in the design drawings. HCAI Field staff will issue subsequent "TIO Program Approval".			
If "Approved with Comments" is checked the following comments shall be resolved by the designer prior to proceeding with the related construction:			



Testing, Inspection, and Observation Program

2019 California Building Standards Code - OSHPD 1

SECTION B			NOTE: Approved agencies, individuals, and all changes to the TIO program shall be identified, evaluated by the DPOR and approved by HCAI prior to proceeding with the related work.				
Facility #:		Facility Name:		Project #:			
11162		Ventura County Medical Center		S220636-56-00			
				Select with "X" or required information:			
Index #	REQUIRED (Select with "X")	TESTS	Samples of test & inspection reports included	OPAA No. and Expiration Date	RESPONSIBLE APPROVED AGENCY AND/OR INDIVIDUAL	COMPLIANCE VERIFICATION BY IOR (Initial/Date)	HCAI/FDD USE (Initial/Date)
B-FP5	X	Fire sprinkler CFC 901.5 & NFPA 13-2016 Chapter 25 Acceptance testing – Aboveground piping					
OTHER TESTS							
B-OT1	X	Radiation Shielding Barriers CBC 1705A.1.1 and 3102C Radiation shielding barrier test			TBD		

APPENDIX I

Infection Control Risk Assessment (ICRA) and Interim Life Safety Measures (ILSM)

Ventura County Medical Center/Santa Paula Hospital

Date: _____ Project #: _____ Work Order #: _____

Pre-Project/Pre-Construction Risk Assessment & Safety Plans

PURPOSE: Your purpose in filling out this risk assessment is to:

1. Think through a project before the work begins, identifying potential adverse impacts before starting work.
2. Develop a strategic safety plan with appropriate precautions to minimize the risk of adverse occurrences.
3. Communicate these intentions to affected authorities so they can approve or raise additional concerns.

Step 1: Record Project Info:

Project

Desc: _____

This is an : ☐ Anticipated Project ☐ Existing Condition ☐ Urgent Response Situation

Assessment Initiated By: _____

Project Coordinator _____

Contractor _____

Affected Building(s) _____ Floor(s): _____ Drawing Attached: ☐ Yes ☐ No

Department: _____ Dept Above: _____ Dept

Below: _____

Adjacent Depts Affected: North _____ South _____ East _____

West _____

Anticipated Start Date: _____ Duration: _____ Days Weeks Months Work Hours: From _____

To _____

Step 2: Determine Which Of These Four Assessments Should Be Completed:

☐ 1. INTERIM LIFE (FIRE) SAFETY ASSESSMENT

Required if any of the following are affected

- | | |
|--|---|
| <input type="checkbox"/> Fire Detection / Alarms | <input type="checkbox"/> Exit / Directional Signs |
| <input type="checkbox"/> Sprinkler / Suppression | <input type="checkbox"/> Emerg Services Access |
| <input type="checkbox"/> Egress / Access / Exits | <input type="checkbox"/> Traffic Flow or Parking |
| <input type="checkbox"/> Ceilings / Floors / Doors | <input type="checkbox"/> Security Changes |
| <input type="checkbox"/> Smoke & Fire Walls | <input type="checkbox"/> Increased Fire Load |

☐ 2. INFECTION CONTROL MEASURES ASSESSMENT

Required if any of the following are affected

- | | |
|---|--|
| <input type="checkbox"/> Ceiling Tiles | <input type="checkbox"/> Carpet Removal |
| <input type="checkbox"/> Dust, Demo, or Debris | <input type="checkbox"/> Moisture / Mold |
| <input type="checkbox"/> Isolation Air | |
| <input type="checkbox"/> Patient Water Supply | |
| <input type="checkbox"/> Exposing Covered Areas | |

☐ 3. UTILITIES DISTRUPTION ASSESSMENT

Required if any of the following are affected

- | | |
|---|--|
| <input type="checkbox"/> Domestic Water (Hot or Cold) | <input type="checkbox"/> Badge / Key / Lenel |
| <input type="checkbox"/> Sewer (Sanitary or Storm) | <input type="checkbox"/> Nurse Call & Codes |
| <input type="checkbox"/> Boiler & Steam | <input type="checkbox"/> Elevators |
| <input type="checkbox"/> Electrical (incl. E-Power) | <input type="checkbox"/> Phone / Data / IMS |

☐ 4. NOISE / VIBRATION / AIR QUALITY ASSESSMENT

Required if any of the following are affected

- | |
|--|
| <input type="checkbox"/> Noise / Vibration |
| <input type="checkbox"/> Odors / Fumes |
| <input type="checkbox"/> Hazmat Exposure |
| <input type="checkbox"/> Asbestos |

<input type="checkbox"/> HVAC / Metasys <input type="checkbox"/> Cameras <input type="checkbox"/> Natural Gas <input type="checkbox"/> Traffic & Parking <input type="checkbox"/> Med Gas, Air, or Vacuum	
---	--

Step 3: Complete & Attach Required Assessments & Plans: (Determined in Step 2 above)

Step 4: Obtain Approvals – Check all parties who have a compelling interest below. Obtain <u>pre</u> -approval (e-mail OK) from all checked ✓ = Approval Required. E-mail completed forms & approval signatures to Plant Services	
<input type="checkbox"/> Safety Officer	<input type="checkbox"/> EVS Mgr
<input type="checkbox"/> Facilities Mgr	<input type="checkbox"/> IMS
<input type="checkbox"/> Infection Control	<input type="checkbox"/> Security
<input type="checkbox"/> Construct Mgr	<input type="checkbox"/> Contractor(s)

Preapproval may not be possible for urgent response work. In such cases assess & maintain safety needs, and notify all affected as quickly as possible.

Final Approval By: _____ Date: _____

☐ Director of Facilities or ☐ Designee

Interim Life (Fire) Safety Measures (ILSM) Assessment & Plan

Project / WO#: _____

Fire Safety System is made up of 6 foundational elements. The assessment must consider the impact on all 6 elements and address increased risks occurring when conditions exist that disable, hinder, or increases the load affecting any element.

Six Foundational Elements	Without it people are at higher risk because:
Detection & Alarm Systems	No warning to escape; Help arrives much later
Sprinklers, Suppression, & Extinguishing Systems	Fires build heat and flash over
Means of Egress with Signage	No way (or knowledge how) to escape flames & smoke
Building Compartmentalization & Barrier Systems	No shelter for disabled or their caregivers; fires spread fast
Staff Response (Information, Preparation, & Training)	Staff make bad decisions, deadly mistakes, & can't help others
Risk Management	Chance of a fire is increased, impact of a fire is worse

Step 1: Determine Need for Interim Life Safety Measures / Plan (If the answer is "Yes" to any question, continue to Step 2. If not, an ILSM Plan is not required unless indicated by other factors not listed)	✓YES	✓NO
1. Detection or alarm systems down >4 hrs in any 24 hr period (requires FD notification & fire watch)		
2. Sprinklers/Suppression systems down >4 hrs in any 24 hr period (requires FD notification & fire watch)		
3. Detector or alarm device down >4 hrs		
4. Sprinkler head / device down > 4hrs		
5. Exit stairs discharge improperly		
6. Access to (or view of) approved exit restricted / blocked		
7. Excessive travel distance to an approved exit		
8. Lack of two available remote exits		
9. FD / PD / emergency forces access to any areas restricted		
10. Patient or ambulance access to the Emergency Department blocked		
11. Hazardous area not properly protected		
12. Corridor walls deficient		
13. Fire / smoke doors, latches, or closers compromised		
14. Large penetrations in smoke / fire barriers		
15. Temporary smoke or fire partition will be erected		
16. Work penetrates fire or smoke barrier (include floors)		
17. Vertical openings improperly protected		
18. Significantly modifying a smoke / fire barrier		
19. Accumulation of combustibles / debris / construction materials		
20. Hot work will be done (anything producing heat, sparks, or flames)		
21. Usage not conforming to building construction type		
22. Constructing an addition to existing buildings		
23. Significantly renovating an occupied floor		
24. Higher risk work in unprotected area (such as hot work on a roof)		

Other Hazards / Notes: _____

Step 2: Create an Interim Life (Fire) Safety Plan (Based on the identified scope of work & potential impacts to fire safety (outlined in Step 1), use the indicated precautions matrix below as a guide to determining appropriate interim measures that provide equal protection. The checklist created along with an additional notes or directions serve as the "Interim Life Safety Plan".

INTERIM LIFE (FIRE) SAFETY PLAN With Indicated Precautions Matrix		Generally Indicated Precautions Matrix (✓ = Generally indicated measure. R = Required by regulation or code)																							
INSTRUCTIONS: Use matrix at right as a guide when determining appropriate required safety measures (designed by a ✓ below). Planners shall also consider occupancy type, scope of work, duration of impact, and other risk factors identified by the reviewing & approving persons. This list, along with any additional notes or directions attached serves as the “Safety Plan”. Effectiveness of required precautions must be monitored at all times by workers, and additional measures are to be added as needed.		1.Detection/alarm system out-of-service>4/24 hr	2.Sprinklers/Suppression out-of-service >4/24 hrs	3.Detectors or alarm device down >4 hrs	4.Sprinkler head or device down >4 hrs	5.Exit stairs discharge improperly	6.Access to, or view of approved exit blocked	7.Excessive travel distance to an approved exit	8.Lack of two available remote exits	9.FD/PP access to any hospital area blocked	10.Patient or ambulance access to the ER blocked	11.Hazardous areas not properly protected	12.Corridor walls deficient	13.Fire/smoke doors, latches, closers compromised	14.Large penetrations in smoke / fire barriers	15.Temporarily erect smoke or fire partitions	16.Penetrating smoke or fire barrier (including floors)	17.Vertical openings improperly protected	18.Significantly modifying smoke/fire barrier	19.Accumulation of combustibles/debris/materials	20.Hot work will be done	21.Usage not conforming to bldg. construction type	22.Constructing addition to an existing bldg	23.Major renovation of an occupied floor	24.High risk work in unprotected area (like roof)
✓ Indicates a Required Precaution Related to Life Safety																									
<input type="checkbox"/> 1. Notify Nursing Admin (obtain approval if applicable)		✓	✓			✓	✓	✓	✓	✓	✓	✓			✓	✓			✓			✓	✓	✓	
<input type="checkbox"/> 2. Ensure egress (inspect daily)																									
<input type="checkbox"/> 3. Notify / Train Personnel in affected areas		✓	✓			✓	✓	✓	✓													✓	✓	✓	
<input type="checkbox"/> 4. Ensure alternate FD/PP access to all areas										✓															
<input type="checkbox"/> 5. Ensure alternate access to ER											✓														
<input type="checkbox"/> 6. Add or change signage as appropriate						✓	✓	✓	✓		✓					✓							✓	✓	
<input type="checkbox"/> 7. Notify FD as required (& PD if affected)		R	R							✓	✓														
<input type="checkbox"/> 8. Fire watch or temporary but equivalent system		✓	✓																						
<input type="checkbox"/> 9. Construct temp. smoke, tight, noncombustible barriers															✓	✓			✓				✓	✓	
<input type="checkbox"/> 10. Provide additional fire-fighting equipment			✓		✓																✓		✓	✓	✓
<input type="checkbox"/> 11. No smoking		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> 12. Control combustible loading		✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> 13. Fire drills conducted 2/shift/qtr. If > 6 wks						✓											✓	✓	✓			✓	✓		
<input type="checkbox"/> 14. Increased hazard surveillance		✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> 15. Penetration Plan required																	✓								
<input type="checkbox"/> 16. Hot Work Permits required																				✓					
<input type="checkbox"/> 17. Contractor’s Daily Inspection Sheets required															✓	✓			✓	✓		✓	✓	✓	
<input type="checkbox"/> 18. Daily Project manager’s Inspection Sheets required																✓						✓	✓	✓	
<input type="checkbox"/>																									
<input type="checkbox"/>																									
<input type="checkbox"/>																									
<input type="checkbox"/>																									

Other Special Precautions / Notes: _____

☐ Check if additional life safety instruction or requirements are attached

The best lifesaving fire precaution available is still working safely so fires never get a chance to start

Infection Control Measures (ICM) Assessment & Plan

Project / WO # / Description: _____

Step 1: Determine Need for Infection Safety Plan (If the answer is "Yes" to any question, continue to Step 2. If not, ICRA is not required unless indicated by other factors)	✓YES	✓NO
1. Will any ceiling tiles be removed in a High Risk rated area? Will more than two ceiling tiles be removed within a 50 sq. ft. area in a High Risk related area? Will large sections of the ceiling system be removed in Medium Risk rated areas?		
2. Will there be any dust generation?		
3. Will the domestic water supply be affected in Risk Rating 2 or higher?		
4. Will any normally hidden areas or surfaces such as spaces within walls or above ceilings be exposed?		
5. Will the ventilation system be affected?		
6. Will the work produce or encounter any standing water or will it create wet conditions in any building structures?		
7. Will any carpet be removed?		
8. Is there evidence of moisture, moisture damage, or mold in affected areas?		

Step 2: Check Activity Type (Select highest level appropriate)			
<input type="checkbox"/> TYPE A Inspection and Non-Invasive Activities, such as, but not limited to: <ul style="list-style-type: none">Removal of ceiling tiles for visual inspection limited to one tile per 50 square feetPainting (but not sanding)Wall covering, electrical trim work, minor plumbing (disrupts water supply to a localized patient care areas, i.e., 1 room for less than 15 minutes) and activities that do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.	<input type="checkbox"/> TYPE B Small scale, short duration activities that create minimal dust such as, but not limited to: <ul style="list-style-type: none">Installation of telephone and computer cablingAccess to chase spacesCutting of walls or ceiling where dust migration can be controlled for the installation/repairs of minor electrical work, or ventilation componentsSanding of walls for painting or wall covering to only repair small patchesPlumbing that requires disruption to the water supply of more than one patient care area (i.e., more than 2 rooms for more than 30 minutes but less than 1 hour)	<input type="checkbox"/> TYPE C Demolition, removal of fixed building components or assemblies (i.e., casework), or work generating moderate to high level of dust such as: <ul style="list-style-type: none">New wall constructionLarge scale sanding of walls for painting or wall covering, or removing floor coverings, ceiling tiles, or caseworkMinor duct or electrical work above the ceilingsMajor cabling activitiesActivities that cannot be completed within 1 shiftPlumbing that requires disruption to the water supply of more than one patient care area (i.e., more than 2 rooms) for more than 30 minutes but less than one hour	<input type="checkbox"/> TYPE D Major demolition and construction and renovation projects, such as, but not limited to: <ul style="list-style-type: none">Activities that require consecutive work shiftsRequires heavy demolition or removal of a complete cabling systemNew constructionPlumbing that results in disruption to the water supply of more than one patient area (i.e., more than 2 rooms) for more than one hour

Step 3: Check Patient Risk Group (Select highest level of group affected)			
<input type="checkbox"/> LOW RISK <ul style="list-style-type: none">Office AreasSupport Service AreasNon-Clinical Care AreasLobbies & Waiting AreasMeeting Rooms	<input type="checkbox"/> MEDIUM RISK <ul style="list-style-type: none">Therapies (PT, OT, RT, Speech, etc.)Rehab (outpatient)Wound CareOther outpatient areas not listed in High and Highest risk	<input type="checkbox"/> HIGH RISK <ul style="list-style-type: none">OncologyCardiopulmonary Support Unit (CPSU)Lab (specimens areas)Day Preop-postopSCURadiologyPharmacy (except admixture)2 NorthLTAC West	<input type="checkbox"/> HIGHEST RISK <ul style="list-style-type: none">ORCentral SupplyIsolation RoomsSCUEndoscopyPharmacy Admixture Rooms

		<ul style="list-style-type: none"> • LTAC North • Dietary 	
--	--	---	--

Step 4: Circle Precaution Class (Based on Choice From Step 2 & 3 above)				
Patient Risk Group (From Step 3 Above)	Activity Type (From Step 2 Above)			
	A	B	C	D
LOW RISK	I	II	II	III / IV
MEDIUM RISK	I	II	III	IV
HIGH RISK	I	II	III / IV	IV
HIGHEST RISK	II	III / IV	III / IV	IV

Infection Control Department approval is required when precaution level is calculated at Class III or IV.

Step 5: Create the Infection Control & Exposure Safety Plan (Based on the known scope of work and the “Precaution Class” (established in Step 4 above), use the Generally Indicated Precautions matrix below as a guide to determine and ✓ check all precautions necessary to protect patients, staff, and visitors. This list along with any other attached instructions serve as the Infection Control & Exposure Safety Plan. Infection Control Departmental approval is required if Precaution Class is rated III or above.)

Infection Control & Exposure Safety Plan		Generally Indicated For Precaution Class			
Generally Indicated Precautions Matrix & Minimum Required Measures Checklist					
✓ Indicates A Required Precaution related to Infection Control or Exposures		I	II	III	IV
<input type="checkbox"/> 1. Nursing Admin (Director or above) Approval		✓	✓	✓	✓
<input type="checkbox"/> 2. Use work methods minimizing dust (use drop sheets)		✓	✓	✓	✓
<input type="checkbox"/> 3. Immediately replace ceiling tiles when done		✓	✓	✓	✓
<input type="checkbox"/> 4. Schedule water interruptions during low activity (i.e., evenings, if possible)		✓	✓	✓	✓
<input type="checkbox"/> 5. Observe for discolored water. Report any discolored water to Plant Services.		✓	✓	✓	✓
<input type="checkbox"/> 6. Ensure water temperature meets the standards set by the healthcare facility		✓	✓	✓	✓
<input type="checkbox"/> 7. Maintains as dry an environment as possible and report any water leaks. Report any leaks to Plant Services.		✓	✓	✓	✓
<input type="checkbox"/> 8. Vacuum dust at source as generated when possible			✓	✓	✓
<input type="checkbox"/> 9. Water mist or foam work surfaces to control dust while cutting/ drilling when possible			✓	✓	✓
<input type="checkbox"/> 10. Active means to prevent airborne dust from dispersing into atmosphere			✓	✓	✓
<input type="checkbox"/> 11. Move patients, patient care equipment, & supplies prior to start of work			✓	✓	✓
<input type="checkbox"/> 12. Notify staff in immediate area about project & precautions / risk factors			✓	✓	✓
<input type="checkbox"/> 13. Traffic routed around affected zone when dust is being generated			✓	✓	✓
<input type="checkbox"/> 14. Seal unused windows and doors with duct tape			✓	✓	✓
<input type="checkbox"/> 15. Temporarily seal off air intakes in construction renovation area			✓	✓	✓
<input type="checkbox"/> 16. Obtain Infection Control approval before start (<i>Required for Precaution Class III or above</i>)				✓	✓
<input type="checkbox"/> 17. Place dust mat at entrance and exit of work areas				✓	✓
<input type="checkbox"/> 18. Seal plumbing and electrical outlet penetrations, intake and exhaust vents within the construction / renovation area				✓	✓
<input type="checkbox"/> 19. Remove or isolate HVAC system in areas where work is being performed to prevent duct system contamination				✓	✓
<input type="checkbox"/> 20. Install sealed barrier (sheetrock or fire related plastic) from the true ceiling to floor				✓	✓
<input type="checkbox"/> 21. Maintain negative pressure with HEPA filtration units or exhausting filtered air to outside				✓	✓
<input type="checkbox"/> 22. Use HEPA air filtration units within work space				✓	✓
<input type="checkbox"/> 23. Contain construction waste before transport in sealed containers				✓	✓
<input type="checkbox"/> 24. Establish low-risk pathways for debris removal					✓
<input type="checkbox"/> 25. Anteroom & vacuum personnel or remove cover clothes before leaving					✓
<input type="checkbox"/> 26. Shoe covers required upon entry and removed upon exit					✓
<input type="checkbox"/> 27. Increases frequency of cleaning adjacent areas to construction / renovation while project is underway				✓	✓
Upon Completion		I	II	III	IV
<input type="checkbox"/> 28. Clean contaminated equipment / discard contaminated disposables		✓	✓	✓	✓
<input type="checkbox"/> 29. Wipe horizontal surfaces with disinfectant & wet mop or vacuum w/HEPA filter vacuum		✓	✓	✓	✓
<input type="checkbox"/> 30. Remove barrier materials carefully to minimize spreading dust & debris		✓	✓	✓	✓
<input type="checkbox"/> 31. Reopen water lines slowly, then run effected taps / faucets 5 minutes to clear system		✓	✓	✓	✓
<input type="checkbox"/> 32. Remove isolation of HVAC system after clean-up		✓	✓	✓	✓
<input type="checkbox"/> 33. Do not remove barriers until area is cleaned by EVS				✓	✓
<input type="checkbox"/> 34. Do not remove barriers until inspected by Plant Services					✓
<input type="checkbox"/> 35. Consider hyperchlorinating or superheating stagnant potable water (esp. if Legionella is present in the hospital potable water supply)					✓
Monitoring (Long-Term Projects)		I	II	III	IV
<input type="checkbox"/> 36. <u>Contractor's Daily Inspection Sheets</u> required					✓
<input type="checkbox"/> 37. Project manager maintains <u>Project manager's Inspection Sheets</u>					✓

Effectiveness of all measures is to be monitored as the project progresses. Measures are to be upgraded as needed.
Other Hazards / Special Precautions: _____

☐ Check if additional IC instruction or requirements are attached

Utility Disruption Mitigation (UDM) Assessment & Plan

Project / WO #: _____

Step 1: Determine Need for a UDM Plan (Answer for each category, "Will work or conditions likely disrupt operation of any of the following systems?" (If the answer is "Yes", continue to Step 2. If not, a UDM Plan is not required unless indicated by other factors)			✓YES	✓NO
1.	Electrical distribution (primary or back up / emergency power)			
2.	HVAC serving patient care or sensitive environment area			
3.	Air pressure relationships in isolation rooms or controlled pressure zones			
4.	Domestic water serving a patient care area (If Yes, IC Assessment Required)			
5.	Oxygen, medical gas, air, or vacuum			
6.	Sanitary or storm sewer			
7.	Natural gas distribution			
8.	Compactors or other waste disposal			
9.	Building control / alarm / warning system			
10.	Badge or key access / lock system			
11.	Boiler, steam, heating, or hot water			
12.	Nurse communication system (circle): Nurse Call Code Buttons Other:			
13.	Data / Video communication system (circle): Computers Hubs Cabling Fax Cameras TV Other:			
14.	Voice Communication system (circle): Radio Phone Intercom Overhead Paging Other:			
15.	Elevators (circle affected types): Service Passenger			
16.	Utility related inability to provide patient care or patient comfort			
17.	Utility related inability of hospital to respond to an emergency or disaster			
18.	Utility related problem blocking access to emergency care			
19.	Utility related problem blocking emergency services access to any area			
20.	Hot work will be done			

Other Hazards / Notes: _____

Step 2: Create the Utilities Disruption Mitigation Safety Plan (Based on the identified scope of work & potential impacts to fire safety (outlined in Step 1), use the generally indicated precautions matrix below as a guide to determining appropriate interim measures that provide equal protection. The checklist along with any additional notes or directions serve as the “Interim Life Safety Plan”.)

Utility Disruption & Mitigation Safety Plan With Generally indicated Precautions Matrix INSTRUCTIONS: Use matrix at right as a guide when determining appropriate required safety measures (designed by a ✓ below). Planners shall also consider occupancy type, scope of work, duration of impact, and other risk factors identified by the reviewing & approving persons. This list, along with any additional notes or directions attached serves as the “Safety Plan”. Effectiveness of required precautions must be monitored at all times by workers, and additional measures are to be added as needed. ✓ Indicates a Required Precaution Related to Life Safety	Generally Indicated Precautions Matrix (✓ = Generally indicated measure. R = Required by regulation or code)																				
	1. Electrical distribution (primary or backup / e- power	2. HVAC in patient care or sensitive environment area	3. Pressure relationships in isolation or controlled area	4. Domestic water serving a patient care area	5. Oxygen, med gas, med air, or vacuum	6. Sanitary or storm sewer	7. Natural gas distribution	8. Compactors or other waste disposal	9. Tube transport	10. Building control / alarms	11. Badge or key access / lock system (e.g. Lenel)	12. Boilers, steam, heating, or hot water	13. Nurse call & code button systems	14. Data / Video communication system	15. Voice communication systems	16. Elevator down	17. Inability to provide patient care or comfort	18. Inability to respond to disasters or emergencies	19. Access to Emergency Care blocked	20. Emergency Services (FD, PD) access blocked	21. Hot work will be done
<input type="checkbox"/> 1. Notify Nursing Admin (obtain approval as appropriate)	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	
<input type="checkbox"/> 2. Notify Emergency Services (FD, PD, etc.) as needed																			✓	✓	
<input type="checkbox"/> 3. Notify Respiratory Care	✓				✓																
<input type="checkbox"/> 4. Notify whole campus	✓								✓							✓			✓	✓	
<input type="checkbox"/> 5. Notify or train whole area / depts. affected	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓		✓	✓	
<input type="checkbox"/> 6. Add or change signage as appropriate	✓			✓	✓														✓	✓	
<input type="checkbox"/> 7. Ensure alternate access by emergency services to all areas																			✓	✓	
<input type="checkbox"/> 8. Ensure alternate patient access to ER																			✓		
<input type="checkbox"/> 9. Ensure code-required egress – inspect daily																					
<input type="checkbox"/> 10. Route traffic around work / affected areas	✓										✓					✓			✓	✓	
<input type="checkbox"/> 11. Relocate patients before work starts	✓																				
<input type="checkbox"/> 12. Evacuate area before work starts																	✓	✓			
<input type="checkbox"/> 13. Install temporary access barriers around work area																					
<input type="checkbox"/> 14. Increased hazard surveillance																			✓	✓	✓
<input type="checkbox"/> 15. Prepare back-up service plan or contingency plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
<input type="checkbox"/> 16. Hot Work Permits required																					✓
<input type="checkbox"/> 17. Contractor's Daily Inspection Sheets required (long term work)		✓																	✓	✓	
<input type="checkbox"/> 18. Daily Project manager's Inspection Sheets required (long term work)		✓																	✓	✓	
<input type="checkbox"/>																					
<input type="checkbox"/>																					

Effectiveness of all measures is to be continuously monitored by the project manager & crews as work progresses, and upgraded as needed.

Other Hazards / Notes: _____

☐ Check if additional UDM instruction or requirements pages are attached

Noise / Vibration and Air Quality (NVAQ) Assessment & Plan

Project / WO #: _____

Step 1: Determine Need for a NVAQ (If the answer is "Yes", continue to Step 2. If not, a NVAQ Plan is not required unless indicated by other factors)			✓YES	✓NO
1.	Any detectible noise or vibration in Special Care Nursery, ORs, ICU, EEG Sleep study room or other sound sensitive area			
2.	Notable noise or vibration in patient sleeping areas 8:00 pm – 7:30 am			
3.	Noise >20 dB above ambient in any usually inhabited indoor area			
4.	Vibration in an area with vibration-sensitive medical or electronic equipment			
5.	Activity creates smoke, gas, fumes, vapors, odors, etc. <input type="checkbox"/> Outdoors <input type="checkbox"/> Indoors (consider air intakes)			
6.	Uncontained toxic, flammable, or harmful fumes / particles			
7.	Removal or disruption of asbestos			

Other Hazards / Notes: _____

Step 2: Create the Noise / Vibration & Air Quality (NVAQ) Safety Plan (Based on the identified scope of work & potential impacts (outlined in Step 1), use the Generally Indicated Precautions matrix below as a guide to determining appropriate precautions that provide protection. This list along with any additional notes or directions service as the “NVAQ Safety Plan”.)

Noise / Vibration & Air Quality Safety Plan With Indicated Precautions Matrix	Generally Indicated Precautions Matrix (✓ = Generally indicated measure)						
	1. ORs, ICU, Sensitive Areas	2. Any noise / vibration in patient care areas 8pm-7:30 am	>57 dB at residential property line daytimes (see Table 1)	4. Vibration in area with vibration-sensitive equipment	5. Activity creates smoke, gas, fumes, odors, etc.	6. Uncontained toxic, flammable, or harmful fumes / particles	7. Removal or disruption of asbestos
INSTRUCTIONS: Use matrix at right as a guide when determining appropriate required safety measures (designed by a ✓ below). Planners shall also consider occupancy type, scope of work, duration of impact, and other risk factors identified by the reviewing & approving persons. This list, along with any additional notes or directions attached serves as the “Safety Plan”. Effectiveness of required precautions must be monitored at all times by workers, and additional measures are to be added as needed.							
✓ Indicates a Required Precaution Related to Life Safety							
<input type="checkbox"/> 1. Acquire Nursing Supervisor approval	✓	✓			✓	✓	✓
<input type="checkbox"/> 2. Notify whole campus						✓	
<input type="checkbox"/> 3. Notify area / department Managers affected	✓	✓		✓	✓	✓	✓
<input type="checkbox"/> 4. Add signage						✓	✓
<input type="checkbox"/> 5. Relocate Patients before work starts					✓	✓	✓
<input type="checkbox"/> 6. Evacuate whole area before work starts						✓	✓
<input type="checkbox"/> 7. Route traffic around work / affected areas						✓	✓
<input type="checkbox"/> 8. Install temporary barriers around work area					✓	✓	✓
<input type="checkbox"/> 9. Run HEPA air scrubbers when vapors are being produced					✓	✓	
<input type="checkbox"/> 10. Provide alternate air supply & / or ventilation						✓	
<input type="checkbox"/> 11. Licensed abatement required							✓
<input type="checkbox"/> 12. Build sound barriers / add sound absorbent materials	✓	✓					
<input type="checkbox"/> 13. Provide additional PPE & / or training to area staff remaining in area					✓	✓	
<input type="checkbox"/> 14. Contractor's Daily Inspection Sheets required (long term work)							
<input type="checkbox"/> 15. Project Mgr maintains Project Manager's Inspection Sheets (long term work)							
<input type="checkbox"/>							
<input type="checkbox"/>							

Other Hazards / Notes: _____

☐ Check if additional NVAQ instruction or requirements pages are attached

Plans

COUNTY OF VENTURA
VCMC NORTH TOWER M
300 HILLMONT AVENUE, VENTURA, CA
PROJECT NO: P6T21010 ⁴ SPEC NO:

300 HILLMONT AVENUE, VENTURA, CA 93003
PROJECT NO: P6T21010  SPEC NO: CP23-0

PROJECT NO: P6T21010 

SHEET INDEX

[illegible]

PERMIT NO	OSHPD #
NO	REVISION
	DATE

[illegible]

DIRECTION OF PUBLIC WORKS

PUBLIC WORKS PROJECT MANAGER

Tn2 Go	
DRAWN BY	CHECKED BY
LM	KG
CONSULTANT JOB NO.	DATE

[illegible]

VCMC
NORTH TOWER
MRI

300 HILLMONT AVENUE
VENTURA, CA 93003

CP23-05
COUNTY PROJECT NUMBER
P6T21010

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SHEET INDEX

T-0.01

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NO.	DESCRIPTION	DATE
1	ISSUED FOR PERMIT	09/20/2017
2	ISSUED FOR CONSTRUCTION	09/20/2017
3	ISSUED FOR AS-BUILT	09/20/2017
4	ISSUED FOR RECORD	09/20/2017
5	ISSUED FOR FINAL	09/20/2017
6	ISSUED FOR CLOSURE	09/20/2017
7	ISSUED FOR REMOVAL	09/20/2017
8	ISSUED FOR REPAIR	09/20/2017
9	ISSUED FOR REPLACEMENT	09/20/2017
10	ISSUED FOR RECONSTRUCTION	09/20/2017

VC/MC
NORTH TOWER
MRI

300 HILGARD AVENUE
VENTURA, CA 93003

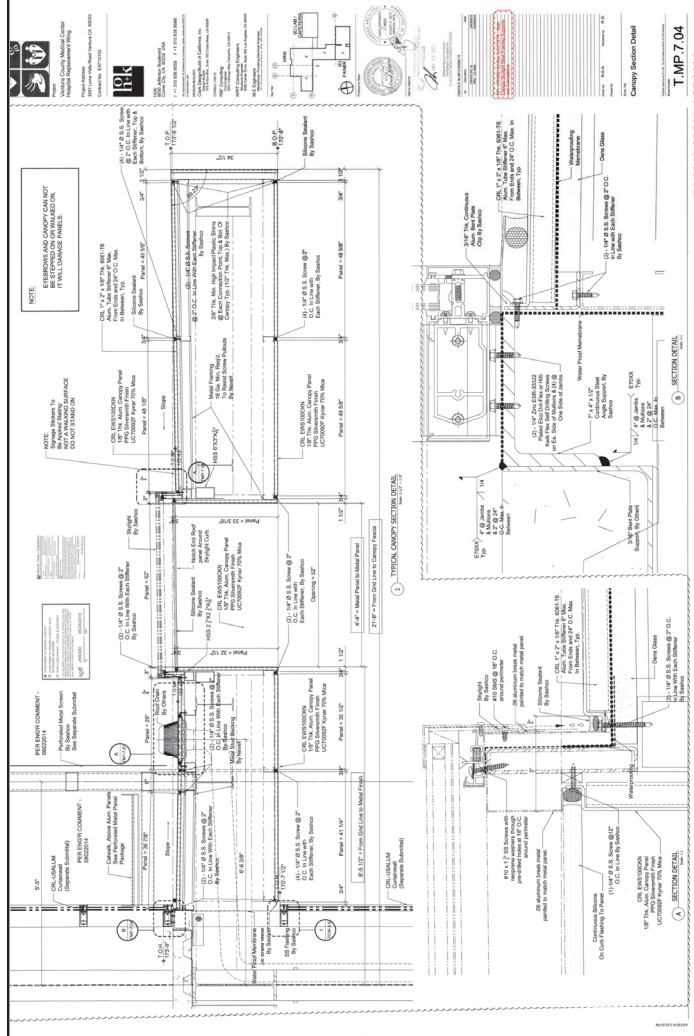
COUNTY PROJECT NUMBER
CP23-05

COUNTY PROJECT NUMBER
P6721010

CONTRACT NUMBER
7 OF 97

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T-PC-EP-01C
AND T-PC-7.04
(FOR REFERENCE ONLY)

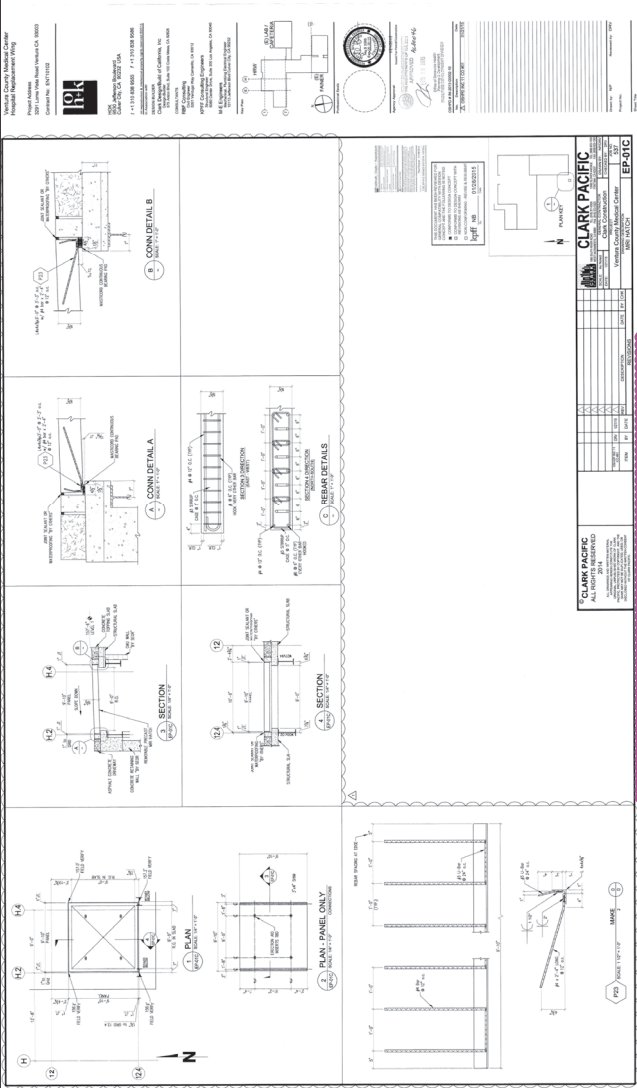
THESE
T-2.13



AS-BUILT DRAWING SHIT T.M.P.7.04 - AMBULANCE CANOPY SECTION DETAILS (FOR REFERENCE ONLY)

N.T.S.

2



FOR REFERENCE ONLY

AS-BUILT DRAWING SHIT T.PC-EP-01C - MRI HATCH FIRST LEVEL (FOR REFERENCE ONLY)

N.T.S.

1

