

ENVIRONMENTAL COMPLIANCE CENTER

310 S. West Avenue
Fresno, CA 93706

Contract # 20-S-01

The County of Fresno Department of Public Works and Planning

2220 Tulare St., 8th Floor
Fresno, California 93721

PROJECT MANUAL

Bid Date: Thursday, June 10, 2021
2:00 P.M. (1400 hours and 00 seconds)

Pre-Bid Conference: Friday, May 21, 2021, 9 a.m.

Budget / Account: 9015 / 8150 / 91440



Development Services & Capital Projects Division

Department of Public Works & Planning

CONTRACT # 20-S-01

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G0.0 Cover Page

Civil Sheets

C1.0 Civil Cover Sheet
C2.0 Notes Sheet
C3.0 Grading Plan
C4.0 Utility Plan
C5.0 Horizontal Control, Signage and Striping Plan
C6.0 Erosion Control Plan
C7.0 Erosion Control Details
C8.0 Construction Details

Architectural Sheets

A1.1 Overall Site Plan
A1.2 Enlarged Site Plan
A2.1 Floor Plan & Exterior Elevating
A2.2 Section & Details
A2.3 Containers: Hazmat Container Reuse Center, Used Oil Storage
A2.4 Containers: Seatrain Storage Containers, Hazmat Storage Containers, Anti-Freeze Tank Storage Unit
A3.1 Calgreen Compliance Sheet 1
A3.2 Calgreen Compliance Sheet 2
A3.3 Calgreen Compliance Sheet 3

Structural Sheets

S1.1 Structural Notes
S1.2 Structural Notes
S2.1 Foundation Plan
S2.2 Roof Framing Plan
S2.3 Canopy Details
S3.1 Structural Details

Plumbing Sheets

- P1.0 Plumbing Site Plan
- P1.3 Shade Structure Plumbing Plan
- P2.0 Plumbing Schedule and Details

Electrical Sheets

- E1.1 Electrical Notes and Symbols
- E1.2 Lighting Schedules and Details
- E1.3 Power Details and Schedules
- E1.4 Titles 24 Compliance Documents
- E2.1 Electrical Site Plan
- E3.1 Shade Structure/Electrical Plans

Landscape Sheets

- L1.0 Irrigation Plan
- L2.0 Planting Plan
- L3.0 Landscape Details
- L4.0 Landscape Notes and WELO

TOTAL: 36 Sheets

PHASE 2 - OFFICE/STORAGE BUILDING

- G0.0 Cover Page

Architectural Sheets

- A1.1 Reference Overall Site Plan (Submitted as Phase I)
- A1.2 Reference Enlarged Site Plan (Submitted as Phase I)
- A2.1 Floor Plans & Elevations
- A2.2 Reflected Ceiling Plan & Roof Plan
- A3.1 Interior Elevations & Finish Schedule
- A3.2 Door Schedule & Window Elevations
- A3.3 Typical Details
- A4.1 Building Sections & Wall Sections
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- A5.1 Calgreen Compliance Sheet 1
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Structural Sheets

- S2.1 Foundation Plan & Details
- S2.2 Roof Framing Plan, Ceiling Framing Plan & Details
- S2.3 Canopy Details

Plumbing Sheets

- P1.2 Office/Storage Building Plumbing Plan
- P2.0 Office/Storage Building Plumbing Schedules and Details
- P2.1 Office/Storage Building Riser Details

Mechanical Sheets

- M1.0 Office/Storage/Toilet Room Building Mechanical Plan
- M2.0 Office Building Mechanical Schedules and Details
- M2.1 Mechanical Schedules and Details
- M2.2 Mechanical Title 24
- M2.3 Mechanical Title 24

Electrical Sheets

- E1.1 Office/Storage Building Electrical Notes and Symbols
- E1.2 Lighting Schedules and Details
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- E1.4 Title 24 Compliance Documents
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- E2.1 Office/Storage Building Electrical Plans

TOTAL: 30 Sheets

PHASE 3 - WAREHOUSE BUILDING

G0.0 Cover

Architectural Sheets

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A2.1 Floor Plans & Elevations
A2.2 Reflected Ceiling Plan & Roof Plan
A3.1 Finish Schedule
A3.2 Door Schedule & Window Elevations
A3.3 Details
A4.1 Calgreen Compliance Sheet 1
A4.2 Calgreen Compliance Sheet 2
A4.3 Calgreen Compliance Sheet 3

Structural Sheets

S1.1 Structural Notes
S1.2 Structural Notes
S2.1 Foundation Plan
S2.2 Roof Framing Plan
S3.1 Structural Details

Plumbing Sheets

P1.3 Warehouse Building Plumbing Plan
P2.0 Warehouse Plumbing Schedules and Details
P2.1 Warehouse Building Riser Details

Mechanical Sheets

M1.0 Warehouse Building Mechanical Plan
M2.0 Warehouse Mechanical Schedules and Details
M2.1 Mechanical Schedules and Details

Electrical Sheets

- E1.1 Electrical Notes and Symbols
- E1.2 Lighting Schedules and Details
- E1.3 Power Details and Schedules
- E1.4 Title 24 Compliance Documents
- E2.1 Warehouse Building Electrical Plans

TOTAL: 27 Sheets

END OF SECTION

ENVIRONMENTAL COMPLIANCE CENTER

Contract # 20-S-01

Adopted by the Fresno County Board of Supervisors, _____, 2021

Steve Brandau, Chairman	2nd District
Brian Pacheco, Vice Chairman	1st District
Sal Quintero	3rd District
Ernest Buddy Mendes	4th District
Nathan Magsig	5th District

Jean M. Rousseau, County Administrative Officer



Steven White, Director
Department of Public Works and Planning



05.13.2021

Date Signed

Architect of Record:

Tiana L. Perez, #C38000
License Renewal 01/31/23

**Fresno County Department of Public Works and Planning
Development Services & Capital Projects Division
2220 Tulare Street, 8th Floor
Fresno, CA 93721-2104**



5/13/20
Date Signed

Civil Engineer:

A handwritten signature in black ink, appearing to read "D. J. Zoldak", written over a horizontal line.

Daniel J. Zoldak, #66124
License Renewal: 06/30/2022

Daniel J. Zoldak
LARS Andersen & Associates, INC.
4694 West Jacquelyn Avenue
Fresno, CA 93722

Date Signed

Structural Engineer:

Michael E. Parolini, #S5405
License Renewal 06/30/22

SSG Structural Engineers
8405 N. Fresno Street
Fresno, CA 93720

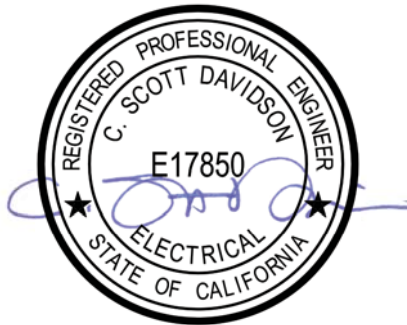


05/13/2021
Date Signed

Plumbing and Mechanical Engineer: _____

Mike Cantelmi, #M23588
License Renewal 09/30/21

Lawrence Engineering Group
7084 N. Maple Ave., Ste. 101
Fresno, CA 93720



05/13/2021
Date Signed

Electrical Engineer: _____

C. Scott Davidson, #E17850
License Renewal 06/30/22

Hardin-Davidson Engineering
356 Pollasky Ave., Ste. 200
Clovis, CA 93612

BOARD OF SUPERVISORS

COUNTY OF FRESNO

STATE OF CALIFORNIA

NOTICE TO BIDDERS

Sealed proposals ~~from bidders who have been pre-qualified to bid on this Project~~ will be received at:

<https://www.bidexpress.com/businesses/36473/home>

and at the Fresno County Department of Public Works and Planning (Department), Office of the Design Engineer, Seventh Floor, Fresno County Plaza Building, 2220 Tulare Street, Fresno, CA 93721 until

**2:00 P.M., (1400 hours and 00 seconds)
Thursday, June 10, 2021**

at which time the bidding will be closed.

If you have any questions about bid submission, please contact us at DesignServices@fresnocountyca.gov or call (559) 600-9908 or (559)600-4509.

Promptly following the closing of the bidding all timely submitted bids will be publicly opened and viewable via a livestream (the link for which will be posted at: <http://www.co.fresno.ca.us/planholders>) for construction in accordance with the project specifications therefor, to which special reference is made as follows:

ENVIRONMENTAL COMPLIANCE CENTER

**310 S. West Avenue,
Fresno CA 93706**

Contract No.: 20-S-01

The work to be done, consists, in general of the construction of a new Drop off site and Shade Structure, a small Office/Storage Building, Storage Warehouse, and associated site work as shown on the Drawings.

A virtual pre-bid conference will be held at **09:00 a.m.**, on **FRIDAY, MAY 21, 2021** via online Zoom Meeting. The meeting ID and password will be posted at:

<http://www.co.fresno.ca.us/departments/public-works-and-planning/construction-bidding-opportunities/20-s-01-environmental-compliance-center>

A discussion of bidding logistics will be held, and visual media may be shared. The meeting will be recorded, and questions raised during the meeting will be fully addressed in writing subsequent to the meeting. Attendance at the pre-bid conference is not mandatory and questions about the project should be submitted in writing using the Contractor Request for Clarification Form.

Electronic copies (in “.pdf” file format) of the official project plans and specifications and such additional supplemental project information as may be provided, are available to view, download, and print at <http://www.co.fresno.ca.us/planholders>.

CONTRACT NO. 20-S-01

Electronic versions of the bid documents are available online at: <https://www.bidexpress.com/businesses/36473/home> and bids may be submitted electronically through that website.

If a bidder is unable to submit a bid via Bid Express, bids shall be submitted in a sealed, opaque envelope addressed to the Department and labeled with the name of the bidder, the name of the project, the contract number, and the statement 'Do Not Open Until The Time Of Bid Opening.'

Known Plan holders and exchange/publication names may be obtained from the Fresno County website at <http://www.co.fresno.ca.us/planholders>.

A Summary of Bids and a list of subcontractors for the apparent low bidder will be posted at the above listed website, generally within 24 hours of the Bid Opening.

The apparent lowest bidder shall submit a Cost Distribution of the bid, otherwise known as a "Schedule of Values," (refer to Section 002113 Instructions to Bidders 1.16 Post-Bid / Pre-Award Information and Requirements) within eight (8) days of the Bid Opening.

The County of Fresno is committed to increasing the availability of employment and training opportunities, and requires that the Contractor and each subcontractor employed on this Project shall use their best efforts to ensure that thirty-three percent (33%) of apprentice hours are performed by qualified participants in state approved apprenticeship programs who also are current or former "Welfare-to-Work" participants in the CalWORKs program. Attention is directed to "Apprentices" in Section 2.55 of the General Conditions.

Incentives whereby the Contractor or subcontractor receives partial reimbursement for the wages paid to apprentices who qualify may be available. The incentive program is administered by the County of Fresno, Department of Social Services through a contract with the Fresno Economic Opportunities Commission. For questions regarding the incentive program, contact Valley Apprenticeship Connections at (559) 263-1110 or visit their website at: <https://fresnoeoc.org/valley-apprenticeship-connections>.

Contractors are encouraged to visit the project site which is located on the southwest corner of West Dan Ronquillo Drive and South West Avenue. All requests for substitutions (refer to Section 012500, Substitution Procedures) and questions regarding this project shall be in writing and shall be received by the Department of Public Works and Planning, Design Division, no later than 2:00 P.M. on the tenth (10th) calendar day prior to bid opening. All substitution requests and questions received after this deadline will not receive a response unless the Department of Public Works and Planning elects to issue an addendum to revise the bid opening date. In the event that the bid opening date is revised, the deadline for questions will be extended to no later than 2:00 P.M. on the tenth (10th) calendar day before the revised bid opening date. Questions shall be submitted on the "Contractor Request For Clarification" form provided on the project website at:

<https://www.co.fresno.ca.us/departments/public-works-and-planning/construction-bidding-opportunities/20-s-01-environmental-compliance-center/20-s-01-requests-for-clarification-form>

Any changes to, or clarification of, the Contract documents and specifications, including approved substitutions, shall be in the form of a written addendum issued to planholders of record. Questions that prompt a change or clarification shall be included in the addendum with the subsequent answer.

Any oral explanation or interpretations provided with regard to this project are not binding.

Bid security in the amount of ten (10) percent of the amount of the bid, and in the form of a bid bond issued by an admitted surety insurer licensed by the California Department of Insurance, cash, cashier's check or certified check shall accompany the bid. Bid security shall be made in favor of the County of Fresno. You must either attach an electronic bid bond or provide an original bid bond (or other form of bid security authorized by Public Contract Code Section 20129(a)), prior to the bid opening, in accordance with the detailed directions set forth in Section 1.04 ("PREPARATION OF PROPOSALS") of the Instructions to Bidders.

No contract will be awarded to a contractor who has not been licensed in accordance with the provisions of the Contractors State License Law, California Business and Professions Code, Division 3, Chapter 9, as amended, or whose bid is not on the proposal form included in the contract document. A valid California Contractor's License, **Class B, (General Building)** is required for this Project.

Asbestos certification from the Contractors State License Board and registration with the Division of Occupational Safety and Health is not required to bid this Project. [Health and Safety Code 25914.2]

The Contractor and their subcontractors shall comply with all applicable statutes and regulations, and all provisions of Sections 2.51, 2.52, and 2.55 of the General Conditions, regarding payment of wages, hours of work and all other labor compliance issues.

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at County of Fresno, Department of Public Works and Planning, 2220 Tulare Street, Sixth Floor, Fresno, CA 93721-2104 and available from the California Department of Industrial Relations' website at <http://www.dir.ca.gov/DLSR/PWD>. Future effective general prevailing wage rates, which have been predetermined and are on file with the California Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

This project shall be subject to monitoring and enforcement by the County of Fresno and the Department of Industrial Relations (DIR), including the obligation to submit certified payroll records to the County of Fresno and directly to the DIR Compliance Monitoring Unit (CMU) at least monthly using the CMU's eCPR system. Detailed information may be obtained on the State of California's Department of Industrial Relations website, <http://www.dir.ca.gov/public-works/publicworks.html>.

No contractor or subcontractor may be listed on a bid proposal 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.

This contract is subject to state contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990.

Bids are required for the entire work described herein. Bids will be compared on the basis of the cumulative sum of the bid amounts listed for the individual line items.

In addition to the bid bond required by law of all bidders on public works projects, the successful bidder shall furnish a faithful performance bond, a payment bond, and a warranty bond in accordance with the provisions of Section 007200, General Conditions, Article 2.36, Performance Bond, Labor and Material Payment Bond and Warranty Bond. The faithful performance bond and the payment bond each shall be in the amount of 100 percent of the Contract Value; and the One Year Warranty Bond shall be in the amount of 10 percent of the Final Contract Sum, as defined in General Conditions Article 2.36, Section A. Each bond specified in this Notice (bid bond, faithful performance bond, payment bond and warranty bond) shall meet the requirements of all applicable statutes, including but not limited to those specified in Public Contract Code section 20129 and Civil Code section 9550.

Each bond specified in this Notice shall be issued by a surety company designated as an admitted surety insurer in good standing with and authorized to transact business in this state by the California Department of Insurance, and acceptable to the County of Fresno. Bidders are cautioned that representations made by surety companies will be verified with the California Department of Insurance. Additionally, the County of Fresno, in its discretion, when determining the sufficiency of a proposed surety company, may require the surety company to provide additional information supported by documentation. The County generally requires such information and documentation whenever the proposed surety company has either a Best's Key Rating Guide of less than **A** and a financial size designation of less than **VIII**. Provided, however, that the County expressly reserves its right to require all information and documentation to which the County is legally entitled from any proposed surety company.

Pursuant to Public Contract Code Section 22300, substitution of securities for any moneys withheld by the County of Fresno to ensure performance under the contract shall be permitted.

The Board of Supervisors reserves the right to reject any or all bids.

Board of Supervisors, County of Fresno

Jean Rousseau, County Administrative Officer

Bernice E. Seidel, Clerk of the Board

Issue Date: May 11, 2021

END OF SECTION

INSTRUCTION TO BIDDERS

1.01 EXPLANATION TO BIDDERS

An explanation desired by bidders regarding the meaning or interpretation of the bid documents must be requested in writing no later than 10 days prior to the bid opening.

Oral explanations given before the award of the contract will not be binding. Any interpretation made will be in the form of an addendum to the bid documents, said addendum will only be issued by the County's Director of Public Works and Planning ("Director"). The addendum will be furnished to each planholder and its receipt shall be acknowledged on the Bid Proposal. Each addendum will also be posted on the Fresno County website at <http://www.co.fresno.ca.us/planholders>.

1.02 EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL PROVISIONS AND SITE OF WORK

The bidder is required to examine carefully the site of the proposed work, the proposal, plans, specifications, special provisions, and contract forms for submitting a proposal. It is mutually agreed that the submission of a proposal shall be considered prima facie evidence that the bidder has made such examination and is satisfied with the conditions to be encountered in performing the work and as to the requirements of the plans, specifications, and special provisions of the contract documents.

1.03 PROPOSAL GUARANTEE

The bidder shall furnish a proposal guarantee, consisting of a bid bond, cash, certified check, or cashier's check, for ten percent (10%) of the total amount bid, including additives.

If security is provided in the form of a certified check or cashier's check, the County may make such disposition of same as will accomplish the purpose for which submitted. Checks deposited by unsuccessful bidders will be returned as soon as practicable after the bid opening.

1.04 PREPARATION OF PROPOSALS

The bidder shall prepare a proposal on the blank proposal form furnished by the County.

The bidder's proposal shall be executed by the individual, by one or more partners of the partnership, or by one or more of the officers of the corporation submitting it. If the proposal is made by an individual, a name and post office address must be shown. If made by a partnership, the name of each member of the partnership must be shown. If made by a corporation, the proposal must show the name of the state under which the corporation was chartered and the name of the president, vice president, secretary and treasurer.

1.05 SUBCONTRACTORS

Every person submitting a bid to perform the work called for in the bid request shall set forth in this bid:

- A. The name and the location of the place of business, and the California contractor's license number, and the public works contractor registration number issued pursuant to Section 1725.5 of the Labor Code, of each subcontractor who will perform work or labor or render service to the general contractor in or about the construction of the work or improvement in an amount in excess of one-half (1/2) of one percent (1%) of the general contractor's total bid; and
- B. The portion of the work which will be done by each subcontractor.

The attention of bidders is directed to the provisions of Public Contract Code Section 4100 et seq which set forth the consequences and possible penalties which may result from a failure to comply strictly with the foregoing requirements for listing of subcontractors.

1.06 SUBMISSION OF PROPOSAL

A. Electronic Bid Submittal

The bidder has the option to submit the bid for this Project electronically. The bidder must either attach an electronic bid bond or provide an original bid bond (or other form of bid security authorized by Public Contract Code Section 20129(a)), prior to the bid opening.

Bidders submitting online may use one of the accepted electronic sureties (SurePath or Surety 2000) to submit their bid bond; or may submit cash, cashier's check, certified check, or a bidder bond to Design Services at 2220 Tulare St., Seventh Floor, Fresno, CA 93721. Those submitting bid bonds directly to Design Services must submit their bid bond:

1. Under sealed cover
2. Marked as a bid-bond
3. Identifying the contract number and the bid opening date on the cover

B. Bid Submittal by Personal Delivery or by Mail

The bidder has the option to submit the bid by personal delivery or by mail. The bidder shall specify, on the blank Proposal form, a lump sum price in both words and figures for each bid item, including alternates, additives and supplemental items. If the bid is not submitted electronically, then all words and figures shall be written on the Proposal form in ink. In the case of a discrepancy between the prices written in words and those written in figures, the written words shall govern. The bidder's proposal shall be signed in ink by the individual executing the bid on behalf of the bidder.

The required proposal guarantee must accompany the proposal.

Each proposal shall be submitted in a sealed envelope labeled to clearly indicate the contract and contents.

When sent by mail, a sealed proposal must be addressed to the Fresno County Department of Public Works and Planning, Office of the Design Engineer, Sixth Floor, Fresno County Plaza Building, 2220 Tulare Street, Fresno, CA 93721. All proposals shall be filed prior to the time and at the place specified in the NOTICE TO BIDDERS. Proposals received after the time for opening of the proposals will be returned to the bidder unopened.

1.07 IRREGULAR PROPOSALS

Proposals that do not conform to bid requirements may be rejected as nonresponsive. Proposals shall be considered irregular and may be rejected for various reasons, including but not limited to the following:

- A. The proposal forms furnished by the County are not used or are altered.
- B. There are unauthorized additions, conditional or alternate proposals or irregularities of any kind which tend to make the proposal incomplete or indefinite.
- C. The bidder adds any provision reserving the right to accept or reject an award, or to enter into a contract pursuant to an award.
- D. The bid fails to contain a price for each bid component.

1.08 DISQUALIFICATION OF BIDDERS

Any one or more of the following may be considered to constitute sufficient cause for disqualification of a bidder and rejection of that bidder's proposal:

- A. More than one proposal for the same work from an individual, partnership or corporation.
- B. Evidence of collusion among bidders. Participants in such collusion will receive no recognition as bidders for any future work of the County until such participant shall have been reinstated as a qualified bidder.
- C. Lack of competency or inadequate machinery, plant or other equipment as considered necessary to perform this project, as may be revealed by financial statement if required.
- D. Unsatisfactory performance record as shown by past work for the County, judged from the standpoint of workmanship and progress.
- E. Prior commitments or obligations which in the judgment of the County might hinder or prevent the prompt completion of the work.
- F. Failure to pay, or satisfactorily settle, all bills due for labor or materials which remain pending under any former contract(s) at the time of submittal of the bid for this project.
- G. Failure to comply with any prequalification requirements of the County.

- H. Failure to furnish full amount of Proposal Guarantee with bid or failure to sign bid bond.

1.09 WITHDRAWAL OR REVISION OF PROPOSALS

A bidder may, without prejudice, withdraw a proposal after it has been deposited, provided the request for such withdrawal is received in writing before the time set for opening proposals. The request shall be executed by the bidder or the bidder's duly authorized representative and shall include the name of the individual authorized to receive the withdrawn proposal. Said individual shall be required to present photo identification prior to withdrawing the proposal. The bidder may then submit a revised proposal provided it is received prior to the time set for opening proposals.

1.10 PUBLIC OPENING OF PROPOSALS

Proposals will be opened and read publicly at the time and place indicated in the Notice to Bidders. Bidders or their authorized agents are invited to be present.

1.11 BID PROTEST PROCEDURE / RELIEF OF BIDDER

A. BID PROTEST PROCEDURE

Any bid protest must be submitted in writing and delivered by the Bidder by either of the following means: (1) via e-mail to DesignServices@fresnocountyca.gov; or (2) via certified mail, return receipt requested to the following address: Design Division, Department of Public Works and Planning, 2220 Tulare Street, Sixth Floor, Fresno, CA 93721.

The bid protest must be received no later than 5:00 p.m. of the seventh (7th) calendar day following the deadline for submittal of the specific bid document(s) placed at issue by the protest. Any Bidder filing a protest is encouraged to submit the bid protest via e-mail, because the deadline is based on the Department's receipt of the bid protest. A bid protest accordingly may be rejected as untimely if it is not received by the deadline, regardless of the date on which it was postmarked. The Bidder's compliance with the following additional procedures also is mandatory:

The initial protest document shall contain a complete statement of the grounds for the protest, including a detailed statement of the factual basis and any supporting legal authority.

The protest shall identify and address the specific portion of the document(s) forming the basis for the protest.

The protest shall include the name, address and telephone number of the person representing the protesting party.

The Department will provide a copy of the initial protest document and any attached documentation to all other Bidders or proposers who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

The Board of Supervisors will issue a decision on the protest. If the Board of Supervisors determines that a protest is frivolous, the party originating the protest may be determined to be irresponsible and that party may be determined to be ineligible for future contract awards.

The procedure and time limits set forth herein are mandatory and are the Bidder's sole and exclusive remedy in the event of a bid protest. Failure by the Bidder to comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including the subsequent filing of a Government Code Claim or legal proceedings.

B. RELIEF OF BIDDER

A bidder who claims a mistake in their bid must follow the procedures in Public Contract Code Section 5100 et seq in seeking relief of their bid.

1.12 AWARD OF CONTRACT

The award of the contract, if it is awarded, will be to the lowest responsible bidder whose proposal complies with all the prescribed requirements. The award, if made, will be within 54 days after the opening of proposals.

If the County finds that it will be unable to award the contract within 54 calendar days after the opening of proposals, the Director may request any or all bidders to extend all terms of their proposal(s) to a specified date. It is possible that additional extensions may subsequently be requested. If a bidder does not elect to extend the terms of their proposal beyond the 54 calendar days following opening of proposals, or does not respond within 10 days to any request for an extension, that bidder's proposal will be deemed as having expired 54 calendar days following opening of the proposals, and that bidder's proposal will not be considered for award of the contract.

The successful bidder will be notified in writing, by letter mailed to the address shown on their proposal, that their bid has been accepted and that they have been awarded the contract.

The right is reserved by the County to reject any or all proposals, to waive technicalities (such as immaterial bid irregularities), to advertise for new proposals, or to proceed to do this work otherwise, if in the judgment of the awarding authorities the best interests of the County will be promoted thereby.

1.13 CANCELLATION OF AWARD

The awarding authority reserves the right to cancel the award of any contract at any time before the execution of said contract by all parties without any liability against the County.

1.14 CONTRACT BONDS

The bidder to whom the award is made shall, within ten days, enter into a written contract with the County. The bidder shall forfeit the proposal guarantee in case the bidder does not follow through with execution of the written contract within ten days after the contract is awarded.

The successful bidder shall furnish a faithful performance bond in the amount of 100 percent (100%) of the contract amount and a payment bond in the amount of 100 percent (100%) of the contract amount, and one-year Warranty Bond in the amount of 10 percent (10%) of the contract amount. Said bonds shall be submitted in triplicate.

The payment bond shall contain provisions such that if the Contractor or their subcontractors shall fail to pay (a) amounts due under the Unemployment Insurance Code with respect to work performed under the contract, or (b) any amounts required to be deducted, withheld and paid over to the Employment Development Department and to the Franchise Tax Board from the wages of the employees of the Contractor and subcontractors pursuant to Section 13020 of the Unemployment Insurance Code with respect to such work and labor, then the surety will pay these amounts. In case suit is brought upon the payment bond, the surety will pay a reasonable attorney's fee to be fixed by the court.

The contract form is attached hereto for the Contractor's information only. Execution of the contract by the successful bidder will not be required until after the bid award is made. Liability and Workers Compensation Insurance requirements shall be as set forth in the Agreement.

1.15 BUILDERS RISK INSURANCE

The Contractor shall obtain and maintain in force Builder's Risk Insurance against loss or damage from all perils. The policy shall cover the entire structure on which the work of this contract is to be done, up to the full insurable value thereof (except that if the contract is for remodeling, alteration, repair, or maintenance, then the policy shall cover the value of the contract therefore), including items of labor and materials connected therewith on the site, materials in place or to be used as part of the permanent construction including materials stored and partially paid for by the County as provided in Division 01-General Requirements, surplus materials, shanties, protective fences, bridges, or temporary structures, miscellaneous materials and supplies incident to the work, and such scaffolding, stagings, towers, forms and equipment as are not owned or rented by the Contractor, the cost of which is included in the cost of the work. EXCLUDED: This insurance does not cover any tools owned by mechanics, any tools, equipment, scaffolding, staging, towers, and forms owned or rented by the Contractor, the capital value of which is not included in the cost of the work, or any structures erected for the Contractor's administration of the project.

All subcontractors shall be insured to the extent of their portion of the work under the Contractor. The Contractor shall request, and is responsible to confirm with its insurer, that the County and all subcontractors are named, both as additional insured and as additional loss payees, on the Builder's Risk insurance policy. The County, Contractor, and all subcontractors waive all rights, each against the others, for damages arising from perils

covered by the insurance required under the terms of this article, except such rights as they may have to the proceeds of the Builder's Risk insurance obtained and maintained by the Contractor. The Contractor shall file a certificate of such insurance with the County upon issuance of the policy, and with any subcontractors upon its request.

1.16 POST-BID / PRE-AWARD INFORMATION AND REQUIREMENTS

Within eight calendar days after bid opening, the apparent low bidder shall submit the following information to the County to DesignServices@fresnocountyca.gov in addition to post-award distribution:

- A. a cost distribution of the bid, with costs shown for major items of work as defined by either the project specification index, the Uniform Construction Index (UCI), or other method as appropriate for the project and approved by the County.
- B. the cost distribution shall distinguish between work to be done by the Contractor's own forces and work that will be subcontracted (including those who are to furnish materials or equipment fabricated to a special design); all subcontractors shall be named, regardless of the dollar amount of subcontracted work. Contractor's attention is also directed to California Public Contract Code Section 4100 et seq regarding subcontracting.

The County reserves the right to reject any proposed subcontractor, installer, or supplier who cannot show satisfactory evidence of meeting the qualifications required by the specification documents. In the event of such rejection, the apparent low bidder shall, within five working days, submit the name and qualifications of a replacement subcontractor, installer or supplier satisfactory to the County. Such replacement submittal shall be in accordance with all specification requirements.

No adjustment of bid prices shall be made in the event of such replacement.

If the project is awarded, the cost distribution will be used in determining amounts payable on progress payments and final payment.

The County may request that bidders other than the apparent low bidder submit similar cost distribution or qualification information, for the purpose of evaluating bids.

Upon completion of the bid evaluation process, cost distributions or qualification information submitted by other than the apparent low bidder will be returned upon request.

END OF SECTION

BIDDERS' CHECKLIST (BUILDING CONTRACTS)

Because of numerous technical irregularities resulting in rejected proposals for projects, the following checklist is offered for the bidders' information and use in preparing the proposal. This checklist is not to be considered as part of the contract documents. Bidders are cautioned that deleting or not submitting a form supplied in the bid documents (even if the form does not require signature) may result in an irregular bid.

PROPOSAL/BID SHEET (Section 004213)

Bidder name on each sheet. Price for each item including: each additive, deductive, supplemental or alternate items. Make no additions such as "plus tax", "plus freight", or conditions such as "less 2% if paid by 15th". Use ink or typewriter. Acknowledge addenda.

BID SECURITY FORM - Read the Notices and Notes (Section 004313)

Indicate type of bid security provided.
Provide contract license information.

State business name and if business is a:

Corporation - list officers

Partnership - list partners

Joint Venture - list members

If Joint Venture members are corporations or partnerships, list their officers or partners.

Individual - list Owner's name and firm name style

Signature of Bidder –BID MUST BE SIGNED!

Corporation - by an officer

Partnership - by a partner

Joint Venture - by a member

Individual - by the Owner

If signature is by a Branch Manager, Estimator, Agent, etc., the bid must be accompanied by a power of attorney authorizing the individual to sign bids, otherwise the bid may be rejected.

Business Address - Firm's Street Address

Mailing Address - P.O. Box or Street Address

BID SECURITY (PROPOSAL GUARANTEE)

Ten percent (10%) of the total amount bid (to include supplemental or additive items).

Type of Bid Security:

Cash - Not recommended; cash is deposited in a clearing account and is returned to bidders by County warrant. This process may take several weeks.

Cashier's or Certified Checks - Will be held until the bid is no longer under consideration. If submitted by a potential awardee, they will be returned when the contract bonds are submitted and approved.

Bid Bonds - Must be signed by the bidder and by the attorney-in-fact for the bonding company. Signature of attorney-in-fact should be notarized and the bond should be accompanied by bonding company's affidavit authorizing attorney-in-fact to execute bonds. An unsigned bid bond will be cause for rejection. If the bid is submitted electronically, then the bidder must either attach an electronic bid bond or provide an original bid bond (or other form of bid security authorized by Public Contract Code Section 20129(a)), prior to the bid opening, as more thoroughly specified in the Instructions to Bidders, Section 1.04.A ("Electronic Bid Submittal").

SUBCONTRACTOR LIST (Section 004336)

One firm for each type of work to be subcontracted. Fill out as completely as possible. Name and location of place of business, California contractor's license number, public works contractor registration number issued pursuant to Section 1725.5 of the Labor Code, and description of work to be performed are required to be listed for each subcontractor in accordance with Public Contract Code section 4104.

NON-COLLUSION DECLARATION (Section 004519)

Must be completed, signed, and returned with bid.

GUARANTY OF WORK (Section 006536)

Does not need to be submitted with the bid. (Must be signed and submitted by the successful bidder together with the executed contract and requisite bonds and insurance certificates, within ten days after award of the Project.)

OTHER

If the bid forms have been removed from the specifications booklet, staple the pages together.

Make sure the bid envelope is sealed and shows the project name, bid package and contract number.

If the bid is mailed, allow sufficient time for postal delivery prior to the bid closing time. Bids received after the scheduled time will be returned unopened. Be sure the statement "**DO NOT OPEN UNTIL TIME OF BID OPENING**" is on the envelope.

END OF SECTION

**PROPOSAL TO THE BOARD OF SUPERVISORS
COUNTY OF FRESNO**

Contract: **Environmental Compliance Center**

Contract No.: **20-S-01**

Fund / Subclass / Org / Account / Program or Memo No.: **9015 / 8150 / 91440**

Work to be performed: **Construction of a new Drop off site and Shade Structure, Office Building, Storage Warehouse, and associated site work as shown on the Drawings**

Building No.: **TBD**

Project Address:
**310 S. West Avenue
Fresno, CA 93706**

In case of a discrepancy between words and figures, the words shall prevail.

If this proposal shall be accepted and the undersigned shall fail to contract, as aforesaid, and to give the two bonds in the sums to be determined as aforesaid, each issued by a surety satisfactory to the Awarding Authority, within ten (10) days after the award of the contract, the Awarding Authority, at its option, may determine that the bidder has abandoned the contract, and thereupon this proposal and the acceptance thereof shall be null and void, and the forfeiture of such security accompanying this proposal shall operate and the same shall be the property of the County.

The undersigned, as bidder, declares that all addenda issued with respect to this bid have been received and incorporated into this Proposal. The bidder's signature on this Proposal also constitutes acknowledgement of all addenda.

The undersigned, as bidder, declares that the only persons, or parties interested in this proposal as principals are those named herein; that this proposal is made without collusion with any other person, firm or corporation; that he has carefully examined the location of the proposed work, the annexed proposed form of contract, and the plans therein referred to; and he proposes and agrees if this proposal is accepted, that he will contract with the County of Fresno to provide all necessary machinery, tools, apparatus and other means of construction, and to do all the work and furnish all the materials specified in the contract in the manner and time therein prescribed, and according to the requirements of the County as therein set forth, and that he will take in full payment therefor the following lump sum price, to-wit:

BIDDER: _____

Contract No.: 20-S-01 Project: Environmental Compliance Center	
Lump Sum Price Written In Words	
1.) Site and Shade Structure _____ Dollars	\$ _____
2.) Office/Storage Building _____ Dollars	\$ _____
3.) Warehouse Building _____ Dollars	\$ _____
4.) Total Bid (1+2+3) _____ Dollars	\$ _____

Acknowledgment of Addendum:	
Addendum No. _____ Dated _____	Addendum No. _____ Dated _____
Addendum No. _____ Dated _____	Addendum No. _____ Dated _____

**END OF PROPOSAL FORM
 END OF SECTION**

BID SECURITY FORM

CONTRACT: ENVIRONMENTAL COMPLIANCE CENTER

CONTRACT: #20-S-01

Accompanying this proposal is security (check one only) in an amount equal to at least ten percent (10%) of the total amount of the bid:

Bid Bond ; Certified Check ; Cashier's Check ; Cash (\$ _____)

The names of all persons interested in the foregoing proposal as principals are as follows:

IMPORTANT NOTICE: If bidder or other interested person is a corporation, state legal name of corporation, also names of the president, secretary, treasurer and manager thereof; if a co-partnership, state true name of firm, also names of all individual co-partners comprising the firm; if bidder or other interested person is an individual, state first and last name in full.

FIRM NAME _____

Licensed in accordance with an act providing for the registration of Contractors,
Class _____ License No. _____ Expires _____
Department of Industrial Relations Registration No: _____

Signature of Bidder Dated

NOTE: If bidder is a corporation, the legal name of the corporation shall be set forth above together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation; if bidder is a co-partnership, the true name of the firm shall be set forth above together with the signature of the partner or partners authorized to sign contracts on behalf of the co-partnership; and if bidder is an individual, his signature shall be placed above. If signature is by an agent, other than an officer of a corporation or a member of a partnership, a Power of Attorney must be on file with the Owner prior to opening bids or submitted with the bid; otherwise, the bid will be disregarded as irregular and unauthorized.

BUSINESS ADDRESS: _____
Zip Code

MAILING ADDRESS: _____
Zip Code

BUSINESS PHONE: (_____) _____ **FAX NUMBER:** (_____) _____

EMAIL: _____

END OF SECTION

CONTRACT # 20-S-01

BIDDER: _____

SUBCONTRACTORS

The following named subcontractor(s) will perform with labor, or otherwise render services to the general contractor in or about the construction of the work or improvement in an amount in excess of one-half of one percent of the total bid presented herewith. Please fill out as completely as possible when submitting your bid. Use subcontractor's business name style as registered with the License Board. Submission of subcontractor's name, location of business and description of work, California contractor's license number and public works contractor registration number issued pursuant to Section 1725.5 of the Labor Code, all are REQUIRED, by Section 4104 of the California Public Contract Code, to be submitted prior to bid opening. (The "location of business" must specify the city in which the subcontractor's business is located, and the state if other than California.) All other requested information shall be submitted, either with the bid or within 24 hours after bid opening.

Please fill out as completely as possible when submitting your bid. Use subcontractor's business name style as registered with the License Board.

FAILURE TO LIST SUBCONTRACTORS AS DIRECTED MAY RENDER THE BID NON-RESPONSIVE, OR MAY RESULT IN ASSESSMENT OF A PENALTY AGAINST THE BIDDER IN ACCORDANCE WITH SECTION 4110 OF THE CALIFORNIA PUBLIC CONTRACT CODE.

<p>SUBCONTRACTOR: _____</p> <p>Business Address: _____</p> <p>Class: _____ License No. _____ DIR Registration No. _____</p> <p>Item No. or Description of Work: _____</p> <p>Dollar Amount: _____ OR Percentage of Total Bid: _____</p> <p>Email Address: _____</p>
<p>SUBCONTRACTOR: _____</p> <p>Business Address: _____</p> <p>Class: _____ License No. _____ DIR Registration No. _____</p> <p>Item No. or Description of Work: _____</p> <p>Dollar Amount: _____ OR Percentage of Total Bid: _____</p> <p>Email Address: _____</p>
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BIDDER: _____

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BIDDER: _____

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<p>SUBCONTRACTOR: _____</p> <p>Business Address: _____</p> <p>Class: _____ License No. _____ DIR Registration No. _____</p> <p>Item No. or Description of Work: _____</p> <p>Dollar Amount: _____ OR Percentage of Total Bid: _____</p> <p>Email Address: _____</p>

CONTRACT: ENVIRONMENTAL COMPLIANCE CENTER
CONTRACT NO.: 20-S-01

To the Board of Supervisors, County of Fresno:

NON-COLLUSION DECLARATION TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID *

The undersigned declares:

I am the _____ of
(Owner, Partner, Corporate Officer (list title), Co-Venturer)

_____, the party making the foregoing bid.

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

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

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____, 2021,

at _____, _____."
[city] [state]

(Printed or Typed Name)

(Signature)

(See Title 23 United States Code Section 112; Calif Public Contract Code Section 7106)

* **NOTE:** Completing, signing, and returning the Non-collusion Declaration is a required part of each Proposal. Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

END OF SECTION

AGREEMENT

THIS AGREEMENT is made at Fresno, in Fresno County, California, by and between _____, hereinafter "Contractor", and the County of Fresno, hereinafter "Owner".

WITNESSETH, the Contractor and the Owner, for the consideration hereinafter named, agree as follows:

ARTICLE I. The Contractor agrees to furnish all labor, equipment and materials, including tools, implements, and appliances required, and to perform all the work in a good and workmanlike manner, free from any and all liens and claims of mechanics, materialmen, subcontractors, artisans, machinists, teamsters, and laborers required for:

Environmental Compliance Center Contract No. 20-S-01

Located at 310 South West Avenue, Fresno, California, all in strict compliance with the plans, drawings, and specifications therefore prepared by the Director of the Fresno County Department of Public Works and Planning and his authorized representatives, hereinafter called the Project Manager, and other contract documents relating thereto.

ARTICLE II. The Contractor and the Owner agree that the Advertisement (Notice to Bidders), the Wage Scale, the Proposal hereto attached, the Instructions to Bidders, the General Conditions of the contract, the Technical Specifications, the Drawings, and the Addenda and Bulletins thereto, the Contract Bonds and Certificates of Liability and Workers Compensation Insurance, and the Contract Change Orders, together with this Agreement form the Contract Documents, and they are as fully a part of the contract as if hereto attached or herein repeated. The Specifications and Drawings are intended to cooperate so that any work exhibited in the drawings and not mentioned in the specifications, or vice versa, is to be executed the same as if both are mentioned in the specifications and set forth in the drawings, to the true intent and meaning of the said drawings and specifications when taken together. Provided, however, that no part of said specifications that is in conflict with any portion of this Agreement, or that is not actually descriptive of the work to be done thereunder, or of the manner in which the said work is to be executed, shall be considered as any part of this Agreement, but shall be utterly null and void, and anything that is expressly stated, delineated or shown in or upon the specifications or Detailed Scope of Work shall govern and be followed, notwithstanding anything to the contrary in any other source of information or authority to which reference may be made.

ARTICLE III. The Contractor agrees that the work under the contract shall be completed as determined by the Owner within **One Hundred and Twenty (120) CALENDAR DAYS** from the date shown in the Notice to Proceed. Time of performance shall be deemed as of the essence hereof and it is agreed that actual damages to the Owner from any delay in completion beyond the date provided for herein, or any extension thereof until the work is completed or accepted, shall be all provable damages plus liquidated damages in the amount of **Five Hundred and 00/100 DOLLARS (\$500.00)** per day; that said liquidated damage was arrived at by a studied estimate of loss to the Owner in the event of a delay considering the following damage items which are extremely difficult or impossible to determine: Additional construction expense resulting from delay of completion including, but not limited to, engineering, inspection, rental and utilities; provided, however, the Owner may conditionally accept the work and occupy and use the same if there has been such a degree of completion as shall in its opinion render the same safe, fit and

convenient for the use for which it is intended and in such cases the Contractor and Surety shall not be charged for liquidated damages for any period subsequent to such conditional acceptance and occupation by the Owner but Owner may assess actual damages caused by failure of total completion during such period. The time during which the Contractor is delayed in said work by the acts or neglects of the Owner or its employees or those under it by contract or otherwise, or by the acts of God which the Contractor could not have reasonably foreseen and provided for, or by storms and inclement weather which delays the work, or by any strikes, boycotts, or like obstructive action by employee or labor organizations, or by any general lockouts or other defensive action by employers, whether general, or by organizations of employers, shall be added to the time for completion as aforesaid.

ARTICLE IV. COMPENSATION: The Owner agrees to make payments on account thereof as provided in the General Conditions in the total amount of _____
AND /100 DOLLARS (\$ _____) in current funds for the performance of the contract which sum is computed as follows: **THE TOTAL SUM COST OF THE SITE AND SHADE STRUCTURE, OFFICE/STORAGE BUILDING, WAREHOUSE BUILDING, AND ALL ASSOCIATED SITE WORK AS SHOWN ON THE DRAWINGS.**

ARTICLE V. The Contractor and the Owner agree that changes in this Agreement or in the work to be done under this Agreement shall become effective only when written in the form of a supplemental agreement or change order and approved and signed by the Owner and the Contractor. It is specifically agreed that the Owner shall have the right to request any alterations, deviations, reductions, or additions to the contract, plans, and/or specifications and the amount of the cost thereof shall be added to or deducted from the amount of the contract price aforesaid by fair and reasonable valuations thereof.

This contract shall be deemed completed when the work is finished in accordance with all Contract Documents as amended by such changes. No such change or modification shall release or exonerate any surety upon any guaranty or bond given in connection with this contract.

ARTICLE VI. In the event of a dispute between the Owner or Project Manager and the Contractor as to an interpretation of any of the specifications or as to the quality of sufficiency of material or workmanship, the decision of the Project Manager shall for the time being prevail and the Contractor, without delaying the job, shall proceed as directed by the Project Manager without prejudice to a final determination by negotiation, arbitration by mutual consent or litigation and should the Contractor be finally determined to be either wholly or partially correct, the Owner shall reimburse him for any added costs he may have incurred by reason of work done or material supplied beyond the terms of the contract as a result of complying with the Project Manager's directions as aforesaid. In the event the Contractor shall neglect to prosecute the work properly or fail to perform any provisions of this contract, the Owner, after three days' written notice to the Contractor, may, without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due to the Contractor, subject to final settlement between the parties as in this paragraph hereinabove provided.

ARTICLE VII. TERMINATION: If the Contractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he or any of his subcontractors should persistently violate any of the provisions of the contract, or if he should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper material, or if he should fail to make prompt payment to subcontractors or for material or labor or persistently disregard laws, ordinances or the instructions of the Project

Manager, then the Owner may, upon the certificate of the Project Manager, when sufficient cause exists to justify such action, serve written notice upon the Contractor and his surety of its intention to terminate the contract, such notice to contain the reasons for such intention to terminate the contract, and unless within five (5) days after the serving of such notice, such violations shall cease and satisfactory arrangements for correction thereof be made, the contract shall, upon the expiration of said five days, cease and terminate.

In the event of any such termination, the Owner shall immediately serve written notice thereof upon the surety and the Contractor, and the surety shall have the right to take over and perform the contract, provided, however, that if the surety within ten (10) days after the serving upon it of notice of termination does not give the Owner written notice of its intention to take over and perform the contract or does not commence performance thereof within the ten (10) days stated above from the date of the serving of such notice, the Owner may take over the work and prosecute the same to completion by contract or by any other method it may deem advisable for the account and at the expense of the Contractor, and the Contractor and his surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may without liability for so doing, take possession of and utilize in completing the work, such materials, appliances, plant and other property belonging to the Contractor as may be on the site or the work and necessary therefore. In such case, the Contractor shall not be entitled to receive any further payment until the work is finished.

If the unpaid balance of the contract price shall exceed the expense of finishing the work, including compensation for additional managerial and administrative services, such excess shall be paid to the Contractor. If such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, and damage incurred through the Contractor's default, shall be certified by the Project Manager.

ARTICLE VIII. The Contractor and his subcontractors shall comply with Sections 1770 – 1780 of the California Labor Code and the provisions of Sections 2.52 and 2.55 of the General Conditions concerning the payment of wages to all workers and mechanics, and the employment and payment of apprentices by the Contractor or any subcontractor for all work performed under this Agreement.

ARTICLE IX. The Contractor and his subcontractors shall comply with Sections 1810 to 1815 of the California Labor Code and the provisions of Section 2.51 of the General Conditions, concerning hours of work and payment of overtime compensation for all work performed under this Agreement.

The Board of Supervisors hereby specifies that portions of the work can only be performed outside the regular working hours as defined in the applicable collective bargaining agreement filed with the Director of Industrial Relations in accordance with Labor Code Section 1773.1, and that the overtime requirements for Saturdays, and holidays are hereby waived for these portions of the work, as more particularly described in the specifications. However, this exemption shall not negate the overtime provisions specified in Labor Code Section 1815.

ARTICLE X. INDEMNIFICATION: To the fullest extent permitted by law, Contractor agrees to and shall indemnify, save, hold harmless and at County's request, defend County and its officers, agents and employees, and the Project Manager and their respective officers, agents and employees, from any and all costs and expenses, attorney fees and court costs, damages, liabilities, claims and losses occurring or resulting to County, or the Project Manager in connection with the performance, or failure to perform, by Contractor, its officers, agents or employees under this Agreement, and from any and all costs and expenses, attorney fees and court costs,

damages, liabilities, claims and losses occurring or resulting to any person, firm or corporation who may be injured or damaged by the performance, or failure to perform, of Contractor, its officers, agents or employees under this Agreement. In addition, Contractor agrees to indemnify County for Federal, State of California and/or local audit exceptions resulting from non-compliance herein on the part of Contractor.

In any and all claims against the County, the Project Manager, or any of their respective officers, agents or employees, initiated by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation set forth in the immediately preceding paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE XI. INSURANCE: Without limiting the Owner's right to obtain indemnification from Contractor or any third parties, Contractor, at its sole expense, in accordance with the provisions of Section 2.40 of the General Conditions, shall maintain in full force and effect the following insurance policies throughout the term of this Agreement, excepting only those policies for which a longer term is specified:

A. Course of Construction (Builder's All Risk) Insurance, with scope and amount of coverage as specified in Section 2.40 E.1 of the General Conditions.

B. Commercial General Liability Insurance, with scope and amount of coverage as specified in Section 2.40 E.2 of the General Conditions.

C. Automobile Liability Insurance, with scope and amount of coverage as specified in Section 2.40 E.2 of the General Conditions.

D. Professional Liability Insurance, with scope and amount of coverage as specified in Section 2.40 E.3 of the General Conditions.

E. Worker's Compensation Insurance, with scope and amount of coverage as specified in Section 2.40 E. 4 of the General Conditions.

The Certificate of Insurance shall be issued in triplicate, to the County of Fresno, and all other participating agencies, whether or not said agencies are named herein, who contribute to the cost of the work or have jurisdiction over areas in which the work is to be performed and all officers and employees of said agencies while acting within the course and scope of their duties and responsibilities.

ARTICLE XII. MISCELLANEOUS PROVISIONS:

1. AUDITS AND INSPECTIONS: The Contractor shall at any time during business hours, and as often as the Owner may deem necessary, make available to the Owner for examination all of its records and data with respect to the matters covered by this Agreement. The Contractor shall, upon request by the Owner, permit the Owner to audit and inspect all of such records and data necessary to ensure Contractor's compliance with the terms of this Agreement. If this Agreement exceeds ten thousand dollars (\$10,000.00), Contractor shall be subject to the examination and audit of the Auditor General for a period of three (3) years after final payment under contract (Government Code Section 8546.7).

2. **INDEPENDENT CONTRACTOR**: In performance of the work, duties, and obligations assumed by Contractor under this Agreement, it is mutually understood and agreed that Contractor, including any and all of Contractor officers, agents, and employees will at all times be acting and performing as an independent contractor, and shall act in an independent capacity and not as an officer, agent, servant, employee, joint venture, partner, or associate of the Owner. Contractor and Owner shall comply with all applicable provisions of law and the rules and regulations, if any, of governmental authorities having jurisdiction over matters of the subject thereof. Because of its status as an independent contractor, Contractor shall have absolutely no right to employment rights and benefits available to Owner's employees. Contractor shall be solely liable and responsible for providing to, or on behalf of, its employees all legally-required employee benefits. In addition, Contractor shall be solely responsible and save Owner harmless from all matters related to payment of Contractor's employees, including compliance with social security, withholding, and all other regulations governing such matters. It is acknowledged that during the term of this Agreement, Contractor may be providing services to others unrelated to the Owner or to this Agreement.

3. **DISCLOSURE OF SELF-DEALING TRANSACTIONS**: This provision is only applicable if the Contractor is operating as a corporation (a for-profit or non-profit corporation) or if during the term of the agreement, the Contractor changes its status to operate as a corporation. Members of the Contractor's Board of Directors shall disclose any self-dealing transactions that they are a party to while Contractor is providing goods or performing services under this agreement. A self-dealing transaction shall mean a transaction to which the Contractor is a party and in which one or more of its directors has a material financial interest. Members of the Board of Directors shall disclose any self-dealing transactions that they are a party to by completing and signing a Self-Dealing Transaction Disclosure Form, attached hereto as Exhibit A and incorporated herein by reference, and submitting it to the Owner prior to commencing with the self-dealing transaction or immediately thereafter.

ARTICLE XIII. The Contractor represents that he has secured the payment of Workers Compensation in compliance with the provisions of the Labor Code of the State of California and Paragraphs B.3, C.3 and E.4 of Article 2.40 of the General Conditions, and that he will continue so to comply with such statutory and contractual provisions for the duration and entirety of the performance of the work contemplated herein.

This Contract, **20-S-01**, was awarded by the Board of Supervisors on _____, 2021. It has been reviewed by the Department of Public Works and Planning and is in proper order for signature of the Chairman of the Board of Supervisors.

IN WITNESS WHEREOF, they have executed this Agreement this _____ day of _____, 2021

(CONTRACTOR)

COUNTY OF FRESNO
(OWNER)

(Taxpayer Federal I.D. No.)

By: _____

By: _____

Name: _____

Steve Brandau, Chairman
of the Board of Supervisors of the
County of Fresno

Title: _____

ATTEST:
Bernice E. Seidel
Clerk of the Board of Supervisors
County of Fresno, State of
California

By: _____
Deputy

FOR ACCOUNTING USE ONLY
9015 / 8150 / 91440

END OF SECTION

CONTRACT NO: 20-S-01

This guaranty shall be executed by the successful bidder in accordance with Section 2.32 of the General Conditions. The bidder may execute the guaranty on this page at the time of submitting the bid or may, in the alternative, submit it with the insurance certificates and bonds within ten (10) days after award.

GUARANTY

To the Owner: County of Fresno

The undersigned guarantees the construction and installation of the following work included in this project:

ALL WORK

Should any of the materials or equipment prove defective or should the work as a whole prove defective, due to faulty workmanship, material furnished or methods of installation, or should the work or any part thereof fail to operate properly as originally intended and in accordance with each individual Work Order Detailed Scope of Work and specifications, due to any of the above causes, all within 365 Calendar Days after the date on which the Work under this contract is accepted by the Owner, the undersigned agrees to reimburse the Owner, upon demand, for its expenses incurred in restoring said work to the condition contemplated in said project, including the cost of any such equipment or materials replaced and the cost of removing and replacing any other work necessary to make such replacement or repairs, or, upon demand by the Owner, to replace any such material and to repair said work completely without cost to the Owner so that said work will function successfully as originally contemplated.

The Owner shall have the unqualified option to make any needed replacement or repairs itself or to have such replacements or repairs done by the undersigned. In the event the Owner elects to have said work performed by the undersigned, the undersigned agrees that the repairs shall be made and such materials as are necessary shall be furnished and installed within a reasonable time after the receipt of demand from the Owner. If the undersigned shall fail or refuse to comply with his obligations under this guaranty, the Owner shall be entitled to all costs and expenses reasonably incurred by reason of said failure or refusal.

Name (Printed): _____

Signature: _____

Title: _____

Date: _____

Contractor: _____

END OF SECTION

GENERAL CONDITIONS

2.01 IDENTIFICATION OF CONTRACT

- A. The Agreement shall be signed by the Contractor and the Owner.
- B. The Contract Documents are defined in ARTICLE II of the Agreement.
- C. The Contract Documents form the Contract for Construction ("Contract"). This Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined above. The Contract Documents shall not be construed to create any contractual relationship of any kind between the Architect of record and the Contractor, but the Architect of record shall be entitled to performance of the obligations of the Contractor intended for their benefit and to enforcement thereof. Nothing contained in the Contract Documents shall create any contractual relationship between the Owner and any Subcontractor or Sub-subcontractor.

2.02 EXECUTION, CORRELATION, AND INTENT OF CONTRACT DOCUMENTS

- A. The Contract Documents are complementary and anything called for by one shall be supplied as if called for by all, providing it comes clearly within the scope of the Contract.
- B. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. Words and abbreviations that have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.
- C. Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with the local conditions under which the Work is to be performed, and has correlated personal observations with the requirements of the Contract Documents.
- D. All work and material shall be the best of the respective kinds specified or indicated. Should any workmanship or materials be required that are not directly or indirectly called for in the Contract Documents, but which nevertheless are necessary for proper fulfillment of the obvious intent thereof, said workmanship or materials shall be the same for similar parts that are detailed, indicated or specified, and the Contractor shall understand the same to be implied and provide for it in his/her tender as if it were particularly described or delineated.

2.03 OWNERSHIP AND USE OF DOCUMENTS

All Contract Documents and copies thereof furnished shall remain the property of the Owner. Except for one (1) contract set for each party to the Contract, such documents are to be returned by Contractor or suitably accounted for to the Owner upon request at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's common law copyright or other reserved rights. The Owner's use of the documents will not increase the Architect's design liability beyond the Project and the site for which the design was originally intended.

2.04 DEFINITIONS

The following words, or variations thereof, as used in these documents have meanings as defined:

- A. The Work – The Work comprises the completed construction required of the Contractor by the Contract Documents, and includes all labor, materials, equipment and services necessary to produce such construction, and all materials, other permits and equipment incorporated or to be incorporated in such construction.
- B. The Project – The collective improvements to be constructed by the Contractor pursuant to the construction of the Sheriff Substation, Vehicle/Evidence Storage building, parking, and associated site improvements for Fresno County.
- C. Owner – The County of Fresno, State of California, as represented by the Fresno County Board of Supervisors and so named in the Agreement. The term Owner additionally includes the Owner's authorized representative (also known as the Project Manager) for this Project.
- D. Architect of record – The Owner and his/her authorized representative, as defined in Section 2.04C, or a duly California licensed Architect.
- E. Contractor – When used in the General Conditions refers to person(s) or entity (partnership or corporation) so named in Agreement and when used in the body of the Specifications, refers to the Contractor for that specific work, whether it be the General Contractor, Subcontractor, or other Contractor. The term Contractor means the Contractor or the Contractor's authorized representative.
- F. Subcontractor – Person, persons, entity, co-partnership or corporation having direct contract with Contractor to perform any of the Work at the site. The term Subcontractor means a Subcontractor or a Subcontractor's authorized representative. The term Subcontractor does not include any separate contractor or any separate contractor's subcontractors.

- G. Sub-subcontractor – Person, persons, entity, co-partnership or corporation having a direct or indirect contract with a Subcontractor to perform any of the Work at the site (i.e. a second-tier, third-tier or lower-tier Subcontractor). The term Sub-subcontractor means a Sub-subcontractor or an authorized representative thereof.
- H. Notice to Proceed – A written notice issued by the Owner directing the Contractor to proceed with construction activities to complete the Project.
- I. Technical Specifications – Contains the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.
- J. Days – All days shall be measured in calendar days unless specifically noted otherwise in these documents or referenced codes.
- K. Year – One year shall be measured in terms of 365 calendar days.

2.05 SPECIFICATIONS AND DRAWINGS

- A. Precedence – Anything mentioned in the Specifications and not shown on the Drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. Subject to Section 2.02, in cases of discrepancy concerning dimension, quantity and location, the Drawings shall take precedence over the Specifications. Explanatory notes on the Drawings shall take precedence over conflicting drawn indications. Large scale details shall take precedence over smaller scale details and figured dimensions shall take precedence over scaled measurement. Where figures are not shown, scale measurements shall be followed but shall in all cases be verified by measuring actual conditions of Work already in place. In cases of discrepancy concerning quality and application of materials and non-technical requirements over materials, the specifications shall take precedence over Drawings.
- B. Division of Specifications – For convenience of reference and to facilitate the letting of independent contracts, this specification may be separated into certain sections; such separation shall not operate to oblige the Owner, Architect or Professional Consultant to establish the limits of any contract between the Contractor and Sub-Contractor each of whom shall depend upon his/her own contract stipulations. The General Conditions apply with equal force to all work, including extra work.
- C. Governing Factors – Dimensions figured on drawings shall be followed in every case in preference to scale of drawings.
- D. Discrepancies – Should the Contractor, at any time, discover a discrepancy in a drawing or specification, or any variation between dimensions on drawings and measurements at site, or any lacking of dimensions or other information, he/she shall report at once to the Project Manager requesting clarification and shall not

proceed with the work affected thereby until such clarification has been made. If the Contractor proceeds with work affected by such discrepancies, without having received such clarification, he/she does so at his/her own risk. Any adjustments involving such circumstances made by the Contractor, prior to approval by the Project Manager, shall be at the Contractor's risk and the settlement of any complications or disputes arising therefrom shall be at the Contractor's sole expense and Contractor shall indemnify, hold harmless and defend Owner, Owner's representatives, and Project Manager from any liability or loss with respect to said adjustments.

- E. Scope of Drawings – The drawings shall be held to determine the general character of the Work as well as its details. Parts not detailed shall be constructed in accordance with best standard practice for work of this class, so as to afford the requisite strength and logically complete the parts they compose. Where it is obvious that a drawing illustrates only a part of a given work or of a number of items, the remainder shall be deemed repetitious and so construed. The Contractor shall be responsible for all errors made in using any drawings which have been superseded.
- F. Shop Drawings, Product Data and Samples –
1. Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work. Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work. Samples are physical examples that illustrate materials, equipment or workmanship, and establish standards by which the work will be judged.
 2. The Contractor shall prepare, review, approve and submit to the Project Manager, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of the Owner or any separate contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents.
 3. By preparing, approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that the Contractor has determined and verified all materials, field measurements and field construction criteria related thereto, or will do so with reasonable promptness, and has checked and coordinated the information contained within such submittals with the requirements of the Work, the Project, the Work Order and the Contract Documents.
 4. The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect's review of

Shop Drawings, Product Data or Samples, unless the Contractor has specifically informed the Project Manager in writing of such deviation at the time of submission and the Architect has reviewed the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Architect's review of them.

5. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications. The cost of such certifications shall be borne by the Contractor. Owner may elect to have an independent certification performed at its own expense. The Owner shall have final approving authority for performance-based items.
6. The Contractor shall direct specific attention, in writing or on resubmitted Shop drawings, Product Data, or Samples, to revisions other than those requested by the Architect on previous submittals.
7. No portion of the Work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been reviewed by the Architect. All such portions of the Work shall be in accordance with reviewed submittals.
8. Submission of Shop Drawings and Samples to the Project Manager is required for only those items specifically mentioned in the Specification Sections. If Contractor submits Shop Drawings for items other than the above, the Project Manager will not be obligated to distribute or review them. Contractor shall be responsible for the procuring of Shop Drawings for his/her own use as he/she may require for the progress of the Work.
9. The term "Shop Drawings" as used herein also includes but is not limited to fabrication, erection, layout and setting drawings, manufacturer's standard drawings, descriptive literature, catalogs, brochures, performance and test data, wiring and control diagrams, all other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and the positions and layout of each conform to the Contract requirements. As used herein the term "manufactured" applies to standard units usually mass-produced, and the term "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements. Shop Drawings shall establish the actual detail of all manufactured or fabricated items; indicate proper relation to adjoining work; amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure; and

incorporate minor changes of design or construction to suit actual conditions.

10. Drawings: Following Contractor's review and approval, Contractor shall submit to the Project Manager for approval four (4) minimum to six (6) maximum prints and/or pdf submission of the same information via email. (Required delivery methods and quantities of submittals will be determined at the time of the Pre-Construction Meeting.) The Project Manager will check the submittal to see if it is complete. If complete, the Project Manager will forward the drawings to the Owner and the Architect. The Architect and Owner will check the drawings and note Architect and Owner comments and affix a stamp to the drawings indicating the status of acceptance, and will return same to the Project Manager, each retaining prints for his/her records. The Architect or his/her consultants, as applicable, will review the Shop Drawings; mark the prints with required revisions; stamp the prints and indicate "No Exceptions Taken", "Make Corrections Noted", "Revise and Resubmit", "Submit Specified Item", or "Rejected", and return the prints. The Project Manager will return the prints to the Contractor. The Contractor shall then print and distribute the appropriate number of copies to his/her job personnel as required. If a drawing is stamped "Rejected" or "Revise and Resubmit", the Contractor shall correct and resubmit as outlined above. When stamped "Make Corrections Noted", or similar instructions, the Contractor shall correct and resubmit for record only, three (3) prints of each drawing. Also see Technical Specifications, Division I, General Requirements.
11. Samples: Following Contractor's review and approval, Contractor shall submit to the Architect, five (5) minimum samples of all materials in quantities and sizes as specified herein as requested by the Architect. Submittals shall be given to the Architect at a time determined by the Contractor, which allows for any necessary resubmittal and which will not cause any delay in the Work. Samples will be forwarded to the Architect. If a sample is stamped "Rejected" or "Revise and Resubmit", one sample so noted will be returned to the Contractor. The Contractor shall correct and resubmit as outlined above. If a sample is stamped "Make Corrections Noted", one sample so noted will be returned. Corrected samples shall be resubmitted for approval as per the original submittal. Also see Technical Specifications and General Requirements.
12. Brochures: Following Contractor's review and approval, Contractor shall submit to the Architect, five (5) copies of all manufacturer's catalogs or brochures as required. Brochures will be forwarded to the Architect for review. If a brochure is stamped "No Exception Taken", two (2) copies will be returned to the Contractor. If stamped "Rejected", one marked copy and two (2) unmarked copies will be returned. Corrected copies shall be

resubmitted for approval as per the original submittal. Also see General Requirements.

13. Manufacturer's Instructions: Where any item or work is required by Specifications to be furnished, installed or performed in accordance with a specified product manufacturer's instructions, Contractor shall procure and distribute the necessary copies of such instructions to all concerned parties.

- G. Materials - All materials, unless otherwise specified, shall be new and of good quality, proof of which shall be furnished by the Contractor; in case of doubt as to kind or quality required, samples shall be submitted to the Architect through the Project Manager who will specify the kind and use of the material appropriate to the location and the function of the item in question. Contractor shall furnish such item accordingly. Before final payment, all material rejected by the Architect or Project Manager shall be promptly removed from the premises by the Contractor, whether or not completely installed, and promptly and properly replaced with correct materials, including any other work adjoining if disturbed, in accordance with the contract and without expense to the Owner; the Contractor also shall pay for work of other Contractors as is affected by such removals and replacements.

2.06 THE ARCHITECT

- A. The Owner may delegate all or a portion of its rights and responsibilities to a California licensed Architect as deemed necessary.
- B. The Architect advises the Project Manager in all aspects of the construction phase of the Project. The Architect's functions include advice and assistance to the Project Manager in the correct interpretation and application of the Contract Documents. The Architect is not authorized independently to issue Addenda, Clarifications, Field Orders, Work Authorizations, or Supplemental Work Orders, or in any other way to bind the Owner in discussions with the Contractor.
- C. The Contractor shall deliver all correspondence relating to the proper execution of the Work to the Project Manager. The Project Manager reserves the right to consult with the Architect and Owner prior to responding to the Contractor's correspondence.
- D. When discussions between the Contractor and the Project Manager occur either on the site or elsewhere, but the Architect is not present, the Project Manager reserves the right to consult with the Architect and Owner prior to issuing his/her final decision or instruction.
- E. The Architect shall review or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for conformance with the design concept of the Work and the information given in the Contract Documents. Such action shall generally be taken within ten (10) working days, however under certain circumstances such as very complex submittals or if

large number of submittals are submitted at one (1) time it may take longer. In this case the Contractor will be notified and given the opportunity to advise the Architect of priorities. The Architect's review of a specific item shall not indicate review of an assembly of which the item is a component.

2.07 THE PROJECT MANAGER

- A. The Project Manager is the authorized representative of the Owner in all aspects of administering the construction contract on behalf of the Owner. All communications from and to the Contractor will be channeled through the Project Manager. However, the Project Manager does not have the authority to bind the Owner in matters affecting adjustments to the time or cost of the Project as defined in the Agreement for Construction.
- B. The Project Manager will be the Owner's representative during the construction and warranty periods, and until final payment to all contractors is due. The Project Manager will advise and consult with the Owner. All instructions to the Contractor shall be forwarded through the Project Manager. The Project Manager will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified by written instrument.
- C. The Project Manager will be on site during construction to monitor the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. On the basis of on-site observations and communication with the Contractor, the Project Manager will keep the Owner informed of the progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work of the Contractor.
- D. The Project Manager shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so that the Project Manager may perform its functions under the Contract Documents.
- E. Based on the Project Manager's observations, and an evaluation of the Contractor's Application for Payment, the Project Manager will determine the amount owing to the Contractor and will issue to the Owner Certificates for Payment incorporating such amount.
- F. The Project Manager will be the initial interpreter of the requirements of the Contract Documents and the initial judge of the performance hereunder by the Contractor. The Owner will have final authority of all such matters.
- G. The Project Manager will render interpretations necessary for the proper execution or progress of the Work, with reasonable promptness and in accordance with agreed upon time limits. Either party to the Contract may make written request to the Project Manager for such interpretations.

- H. Claims, disputes and other matters in question between the Contractor and the Project Manager relating to the execution or progress of the Work or the interpretation of the Contract Documents shall be referred to the Owner (or his/her designee).
- I. All interpretations and decisions of the Project Manager will be in writing or in graphic form, and shall be both consistent with the intent of the Contract Documents and reasonably inferable therefrom.
- J. The Project Manager will have the authority to reject, or recommend to the Owner the rejection, of any work that does not conform to the Contract Documents. Whenever, in the Project Manager's opinion, it is considered necessary or advisable for the implementation of the intent of the Contract Documents, the Project Manager will have authority to require special inspection or testing of the Work whether or not such work be then fabricated, installed or completed.
- K. The Project Manager will receive from the Contractor and review all Shop Drawings, Product Data and Samples, and forward same to Architect and Owner for review.
- L. Following consultation with the Owner, the Project Manager will take appropriate action on changes, and will have authority to order minor changes in the Work as provided herein.
- M. The Project Manager will conduct inspections to determine the date of Completion, and will receive and forward to the Owner for the Owner's review written warranties and related documents required by the Contract Documents and assembled by the Contractor. The Project Manager will issue a final Project Certificate for Payment upon compliance with the requirements for completion and final payment. The Project Manager will monitor the warranty for a period of 365 Calendar Days from and after the date of acceptance of the Work, unless otherwise specified as a longer term.
- N. The duties, responsibilities and limitations of authority of the Project Manager as the Owner's representative during construction, as set forth in the Contract Documents, will not be modified or extended without written consent of the Owner, the Contractor and the Project Manager, which consent shall not be unreasonably withheld. Failure of the Contractor to respond within ten (10) business days to a written request shall constitute consent by the Contractor.
- O. In case of the termination of the employment of the Project Manager, the Owner may appoint a successor Project Manager, whose status and duties under the Contract Documents shall be the same as those of the former Project Manager.

2.08 OWNER

A. Information and Services Required of the Owner

1. Unless otherwise provided in the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.
2. Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the Work.
3. The Owner shall forward all instructions to the Contractor through the Project Manager.

B. Owner's Right to Stop the Work

If the Contractor fails to correct defective work as required by Section 2.42 herein or persistently fails to carry out the Work in accordance with the Contract Documents, the Owner, by a written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of any contractor or any other person or entity, except to the extent required by Section 2.12.C.

C. Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails after written notice from the Owner to correct such default or neglect with diligence and promptness, the Owner may, after an additional written notice and without prejudice to any other remedy the Owner may have, make good such deficiencies. In such case an appropriate Contract Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the additional services of the Architect or other professionals made necessary by such default, neglect or failure. Such action by the Owner and the amount charged to the Contractor are both subject to the prior approval of the Architect. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner, or Owner may require payment by the surety on the performance or warranty bonds as appropriate. Such action shall, in no way, affect the status of either party under contract, nor be held as a basis of any claim by the Contractor for damages or extension of time.

2.09 CONTRACTOR RESPONSIBILITIES

A. Review of Contract Documents and Field Conditions

1. The Contractor shall carefully study and compare the Contract Documents and shall at once report to the Project Manager any discrepancy or inconsistency that may be discovered. The Contractor shall not be liable to the Owner or the Project Manager for any damage resulting from any such inconsistencies or discrepancies in the Contract Documents unless the Contractor recognized such inconsistencies or discrepancies and knowingly failed to report it to the Project Manager. The Contractor shall perform no portion of the Work at any time unless authorized by the Contract Documents or, where required, approved Shop Drawings, Product Data or Samples for such portion of the Work.
2. Neither the Owner nor the Project Manager or Architect assume any responsibility for an understanding or representation made by any of their agents or representation prior to the execution of the Agreement unless (1) such understanding or representations are expressly stated in the Agreement, and (2) the Agreement expressly provides that responsibility therefor is assumed by the Owner.
3. Failure by the Contractor to acquaint himself/herself with all available information will not relieve him/her from responsibility for estimating properly the difficulty or cost of successfully performing the Work.
4. The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Any inconsistencies or discrepancies discovered by the Contractor shall be reported to the Project Manager at once.
5. Before submitting any Request for Information (RFI), or other contractor-initiated request for information, the Contractor shall determine that the information requested is not clearly provided in the Contract Documents. RFI's shall be submitted to the Project Manager only from the Contractor, or Owner, and not from any subcontractor, supplier or other vendor, and shall be on a form approved by the Project Manager. The Contractor shall provide a revised and updated RFI Priority Schedule on a weekly basis. The RFI Priority Schedule shall rank RFI's in order of priority and include a brief statement of reason for priority. Owner initiated RFI's will not be listed on the Contractor's RFI Priority Schedule. The Owner will provide the Architect a separate list of Owner initiated RFI's upon request of the Architect. The Architect will endeavor to respect the order of priorities as requested by the Contractor or Owner for the overall benefit of the Project.

The RFI process is for information and clarification only and may not be utilized to obtain approval for changes in Work Order Price or time. Also see Division 01 - General Requirements.

B. Supervision Procedures

1. The Contractor shall efficiently supervise and direct the Work, using therein the Contractor's best skill and diligence for which he/she is remunerated in the Contract Price. The Contractor shall carefully inspect the site and study and compare the Contract Documents, as ignorance of any phase of any of the features or conditions affecting the Contract will not excuse him/her from carrying out its provisions to its full intent.
2. The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during the progress of the Work. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed upon written request in each case. The Superintendent who begins the Project shall remain on the Project until the Project is completed, as long as the Contractor employs that person. The Superintendent shall not be replaced without the approval of the Owner.
3. The Contractor shall be responsible to the Owner for the acts and omissions of his/her employees, subcontractors and their agents and employees, and other persons performing any of the Work under a contract with the Contractor.
4. The Contractor shall at all times enforce strict discipline and good order among his/her employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him/her.
5. The Contractor shall not be relieved from his/her obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Owner or the Architect in his/her administration of the Contract, or by inspections, tests or approvals required or performed by persons other than the Contractor.
6. Contractor shall alert and inform their employees that State law requires that the identities of inmates/wards/patients/clients be kept confidential. Revealing the identities of inmates/wards/patients/clients is punishable by law.

C. Construction Procedures

1. Means and Methods - The Contractor shall be solely responsible for and control of construction means, methods, techniques, sequences, coordination and procedures for all the Work of this contract. Additionally, the Contractor shall be responsible for safety precautions and programs in connection with the Work.
2. Laws of County and State - The Contractor must comply with all laws, rules, regulations, provisions and ordinances of the County in which the Work is being done, and all State laws pertaining to the Work.
3. Safeguards - The Contractor shall provide, in conformity with all local codes and ordinances and as may be required, such temporary walls, fences, guard-rails, barricades, lights, danger signs, enclosures, etc., and shall maintain such safeguards until all work is completed.
4. Housekeeping - Contractor shall keep the premises free of excess accumulated debris. Clean up as required and as directed by the Project Manager. At completion of work all debris shall be removed from the site. Refer to General Requirements for additional requirements.
5. Labor and Materials - Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work
6. The Contractor shall deliver to the Project Manager, prior to final acceptance of the Work as a whole, signed certificates from suppliers of materials and manufactured items stating that such items conform to the Contract Documents.
7. The Contractor, immediately upon receipt of the Notice to Proceed (or where shop drawings, samples, etc., are required, immediately upon receipt of review thereof), shall place orders for all materials, work fabrication, and/or equipment to be employed by him/her in connection with that portion of the contracted Work . The Contractor shall keep all materials, work fabrications and/or equipment specified and shall advise the Project Manager promptly, in writing, of all orders placed and of such materials, work fabrications and/or equipment which may not be available in a timely manner for the purposes of the Contract.

8. Any worker whose work is unsatisfactory to the Owner or the Architect, or are considered by the Owner or Architect to be careless, incompetent, unskilled or otherwise unfit shall be dismissed from work under the Contract upon written request to the Contractor from the Owner or the Architect.
9. Temporary Facilities – Contractor may connect to existing water and electricity available on the site provided it is suitable to the Contractor's requirements. Water and electricity used will be paid by the Owner. Contractor shall bear all expenses for carrying the water or electricity to the appropriate locations and to connect or tap into existing lines. Toilet facilities may be available on a site to the workmen engaged in the performance of this contract. It shall be the responsibility of the Contractor to confirm with the Owner the availability of toilet facilities on the site. The use of such facilities may be revoked in the event of excess janitorial requirements.
10. Contractor shall not perform any fire hazardous operation adjacent to combustible materials. Any fire hazardous operation shall have proper fire extinguisher close by and the adjacent area shall be policed before stopping work for the day. Contractor shall provide not less than one OSHA/NFPA Class 6-ABC fire extinguisher for each 9,000 square feet of Project area or fraction thereof.
11. Contractor shall erect temporary dust separation partitions and floor mats as necessary to confine dust and debris within area of work. Contractor shall post signs, erect and maintain barriers and warning devices for the protection of the general public and Owner personnel.
12. Trenching and Excavation - In accordance with Section 7104 of the California Public Contract Code, the following provisions shall apply to any contract involving digging of trenches or other excavations that extend deeper than four feet below the surface:
 - a. The Contractor shall promptly, and before the following conditions are disturbed, notify the Owner, in writing, of any:
 - i. Material that the contractor believes may be material that is 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.
 - ii. Subsurface or latent physical conditions at the Project site differing from those indicated by information about the site made available to bidders prior to the deadline for submitting bids.

- iii. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.
- b. The Owner shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the contractor's cost of, or the time required for, performance of any part of the work, shall issue a Contract Change Order in accordance with the provisions of Section 2.09 of the General Conditions.
- c. In the event that a dispute arises between the Owner and the contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the contractor's cost of, or time required for, performance of any part of the work, the contractor shall not be excused from any scheduled completion date provided for by the contract, but shall proceed with all work to be performed under the contract. 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.

2.10 SUBCONTRACTORS

- A. Agreements - Agreements between the Contractor, Subcontractors, and Subcontractors of lower tier shall be subject to the approval of the Owner, but in no case does such approval relieve the Contractor of any conditions imposed by the Contract Documents. The Contractor shall only use those subcontractors that are required to be listed and included in his/her sealed bid Subcontractor List, section 004336, unless any proposed substitution is first approved by the Owner pursuant to statute. The Contractor shall not use any subcontractor who is ineligible to perform work on a Public Works Project pursuant to section 1777.1 or 1777.7 of the Labor Code. Notwithstanding any other provision of the Contract Documents, subcontractors may be added, deleted or substituted only in accordance with the provisions of Public Contract Code Section 4100 et seq.
- B. Relation with Subcontractor – By an appropriate agreement, written where legally required for enforceability, the Contractor shall bind every Subcontractor and require therein that every Subcontractor agrees to be bound by the terms of the Contract Documents to carry out their provisions insofar as applicable to their work; and the Contractor further agrees to pay to each Subcontractor promptly upon issuance of Certificate of Payment, his/her or their due portion. Said agreement shall preserve and protect the rights of the Owner and the Architect

under the Contract Documents with respect to the work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the Contractor-Subcontractor Agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, under the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with their Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Paragraph and identify to the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of Contract Documents available to their Sub-subcontractors. Nothing contained herein shall be deemed to create an agency relationship between the Owner and any Subcontractor or material supplier.

- C. Owner's Relation - Neither the acceptance of the name of Subcontractor nor the suggestion of such name nor any other act of the Owner or Architect nor anything contained in any Contract Document is to be construed as creating any contractual relation between the Owner (or Owner's authorized representatives) and any Subcontractor of any tier nor as creating any contractual relation between the Architect and any Subcontractor of any tier.
- D. All Subcontractors employed by the Contractor shall be appropriately licensed in conformity with the laws of the State of California.
- E. Jurisdictional disputes between Subcontractors or between Contractor and Subcontractor shall not be mediated or decided by the Owner, Architect or the Architect. The Contractor shall be responsible for the resolution of all such disputes based upon his/her contractual relationship with his/her Subcontractors.

2.11 OWNER'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS

- A. The Owner reserves the right to perform work related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar Conditions of the Contract. If the Contractor claims that the Owner's action results in delay, damage or additional cost attributable thereto, the Contractor shall make such claim as provided elsewhere in the Contract Documents.
- B. When separate contracts are awarded for different portions of the Project or other work on the site, the term Contractor in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

- C. The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.
- D. Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the Contractor under the Conditions of the Contract.

2.12 MUTUAL RESPONSIBILITY

- A. The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.
- B. When any part of the Contractor's Work depends upon proper execution or results of the work of the Owner or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Project Manager any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acceptance of the Owner's or separate contractor's work as fit and proper to receive the Work, except as to defects which may subsequently become apparent in such work by others.
- C. If, following the reporting of any discrepancy or defect as required herein above, the Contractor suffers damage due to disruption or delay caused by the separate contractor, without fault by the Owner, the Contractor's remedy shall be limited to seeking recovery from the separate contractor.
- D. Any costs caused by defective or ill-timed work shall be borne by the Contractor responsible therefor.
- E. Should the Contractor cause damage to the work or property of the Owner, or to other work or property on the site, the Contractor shall promptly remedy such damage as provided herein.
- F. Should the Contractor wrongfully delay or cause damage to the work or property of any separate contractor, the Contractor shall, upon due notice, promptly attempt to settle with such other contractor by agreement, or otherwise to resolve the dispute. If such separate contractor sues the Owner on account of any delay or damage alleged to have been caused by the Contractor, the Owner shall notify the

Contractor who shall defend such proceedings, and if any judgment or award against the Owner (or Owner's authorized representatives) arises therefrom, the Contractor shall pay or satisfy such judgment or award in full and shall reimburse the Owner for all costs which the Owner has incurred in connection with such matter.

2.13 OWNER'S RIGHT TO CLEAN UP

If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up as required in the Contract Documents, the Owner may clean up and the contractor responsible shall pay Owner such portions of the cost as the Project Manager shall determine to be just.

2.14 GOVERNING LAW

The Contract shall be governed by the law of the State of California.

2.15 INSPECTION

- A. All material and workmanship (if not otherwise designated by the Contract Documents) shall be subject to inspection, examination, and test by the Owner and Project Manager at any and all times during manufacture and/or construction and at any and all places where such manufacture and/or construction are carried on. The Owner and Project Manager shall have the right to reject defective material and workmanship or require its correction.
- B. The Contractor shall furnish promptly without additional charge, all reasonable facilities, labor, and materials necessary for the safe and convenient inspection and tests that may be required by the Owner and Project Manager.
- C. Where the Contract Documents, instructions by the Owner, laws, ordinances, or any public authority having jurisdiction requires work to be inspected, tested or approved before work proceeds, such work shall not proceed, nor shall it be concealed prior to inspection.
- D. The Contractor shall give the Project Manager at least two (2) business days advance notice of the readiness for any Contract compliance inspection by the Inspector. The Contractor shall give notice as required by all other inspecting and testing agencies of jurisdiction for Code and regular compliance inspection. In all cases, the Contractor shall schedule inspections so as not to delay the Work.
- E. If the Project Manager determines that any work requires additional special inspection beyond that identified in the specifications, the Project Manager will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as provided above. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall

bear all costs thereof, including compensation for the Project Manager's additional services, testing or inspections made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Contract Change Order shall be issued.

- F. Should it be considered necessary or advisable by the Project Manager at any time either before acceptance of the entire Work or after acceptance and within the guaranty period to make an examination of work already completed, by removing or tearing out same, the Contractor shall on request promptly furnish all necessary facilities, labor, and material. If such work is found to be defective in any material respect, due to the fault of the Project Manager or his/her Subcontractors, he/she shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, any compensation deemed appropriate shall be handled by issuance of a Contract Change Order to the Contractor and he/she shall, in addition, if completion of the work has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.
- G. Required certificates of inspection, testing or approval shall be secured by the Contractor and the Contractor shall promptly deliver them to the Project Manager for review and evaluation of compliance with the appropriate specifications and standards.
- H. When the work is completed the Contractor shall notify the Project Manager in writing that the work will be ready for final inspection and test on a definite date which shall be stated in such notice.

2.16 TAXES, PERMITS, FEES, AND INDEMNIFICATION FOR PATENT INFRINGEMENT CLAIM

- A. The Contractor shall pay for and include all Federal, State and local taxes direct or indirect for the work or portions thereof provided by the Contractor which are legally enacted at the time the Notice to Proceed is issued, whether or not yet enacted, and secure and pay all fees and charges for permits and licenses, unless otherwise specified.
- B. Royalty and license fees incidental to the use of any patented material, device or process shall be paid by the Contractor and in the event of a claim of alleged infringement of patent copyright, or Trade Secret rights, the Contractor shall indemnify, save the Owner (and Owner's authorized representatives) free and harmless, and defend, at the Contractor's own expense, any and all suits that may be brought in such connection.
- C. Unless otherwise provided in the Contract Documents, the Owner shall secure and pay for the building permit, permanent utility connection fees, and right-of-way encroachment permit. The Contractor shall secure and pay for temporary

construction utilities, and all other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work.

- D. The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work.
- E. It is not the responsibility of the Contractor to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, the Contractor shall promptly notify the Project Manager in writing, and any necessary changes shall be accomplished by appropriate Modification.
- F. If the Contractor performs any work knowing it to be contrary to any laws, ordinances, rules and regulations, without notice to the Project Manager, the Contractor shall assume full responsibility therefor and shall bear all costs attributable thereto.
- G. Any reference in the Contract Documents to codes, standard specifications or manufacturer's instructions shall mean the latest printed edition of each in effect at the Contract date.

2.17 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Within thirty (30) calendar days after receipt of Notice to Proceed, the Contractor shall submit a Construction Schedule in CPM (Critical Path Method) form to the Project Manager for approval. The Construction Schedule shall be sufficiently detailed to accurately depict all the work required by the Contract. CPM Construction Schedule shall reflect shop drawings; submittals due and return dates, fabrication and delivery times, cost loading, crew mix, and equipment loading data. The Contractor shall thereafter adhere to the Construction Schedule, as updated monthly, or as necessary in accordance with the Contract Documents, including any scope changes or changes in the work approved by the Owner during the course of construction. "Slack" or "float" time on the CPM Construction Schedule is not intended, and shall not be, for the sole benefit of either the Owner or Contractor.
- B. Within fourteen (14) calendar days after the pre-construction conference, the Contractor shall provide a Submittal and Procurement Schedule indicating time periods for review of Shop Drawings, Data, Samples, and procurement of material and equipment required for the Work. Contractor shall allow time for submittal review in accordance with the General Requirements Section – Construction Progress Documentation. All items that require review by the Project Manager and/or are not readily available from stock and requiring more than thirty-five (35) days lead-time shall be included in the Submittal and Procurement Schedule. Items listed in the Submittal and Procurement Schedule shall also be identified as

activities on the CPM Construction Schedule. Contractor shall identify items requiring coordination with work of separate contractors. The working day to calendar date correlation shall be based upon the Contractor's proposed work week with adequate allowance for legal holidays, days lost due to abnormal weather, and any special requirements of the Project.

- C. The Construction Schedule shall be prepared and maintained by the Contractor.
- D. The Owner, Project Manager, Contractor and other Contractor(s) shall jointly review the progress of the work weekly. Should this review, in the opinion of the Project Manager, indicate that the work is behind the schedule established by currently reviewed Construction Schedule, the Contractor shall either (1) provide a plan to the Project Manager indicating the steps the Contractor intends to take in order to recover the time behind schedule and conform to the reviewed Construction Schedule; or (2) submit a revised Construction Schedule for completion of the work, remaining within the contract completion time, to the Project Manager for review by the next weekly meeting. If the Contractor's recovery or revised schedule requires work to occur during other than normal working hours, the Contractor will be responsible for any resulting costs incurred by the Owner, including but not limited to, the costs for construction management, contract administration, inspection, testing and staffing.
- E. The Contractor shall deliver copies of his/her daily job logs to the Project Manager and Owner on a weekly basis or as otherwise agreed to by Owner. At a minimum, the Contractor's daily job log should include the sub-contractors working onsite, number of workers and their trade classification, description of work, visitors, temperature and weather conditions, accidents, delays, and any other important information pertaining to the Project that day. The Contractor will schedule and coordinate the Work of all sub-contractors on the Project. The Contractor will keep the Sub-contractors informed of the Construction Schedule to enable the Contractor to plan and perform the Work properly.

2.18 RECORDS, DOCUMENTS AND SAMPLES AT THE SITE

- A. The Contractor shall maintain all records of required Review Agencies, County or State inspections and shall promptly notify the Project Manager of the results of any inspection. Copies of all such records shall be provided to the Owner.
- B. The Contractor shall secure and maintain required certificates of inspection, testing or approval and shall promptly deliver them to the Project Manager.
- C. The Contractor shall maintain at the Project site, on a daily basis, one (1) record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record all changes made during construction, and reviewed Shop Drawings, Product Data and Samples. These shall be available to the Project Manager and the Owner and reviewed weekly, and shall be delivered to the Project Manager for forwarding to the Owner

upon completion of the Project. The Contractor shall advise the Project Manager on a current basis of all changes in the Work made during construction. Payment may be withheld from Contractor for failure to maintain current Record Documents.

2.19 USE OF SITE

- A. The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment.
- B. The Contractor shall coordinate all of the Contractor's operations with, and secure approval from, the Project Manager before using any portion of the site. Also see Technical Specifications, Division 01, General Requirements.

2.20 CUTTING AND PATCHING OF WORK

- A. The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly.
- B. The Contractor shall not damage or endanger any portion of the Work or the work of the Owner or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any separate contractor except with the written consent of the Owner and of such separate contractor. The Contractor shall not unreasonably withhold from the Owner or any separate contractor consent to cutting or otherwise altering the Work.
- C. The Contractor in all cases shall exercise extreme care in any cutting operations, and perform such operations under adequate supervision by competent mechanics skilled in the applicable trade. Openings shall be neatly cut and shall be kept as small as possible to avoid unnecessary damage. Careless and/or avoidable cutting damage, etc., will not be tolerated, and the Contractor will be held responsible for such avoidable or willful damage.
- D. All replacing, patching and repairing of all materials and surfaces cut or damaged in the execution of the Work shall be performed by experienced mechanics of the several trades involved. All work of such nature shall be done with the applicable materials, in such a manner that all surfaces so replaced, repaired, or patched, will, upon completion of the Work, match the surrounding similar surfaces.

2.21 CLEANING UP

- A. The Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by the Contractor's operations. At the completion of the Work, the Contractor shall remove all the Contractor's waste materials and rubbish from and about the Project as well as all the Contractor's tools, construction equipment, machinery and surplus materials.
- B. If the Contractor fails to clean up at the completion of the Work, the Owner may do so, and the cost thereof shall be paid by the Contractor.

2.22 INDEMNIFICATION

- A. To the fullest extent permitted by law, Contractor agrees to and shall indemnify, save, hold harmless and at Owner's request, defend Owner and its officers, agents and employees, and the Architect and Consultants and their respective officers, agents and employees, from any and all costs and expenses, attorney fees and court costs, damages, liabilities, claims and losses occurring or resulting to Owner, the Architect or Consultants in connection with the performance, or failure to perform, by Contractor, its officers, agents or employees under this Agreement, and from any and all costs and expenses, attorney fees and court costs, damages, liabilities, claims and losses occurring or resulting to any person, firm or corporation who may be injured or damaged by the performance, or failure to perform, of Contractor, its officers, agents or employees under this Agreement. In addition, Contractor agrees to indemnify Owner for Federal, State of California and/or local audit exceptions resulting from non-compliance herein on the part of Contractor.
- B. In any and all claims against the Owner, the Architect or Consultants, or any of their respective officers, agents or employees, initiated by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation set forth in the immediately preceding paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.
 - 1. Independent Contractor: In performance of the work, duties and obligations assumed by Contractor under this Agreement, it is mutually understood and agreed that Contractor, including any and all of the Contractor's officers, agents, and employees will at all times be acting and performing as an independent contractor, and shall act in an independent capacity and not as an officer, agent, servant, employee, joint venturer, partner, or associate of the Owner. Furthermore, Owner shall have no right to control or supervise or direct the manner or method by which Contractor shall perform its work and function. However, Owner shall retain the right to administer this Agreement

so as to verify that Contractor is performing its obligations in accordance with the terms and conditions thereof.

Contractor and Owner shall comply with all applicable provisions of law and the rules and regulations, if any, of governmental authorities having jurisdiction over matters the subject thereof.

Because of its status as an independent contractor, Contractor shall have absolutely no right to employment rights and benefits available to Owner employees. Contractor shall be solely liable and responsible for providing to, or on behalf of, its employees all legally-required employee benefits. In addition, Contractor shall be solely responsible and save Owner harmless from all matters relating to payment of Contractor's employees, including compliance with Social Security withholding and all other regulations governing such matters. It is acknowledged that during the term of this Agreement, Contractor may be providing services to others unrelated to the Owner or to this Agreement

2.23 FAIR EMPLOYMENT PRACTICES CLAUSE

Nondiscrimination: In connection with the performance of Work under the contract, the Contractor agrees (as prescribed in Chapter 6 of Division 3 of Title II of the Government Code of the State of California, commencing at Section 12900 and by Labor Code Section 1735) not to discriminate against any employee or applicant for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, marital status or sex. The aforesaid provisions shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Contractor agrees to post hereafter in conspicuous places, available for employees and applicants for employment, Notices to be provided by the County, setting forth the provisions of this discrimination clause. The Contractor further agrees to insert the foregoing provisions in all subcontracts hereunder, except subcontracts for standard commercial supplies of raw materials.

2.24 PAYMENT

A. CONTRACT SUM

The Contract Sum is stated in the Owner-Contractor Agreement ("the Agreement"), Section 005213, and, including authorized adjustments thereto, is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents.

B. SCHEDULE OF VALUES

Before the first Application for Payment, the Contractor shall submit to the Project Manager a Schedule of Values allocated to the various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Project Manager may require. This schedule, unless objected to by the Project Manager, shall be used only as a basis for the Contractor's Applications for Payment.

C. APPLICATIONS FOR PAYMENT

The Owner will make progress payments to the Contractor upon completion of portions of the Work, as covered by the Contract Documents, in accordance with established Owner procedures. Before submitting an Application for Payment (Final or Partial) the Contractor shall reach an agreement with the Project Manager (in consultation with the Architect) concerning the percentage complete of the Work and the dollar value for which the Application for Payment may be submitted.

1. On or about the twentieth (20th) day of the month in which the work was performed, the Contractor shall submit to the Project Manager an itemized Application for Payment, notarized if required, supported by such data substantiating the Contractor's right to payment as the Owner or the Project Manager may require, including appropriate updates to the Construction Schedule, and reflecting retainage, if any, as provided elsewhere in the Contract Documents. Payment is expressly conditioned upon submission by the Contractor of conditional and unconditional waivers and release of lien rights upon progress payment as the Owner or the Architect may require. Waiver and Release forms must be submitted on forms approved by the Owner. Copies of said forms shall comply with Civil Code Section 8132 through 8138, inclusive.
2. Unless otherwise provided in the Contract Documents, payments may be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site and, if approved in advance by the Owner, payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance and transportation to the site for those materials and equipment stored off the site.

3. The Contractor warrants that title to all work, materials and equipment covered by an Application for Payment will pass to the Owner either by incorporation in the construction or upon receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, stop notices, claims, security interest or encumbrances, hereinafter referred to as "liens"; and that no work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

4. On or about the twentieth (20th) day of the month following the month in which the work was performed, the Owner shall pay to the Contractor ninety-five percent (95%) of the value of said work in place, as checked and approved by the Project Manager. The balance of five percent (5%) of the estimate shall be retained by the Owner until the time of final acceptance of said work. In lieu of the five percent (5%) retainage, the Contractor may substitute securities as provided herein below.
 - a. If the Owner does not pay the Contractor within thirty (30) days after receipt of an undisputed and properly submitted payment request for a progress payment, excluding that portion of the final payment designated by the contract as retention earnings, then the Owner shall pay interest to the Contractor as provided by Public Contract Code Section 20104.50. Said interest penalty is the sole recourse of Contractor and Contractor shall have no right to stop the Work until payment of the amount owing has been received, nor shall the contract completion time be extended, nor shall the Contract Sum be increased in any way, including by reason of any costs incurred by Contractor, except to the extent of said interest payment.

 - b. Pursuant to Public Contract Code Section 7107, in the event of a dispute between the Owner and Contractor, the Owner may withhold from the final payment an amount not to exceed one hundred and fifty percent (150%) of the disputed amount. Except as so provided, the Owner shall release the retention withheld within sixty (60) days after the date of completion of the Work, as "completion" is defined in Public Contract Code Section 7107. In the event that retention payments are not made within the time periods required by Public Contract Code Section 7107, the Owner may be subject to the interest provisions of Public Contract Code Section 7107.

5. Security Substitutions and Escrow for Moneys Withheld to Insure Contractor's Performance. Pursuant to Public Contract Code section 22300, the Contractor may deposit in an escrow, equivalent securities for any moneys withheld to ensure performance and have said moneys paid directly to Contractor, or, in the alternative, have the Owner deposit such moneys directly into an escrow. Upon the closing of any such escrow, Contractor shall pay to each Subcontractor, not later than twenty (20) days after receipt of the closing payment, the respective amount of interest earned, net of costs attributed to retention withheld from each Subcontractor, on the amount of retention withheld to insure the performance of the Contractor. Any escrow established pursuant to this article shall be with a state or federally chartered bank, shall be at the sole expense of the Contractor, and shall be established using an escrow agreement in substantially the following form:

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(Begin Escrow Agreement)

ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION

This Escrow Agreement is made and entered into by and between the County of Fresno, (hereinafter called "Owner"), _____ (hereinafter called "Contractor"); and _____, a state or federally chartered bank in California, (hereinafter called "Escrow Agent").

For the consideration hereinafter set forth, the Owner, 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 Owner pursuant to the Construction Contract entered into between the Owner and Contractor for _____ in the amount of \$_____, and dated _____ (hereinafter referred to as the "Contract"). Alternatively, on written request of the Contractor, the Owner 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 Owner within ten (10) days of the deposit. The market value of the securities at the time of the substitution, as valued by the Owner, shall be at least equal to the cumulative total cash amount then required to be withheld as retention under the terms of the contract between Owner and Contractor. If the Owner determines that the securities are not adequate it will notify Contractor and Escrow Agent, and Contractor shall deposit additional security as further determined by the Owner. Securities shall be held in the name of the Owner and shall designate the Contractor as the beneficial owner.
2. Securities eligible for investment under subdivision (c) of the above-referenced Section 22300 shall include those listed in Section 16430 of the Government Code, and shall also include bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, and standby letters of credit. Deposit of any other type of security may be permitted only by mutual agreement of the Contractor and the Owner, evidenced by an amendment to this agreement executed by all of the parties hereto.
3. Upon the deposit of adequate securities, Owner shall make progress payments to the Contractor for such funds which otherwise would be withheld from progress payments pursuant to the Contract provisions.

4. When the Owner, at Contractor's written request, makes payment of retentions earned directly to the 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 Owner pays the Escrow Agent directly.
5. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account and all expenses of the Owner. The Owner, Contractor and Escrow Agent shall determine these expenses and payment terms.
6. 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 Owner.
7. 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 Owner to the Escrow Agent that Owner consents to the withdrawal of the amount sought to be withdrawn by Contractor.
8. The Owner shall have the right to draw upon the securities or any amount paid directly to Escrow Agent in the event of default by the Contractor. Upon seven (7) days written notice to the Escrow Agent from the Owner of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash, including any amounts paid directly to Escrow Agent, as instructed by the Owner. Escrow Agent shall not be concerned with the validity of any notice of default given by Owner pursuant to this paragraph, and shall promptly comply with Owner's instructions to pay over said escrowed assets. Escrow Agent further agrees not to interplead the escrowed assets in response to conflicting demands and hereby waives any present or future right of interpleader.
9. Upon receipt of written notification from the Owner certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to 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 payment of fees and charges.
10. Escrow Agent shall rely on the written notifications from the Owner and Contractor pursuant to Sections (6), (7), (8) and (9) of this Agreement and the Owner and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.

- 11. The venue of any litigation concerning the rights and obligations of the parties to this agreement shall be the County of Fresno and the parties hereto waive the removal provisions of Code of Civil Procedure Section 394.
- 12. The names of the persons who are authorized to give written notice or to receive written notice on behalf of the Owner and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On Behalf of Owner:

On behalf of Contractor:

Title – **Business Manager**

Title

Name – **Lemuel Asprec**

Name

Signature

Signature

Address: **2220 Tulare St, 6th Floor
Fresno, CA 93721**

Address:

On behalf of Escrow Agent:

Title

Name

Signature

Address

At the time the Escrow Account is opened, the Owner 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.

Owner:

Title – **Steve White, Director**

**Department of Public Works
and Planning**

Signature

Address – **2220 Tulare St, 6th Floor
Fresno, CA 93721**

Contractor:

Title

Name

Signature

Address

Escrow Agent:

Title

Name

Signature

Address

(End Escrow Agreement)

6. Itemized Breakdown: The Contractor shall submit a financial breakdown of the work, itemized by crafts or sections as designated by the Owner. The Contractor's payment shall be based upon the monthly percentage of completion of these items.
7. Lien Waivers: The Owner may require the Contractor to submit, along with the progress payment request, notarized lien waivers from each Subcontractor, materials or equipment supplier. Lien waivers shall comply with Civil Code Section 8132, et seq., and the aggregate sum thereof shall reflect all progress payments previously made.

D. CERTIFICATES FOR PAYMENT

1. The Project Manager shall, within seven (7) days after the receipt of the Project Application for Payment, review the Project Application for Payment and either issue a Project Certificate for Payment to the Owner for such amounts as the Project Manager determines are properly due, or notify the Contractor in writing of the reasons for withholding a Certificate provided in Part F of this Section 2.24.
2. The issuance of a Project Certificate for Payment will constitute a representation by the Project Manager to the Owner that, based on the Project Manager's observations at the site as provided herein and the data comprising the Project Application for Payment, the Work has progressed to the point indicated and that, to the best of the Project Manager's knowledge, information and belief, the quality and timeliness of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Completion of the Work, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in the Certificate); and that based upon all currently available information, the Contractor is entitled to payment in the amount certified. However, by issuing a Project Certificate for Payment, the Project Manager shall not thereby be deemed to represent that the Project Manager has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, has reviewed the construction means, methods, techniques, sequences or procedures, or has made any examination to ascertain how or for what purpose the Contractor has used the monies previously paid on account of the Contract Sum.

E. PROGRESS PAYMENTS

1. After the Project Manager has issued a Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents.
2. The Contractor shall promptly pay each Subcontractor upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contract on account of such Subcontractor's Work. The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payments to their Sub-subcontractors in similar manner.
3. The Project Manager may on request of any Subcontractor, at the Project Manager's discretion, furnish to that Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken thereon by the Project Manager on account of Work done by such Subcontractor.
4. Neither the Owner nor the Project Manager shall have any obligation to pay or to see to the payment of any monies to any Subcontractor or Material Suppliers except as may otherwise be required by law.
5. Neither certification of a progress payment, delivery of a progress payment, nor partial or entire use or occupancy of the Project by the Owner, shall constitute an acceptance of any Work not performed in accordance with the Contract Documents.

F. PAYMENTS WITHHELD

1. The Project Manager may decline to certify payment and may withhold the Certificate in whole or in part to the extent necessary to reasonably protect the Owner, if, in the Project Manager's opinion, the Project Manager is unable to make representations to the Owner as provided herein above for Certificates for Payment. If the Project Manager is unable to make representations to the Owner and certify payment in the amount of the Project Application, the Project Manager will notify the Contractor as provided herein. If the Contractor and the Project Manager cannot agree on a revised amount, the Project Manager will promptly issue a Project Certificate for Payment for the amount for which the Project Manager is able to make such representations to the Owner. The Project Manager may also decline to certify payment or, because of subsequently discovered evidence or subsequent observations, the Project Manager may

nullify the whole or any part of any Project Certificate for Payment previously issued to such extent as may be necessary, in the Project Manager's opinion, to protect the Owner from loss because of:

- a. Defective Work not remedied;
 - b. Third party claims filed or reasonable evidence indicating probable filing of such claims, including claims by separate contractors;
 - c. Failure of the Contractor to make payments properly to Subcontractors, or for labor, materials or equipment;
 - d. Architect's determination, based upon reasonable evidence, that the Work cannot be completed for the unpaid balance of the Contract Sum;
 - e. Damage to the Owner or another contractor;
 - f. Architect's determination, based upon reasonable evidence, that the Work will not be accomplished in compliance with the Work Order Completion Time;
 - g. Persistent failure to carry out the Work in accordance with the Contract Documents;
 - h. Failure of the Contractor to submit Construction Schedules or Submittal and Procurement Schedules as required;
 - i. Failure of the Contractor to maintain record drawings on a current basis;
 - j. Failure of the Contractor to submit notarized lien waivers from each Subcontractor, materials or equipment supplier;
 - k. Failure of the Contractor to submit certified payroll reports;
 - l. Stop notice served upon the Owner.
2. A retention in the amount of one-thousand dollars (\$1,000) will be withheld from the Contractor's monthly progress payment for each and every required document not submitted in a timely manner by the Contractor or its subcontractors up to a maximum of ten-thousand dollars (\$10,000). For purposes of this Paragraph, the term "required document" includes, but is not limited to, certified payrolls, labor compliance documents, Disadvantaged Business Enterprise documents, and any other information or documents required to be submitted by the Contractor or any of its subcontractors under the terms of this Agreement or pursuant to applicable federal, state or local laws or regulations. The retention provided for in this Paragraph shall be in addition to any other deduction or retention allowed under this Agreement, and shall be in addition to any other remedy or consequence provided by law for untimely submission of any required document. Such retention shall remain in effect only until such time as the required documents have been submitted by the Contractor or its subcontractor(s) and have been determined by the Owner to be both complete and acceptable as to form.

3. When the grounds as noted above are removed, payment shall be made for amounts withheld on the basis thereof.

G. COMPLETION AND FINAL PAYMENT

1. Following the Contractor's completion of the Work, the Contractor shall forward to the Project Manager a written notice that the Work is ready for final inspection and acceptance, and shall also forward to the Project Manager a final Application for Payment. Upon receipt, the Project Manager will promptly make such inspection. When the Project Manager finds the Work acceptable under the Contract documents and the Contract fully performed, the Project Manager will issue a Project Certificate for Payment which will certify the final payment due the Contractor. This certification will constitute a representation that, to the best of the Project Manager's knowledge, information and belief, and on the basis of observations and inspections, the Work has been completed in accordance with the Terms and Conditions of the Contract Documents and that the entire balance found to be due the Contractor, and noted in said Certificate, is due and payable. The Project Manager's certification of said Project Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth herein below have been fulfilled.
2. Neither the final payment nor the remaining retainage shall become due until the Contractor submits to the Project Manager (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might in any way be responsible, have been paid or otherwise satisfied, (2) consent of surety, if any, to final payment, and (3) other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the Owner. If any Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against any such lien. The bond cannot be from the original surety insurer for the Project or any affiliate of the original surety. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such lien.
3. All provisions of this Agreement, including without limitation those establishing obligations and procedures, shall remain in full force and effect notwithstanding the making or acceptance of final payment, and the making of final payment shall not constitute a waiver of any claims by the Owner.

4. Upon completion and acceptance of all work whatsoever required, and upon the release of all claims against the Owner as specified, the Owner shall file a written Notice of Completion with the County Recorder as to the entire amount of work performed.
5. Final payment will be released within sixty (60) days after the date of acceptance of the Work as reflected in the Notice of Completion filed with the County Recorder's Office; provided, that Owner may withhold from the final payment, in the event of a dispute between Owner and Contractor, retentions in and amount not exceeding 150 percent of the disputed amount. At the Contractor's option, the Owner may release retention upon receipt of an unconditional lien release for the full value of the Work and any of its Contract Change Orders.
6. All manufacturers' warranties required by the Contract Documents shall commence on the date of the Notice of Completion for the Work. It shall be the Contractor's responsibility, through appropriate contractual arrangements with all subcontractors, materialmen and suppliers, to ensure compliance with this requirement.
7. The acceptance by the Contractor of the final payment, after the date of Notice of Completion of the Project, shall be and shall operate as a release to the Owner of all claims and of all liability to the Contractor, under the Contract Documents or otherwise, for all things done or furnished in connection with this Work, excepting only the Contractor's claims for interest upon final payment, if such final payment be improperly delayed. No payments, however, final or otherwise, shall operate to release the Contractor or his/her sureties from any obligations under the Contract Documents, including but not limited to the Performance and Payment Bonds.

2.25 CHANGES TO THE WORK

- A. The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletion or other revisions. All such changes in the Work shall be authorized by a Contract Change Order, and shall be performed under the applicable conditions of the Contract Documents.
- B. **CONTRACT CHANGE ORDER:** A Change Order issued to add or delete Work from the Contract. Only an executed Contract Change Order will effectuate change in either the Contract Sum and/or the contract time. A Change Order is a written order to the Contractor dually signed to show both the approval of the

Architect and Authorization of the Owner, issued after execution of the Contract. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including any adjustment in the Contract Sum or the contract time, and the full and final settlement of all costs (direct, indirect and overhead) related to the Work authorized by the Change Order.

- C. All claims for additional compensation to the Contractor shall be presented in writing before the expense is incurred and will be adjusted as provided herein. No work shall be allowed to lag pending such adjustment, but shall be promptly executed as directed, even if a disputed claim arises. No claim will be considered after the work in question has been done unless a Contract Change Order has been issued or a timely written notice of claim has been made by Contractor.
- D. Costs mean an itemized breakdown of all labor (by crafts), materials, sales taxes, equipment rentals, etc., for each portion of the Work which comprises the Change Order including any Subcontractor's itemized breakdown, plus not more than twenty (20) percent to cover all profits and administration. The cost or credit to the Owner resulting from a change in the Work shall be determined in one or more of the following ways:
 - 1. By mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
 - 2. By unit prices state in the Contract Documents or subsequently agreed upon;
 - 3. By cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
 - 4. By the method provided under Article 2.26.
- E. The amount of credit to be allowed by the Contractor to the Owner, as confirmed by the Project Manager, for any deletion or change that results in a decrease in the Contract Sum will be the amount of the actual cost. When both additions and credits covering related Work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase, if any, with respect to that change.

2.26 CHANGES TO THE CONTRACT (EXTRA WORK AT FORCE ACCOUNT)

- A. If none of the methods set forth in Section 2.25.D, is agreed upon, the Contractor, provided that a written order signed by the Owner is received, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the Project Manager, on the basis of reasonable expenditures or savings of

those performing the Work attributable to the change, including, in the case of an increase in the Contract Sum, not more than twenty percent (20%) for all overhead and profit. In such case, and also under Section 2.25.D, Paragraph 3, the Contractor shall keep and present, in such form as the Owner or the Project Manager may prescribe, an itemized accounting of actual cost together with appropriate supporting data for inclusion in a Contract Change Order. Unless otherwise provided in the Contract Documents, cost shall be limited to the following:

1. Labor Cost is the cost of labor for the workers (including working foremen) used in the actual and direct performance of the extra work, whether employed by the Contractor, or Subcontractors and Specialized Forces of any tier. Labor Cost shall include:
 - a. Actual Wages paid to the works, plus employer payments to or on behalf of the workers for health and welfare, pension, vacation, and training. If required by the Project Manager, certified payrolls shall be submitted with extra work reports as verification of wages paid to the workers.
 - b. A Labor Surcharge of 20 percent (35 percent for demolition work and roofing work) will be added to the Actual Wages as defined above. The Labor Surcharge shall constitute full compensation for all payments imposed by State and Federal laws, including Workers Compensation Insurance, Social Security, and Unemployment Insurance.
 - c. Subsistence and Travel Allowance if actually paid to the workers. Labor Surcharge will not be added to Subsistence and Travel Allowance.
2. Equipment Cost is the payment made for the equipment actually used in the performance of the extra work.
 - a. Equipment valued at three hundred dollars (\$300) or less shall be considered as small tools, and no payment will be made therefor.
 - b. Equipment costs will be paid in accordance with the rental rates listed in the "Cal-Trans Equipment Rental Rates, County of Fresno, Department of Public Works and Planning," in effect at the time of bid, available from the Department, Suite 711, Fresno County Plaza Building, 2220 Tulare Street, Fresno, CA 93721.

- c. In the event that any of the equipment to be used is not listed in the above publication, the rental rate shall be agreed upon in writing by the Contractor and CM before the extra work is begun.
3. Materials Cost is the payment made for materials incorporated into the Work.
 - a. Materials Cost shall include sales tax, freight, and delivery charges, less any available discounts whether or not said discounts are taken.
 - b. Materials Cost shall be based upon supplier's or manufacturer's invoice. If invoices or other satisfactory evidence of cost are not furnished within sixty (60) days of delivery or within fifteen (15) days after acceptance of the Contract, whichever occurs first, then the Project Manager shall determine the Materials Cost, in his/her sole discretion, on the basis of available information and on his/her considered experience.
4. Specialized Services are those services or items of extra work that, by agreement of the Contractor and the Project Manager, cannot be performed by forces of the Contractor or his/her Subcontractors, and may be performed by a specialist.
 - a. Specialized Services may be paid for by invoice if the established practice of the specialized force industry does not provide complete itemization of Labor, Equipment and Materials Costs.
5. Markup for Profit, Home Office and Field Office Overhead, Bond Premium, insurance, taxes, and supervision will be added to the total of Labor Cost, Equipment Cost, Materials Cost, and Specialized Services.
 - a. Markup will be added only once on any Extra Work at Force Account, regardless of the number of contractors and subcontractors involved.
 - b. It is recognized that individual contractors and subcontractors have different overhead costs, profit requirements and bond premium rates. The amount to be added to Extra Work for markup shall include compensation for profit, overhead and bond premium without distinguishing among these items.
 - c. The markup to be added for Extra Work at Force Account on this Project shall be fifteen percent (15%) plus 1-1/2% for Performance and Payment Bonds for Contractor only.

6. Records shall be maintained by the Contractor and Subcontractors in such a manner as to provide a clear distinction between the costs of Extra Work paid for on a forced account basis and the costs of other operations. From these records, the Contractor shall furnish the Project Manager a completed extra work report for each day's extra work to be paid for on a force account basis. Extra work reports shall itemize the materials used, equipment rental charges, and specialized services costs, and shall provide names or identifications and classifications of workmen, the hourly rate of pay, and hours worked. Extra work reports shall be compiled and submitted to the Project Manager daily for verification and signature. Extra work reports shall be signed by the Contractor or his/her authorized representative.
7. If the Contractor disputes the Architect's cost determination, the Contractor may initiate a claim in compliance with the Claims and Disputes Resolution provisions of these General Conditions.

2.27 SITE CONDITIONS

- A. Where investigations have been conducted by the Owner of existing conditions on a site, including subsurface conditions, such investigations are made for the purpose of design only and for the information of bidders. The results of such investigations represent only the statement by the Owner as to the circumstance and character of materials actually encountered by the Owner during the investigations. The Owner makes no guarantee or warranty, express or implied, that the conditions indicated are representative of conditions existing throughout the site of a Project or any part of it, or that unanticipated conditions might not occur.
- B. All excavation work shall be performed on an "unclassified basis"; that is, such work shall include the removal of all material encountered including earth or rock formations, regardless of the type or hardness thereof, or groundwater conditions in the excavation, the cost of such excavations being included in the Contract Sum. Unclassified excavation Work includes drilling or blasting operations.
- C. If site conditions are discovered that materially differ from previous information that the Contractor has received, and that could not have been discovered by the Contractor through prudent and reasonable investigation prior to developing the Contract Sum for the Work, the Contractor shall be compensated for additional costs incurred in working with the unknown site conditions, but only to the extent that such previously unknown and undiscoverable site conditions cause the Contractor to incur costs in addition to the Contract Sum for that portion of the Work. The Contractor must be able to demonstrate clearly the original Contract

Sum for that portion of the Work (plus any Contract Change Orders applicable to that portion of the Work) and the additional costs incurred as a direct result of the unknown site conditions. Only additional costs over and above the amount of the Contract Sum for that portion of the Work will be compensated upon a recommendation of approval by the Project Manager.

2.28 REQUEST FOR EQUITABLE ADJUSTMENT

- A. If the Contractor considers a Request for Equitable Adjustment is justified for any increase in the contract time, the Contractor shall promptly, upon first observance of the condition giving rise to the request, provide the Project Manager and Owner written notice of such condition and circumstance. This notice shall be given by the Contractor before proceeding to execute the Work, except in emergency endangering life or property, in which case the Contractor shall proceed in accordance with the Emergency provisions of these General Conditions. No such request shall be valid unless so made. A Contract Change Order shall be required to authorize any change in the contract time resulting from such request for equitable adjustment.
- B. If the Contractor requests that additional cost or time is involved because of, but not limited to, (1) any written interpretation pursuant to Section 2.07.G, (2) any order by the Owner to stop the Work pursuant to Section 2.08 where the Contractor was not at fault, or any such order by the Project Manager as the Owner's agent, (3) any written order for a minor change in the Work issued pursuant to Section 2.29, the Contractor shall make such request for equitable adjustment as provided in Section 2.28.A.

2.29 MINOR CHANGES IN THE WORK

The Project Manager will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or extension of the contract time and not inconsistent with the intent of the Contract Documents. Such changes shall be enacted by written order issued through the Project Manager, and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written orders promptly.

2.30 SUCCESSORS AND ASSIGNS

The Owner and the Contractor, respectively, bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party with respect to all covenants, agreements and obligations contained in the Contract Documents. Neither

party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other.

2.31 ASSIGNMENT OF MONEYS

The Contractor shall not assign moneys due or to become due him/her under the contract without the written consent of the Auditor-Controller of Fresno County. Any assignment of moneys shall be subject to all proper set-offs in favor of the County of Fresno and to all deductions provided for in the contract and particularly all money withheld, whether assigned or not, shall be subject to being used by the County of Fresno for the completion of the work in the event that the Contractor should be in default therein.

2.32 GUARANTEE OF WORK

- A. The Contractor warrants to the Owner that all materials and equipment and the Work as a whole furnished under this Contract will be new unless otherwise specified, and that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents, for a period of 365 Calendar Days from the date of acceptance of the Work as specified in the Notice of Completion, unless a longer period is otherwise specified. All manufacturer's warranties required by the Contract Documents shall commence on the date of the filing of the Notice of Completion for the Work (which date necessarily will follow the performance under separate contracts). It shall be the Contractor's responsibility, through appropriate contractual arrangements with all subcontractors, material men and suppliers, to ensure compliance with this requirement. All Work not conforming to these requirements, including substitutions not properly reviewed and authorized, may be considered defective. If required by the Project Manager, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.
- B. If repairs or changes are required in connection with guaranteed work within any guaranteed period, which, in the opinion of the Project Manager is rendered necessary as the result of the use of materials, equipment or workmanship which are inferior, defective, or not in accordance with the Contract Documents, the Contractor shall, promptly upon receipt of notice from the Owner, and without expense to the Owner (1) place in satisfactory condition in every particular all of such guaranteed work, correct all defects therein, and (2) make good all damage to the building or site, or equipment or contents thereof, which, in the opinion of the Project Manager, is the result of the use of materials, equipment or workmanship which are inferior, defective, or not in accordance with the Contract Documents; and (3) make good any work or materials, or the equipment and contents of said building or site disturbed in fulfilling any such guarantee.

- C. If the Contractor disturbs any work guaranteed under another contract in fulfilling the requirements of the contract or of any guarantee, embraced in or required thereby, he/she shall restore such disturbed work to a condition satisfactory to the Project Manager and guarantee such restored work to the same extent as it was guaranteed under such other contract.
- D. The Owner may have the defects corrected if the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee and the Contractor and his/her surety shall be liable for all costs and expenses incurred in connection therewith.
- E. All special guarantees applicable to definite parts of the work that may be stipulated in the Contract Documents shall be subject to the terms of this Article 2.32 during the first (1st) year (365 Calendar Days) of the life of such special guarantee.

2.33 RESPONSIBILITY FOR DAMAGE

- A. Neither the Owner, the Architect, nor any officer or employee of the County, or officer or employee thereof, within the limits of which the work is being performed, shall be answerable or accountable in any manner, for any loss or damage that may happen to the work or any part thereof; or for any of the materials or other things used or employed in performing the work; or for injury to any person or persons, either workmen or the public, for damage to property from any cause which might have been prevented by the Contractor, or his/her workmen, or anyone employed by him/her, against all of which injuries or damages to persons and property the Contractor having control over such work must properly guard.
- B. The Contractor shall be responsible for any liability imposed by law for any damage to any person or property resulting from defects or obstructions or from any cause whatsoever during the progress of the work or at any time before the issuance of the Notice of Completion.
- C. The Contractor shall indemnify and hold harmless the Owner, the Project Manager, the Architect, and all of their respective officers and employees, from all claims, lawsuits or actions of every kind and nature whatsoever, brought for, or on account of any injuries or damages received or sustained by any person or persons, resulting from any act or admission by the Contractor or his/her servants or agents, in the construction of the work or by or in consequence of any negligence in guarding the same, in improper materials used in its construction, or by or on account of any act or omission of the Contractor or his/her agents in the performance of Contractor's obligations under the Contract Documents. In addition to any remedy authorized by law, so much of the money due the Contractor under and by virtue of the contract as shall be considered necessary by

the Owner may be retained by the Owner until disposition has been made of such claims, lawsuits or actions for damages as aforesaid.

2.34 WRITTEN NOTICE

Subject to any additional requirements that may be applicable to claims under the immediately following Article 2.35 RESOLUTION OF CONTRACT CLAIMS AND DISPUTES, formal service, when required, of written notice shall be deemed to have been duly served if delivered in person, to the individual or member of the firm or entity or to an officer of the corporation for whom it was intended, or if sent by registered or certified mail to the listed address of that entity for the attention of such individual.

2.35 RESOLUTION OF CONTRACT CLAIMS AND DISPUTES

- A. A Claim is a demand or assertion sent by registered mail or certified mail with return receipt requested by one (1) of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time, or a request for equitable adjustment or Contract Change Order which cannot be resolved per provisions of Section 2.25 - CHANGES TO THE WORK. Any Claim shall be reduced to writing and filed with the Project Manager, within ten (10) calendar days after the Contractor has notice of the condition giving rise to the Claim, and final action per Section 2.25 - CHANGES TO THE WORK procedures has taken place or has been declared as such in writing, by either party. Such ten (10)-day notice of an asserted claim is in addition to the requirement for prompt notice required per Section 2.25 - CHANGES TO THE WORK.
- B. The Contractor shall not claim or recover any overhead cost administrative or otherwise, particularly 'Home Office' expenses, 'Extended site overhead', or any other overhead cost on the basis of any 'Home Office' damages formula, 'Eichleay' formula, 'Total Cost' recovery formula or any other such formula.
- C. REQUIREMENTS FOR FILING A CLAIM. Claims shall be submitted to the Project Manager. Claims must be filed within the time specified above, but in no event shall any claim be considered by the Project Manager that is filed later than the date of final payment of the Project. The claim shall be in writing and shall be a sum certain if known. If unknown, Contractor shall specify the basis for establishing the sum certain. Claim shall include a statement of the reasons for the asserted entitlement, and include the documents necessary to substantiate the claim. Such documents may include but are not limited to payroll records, purchase orders, quotations, invoices, estimates, subcontracts, daily logs, supplier contracts, subcontract billings, bid takeoffs, equipment rental invoices, ledgers, journals, daily reports, job diaries, and any documentation related to the requirements of Section 2.25 - CHANGES TO THE WORK. In the case of a

continuing delay, only one (1) claim is necessary. If adverse weather conditions are the basis for a claim for additional time, such claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the critical activities on the construction schedule. The Contractor shall certify, at the time of submission of a claim, as follows:

"I, _____, being the _____
(MUST BE AN OFFICER) of _____
(GENERAL CONTRACTOR), declare under penalty of perjury under the laws of the State of California, and do personally certify and attest that: I have thoroughly reviewed the attached claim for additional compensation and/or extension of time, and know its contents, and said claim is made in good faith; the supporting data is truthful and accurate; the amount requested accurately reflects the contract adjustment for which the Contractor believes the Owner is liable; and, further, that I am familiar with California Penal Code Section 72 and California Government Code Section 12560, et seq, pertaining to false claims, and further know and understand that submission or certification of a false claim may lead to fines, imprisonment and/or other severe legal consequences.

By: _____
(Contractor's signature) (Date)

D. Nothing in this Article is intended to extend the time limit or supersede notice requirements otherwise provided by this contract or by applicable law for the filing of claims. Any formal claim shall be processed in accordance with the provisions of Public Contract Code Section 9204 and Section 20104 et. seq., each of which establishes a process for resolution of claims, the provisions of which are consistent with and effectively summarized by the following

1. The Owner (or his/her designee), shall review the facts pertinent to the claim, obtain additional information deemed necessary for a decision (if any), review recommendations of the Project Manager, coordinate with the contract administrator (if any) and secure assistance from legal and other advisors, and render a written decision on the claim within forty-five (45) days of receipt of the claim. If additional information or documentation is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the Owner (or his/her designee) and claimant. The Owner's (or his/her designee's) written response to the claim, as supplemented by any additional information and/or documentation provided by claimant, shall be submitted to the claimant within fifteen (15) days after receipt of the further information and/or documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.

- a. For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the Owner (or his/her designee), shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the Owner (or his/her designees) may have against the claimant.
2. If the claimant disputes the written response of Owner (or his/her designee), or Owner fails to respond within the time prescribed, the claimant may so notify the Owner (or his/her designee), in writing, either within fifteen (15) days of receipt of the Owner (or his/her designee's) response or within fifteen (15) days of the Owner (or his/her designee's) failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the Owner (or his/her designee) shall schedule a meet and confer conference within thirty (30) days for settlement of the dispute.
3. Within ten (10) business days following conclusion of the meet and confer conference, any unpaid portion of the claim remaining in dispute shall be submitted to nonbinding mediation, as that term is defined by Public Contract Code Section 9204(d)(2)(C).
4. If following the conclusion of the meet and confer conference and mediation process, the claim or any portion thereof remains in dispute, the claimant may file a claim pursuant to Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his/her written claim pursuant to subdivision (a) until the time the claim is denied, including any period of time utilized by the meet and confer conference and mediation process as described in the immediately preceding Paragraphs 2 and 3 of this Section D.
5. In the event of any perceived conflict between the summary of the procedure set forth in this Article and the actual provisions of the Public Contract Code Section 9204 and Section 20104, et seq., the statutory provisions shall control; and in the event of any perceived conflict between the provisions of Section 9204 and Section 20104, et seq., the provisions of Section 9204 shall control.

- E. Procedures for Civil Actions to Resolve Disputed Claims: Non-binding Mediation: Within sixty (60) days, but no earlier than thirty (30) days, following the filing of a responsive pleading, the court shall submit the matter to non-binding mediation unless waived by mutual stipulation by both parties. The mediation process shall provide for the selection within fifteen (15) days by both parties of a disinterested third person as mediator, shall be commenced within thirty (30) days of the submittal, and shall be concluded within fifteen (15) days from the commencement of the mediation unless a time requirement is extended upon a good cause shown to the court. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

Judicial Arbitration: If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of the code. The Civil Discovery Act of 1986 (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subsection consistent with the rules pertaining to judicial arbitration. Arbitrators shall be experienced in construction law.

Appeals: As provided by statute (specifically Public Contract Code section 20104.4(b)(3) and Code of Civil Procedure section 1141.21), any party appealing an arbitration award who does not obtain a more favorable judgment shall, in addition to payment of costs and fees, also pay the attorneys' fees on appeal of the other party.

- F. CLAIMS AND DISPUTES EXEMPT FROM FILING REQUIREMENTS. The requirements and procedures imposed by this Article do not apply to:
1. Any claims by the Owner; or
 2. Any claim for or respecting personal injury or death or reimbursement or other compensation arising out of or resulting from liability for personal injury or death; or
 3. Any claim or dispute relating to stop payment requests or stop notices; or
 4. Any claim or dispute related to the approval, refusal to approve, or substitution of Subcontractors, regardless of tier, and suppliers.
- G. PAYMENT OF UNDISPUTED PORTION OF CLAIM. Owner shall pay claimant such portion of a claim that is undisputed except as otherwise provided in the contract.
- H. CONTINUE WORK DURING DISPUTE. In the event of any disputed claim or other dispute between the Owner and the Contractor, the Contractor will not stop

work but will prosecute the work diligently to completion in his/her manner directed by the Owner, and the dispute shall be resolved by a court of law after completion of the Work. However, Contractor must submit all disputes in accordance with the provisions of this Section 2.35.

- I. SUIT IN FRESNO COUNTY ONLY. Any litigation arising out of this Contract shall be brought in Fresno County and Contractor hereby waives the removal provisions of California Code of Civil Procedure Section 394.

2.36 PERFORMANCE BOND, LABOR AND MATERIAL PAYMENT BOND AND WARRANTY BOND

- A. The Contractor shall furnish Performance Bond in the amount of one hundred percent (100%) of the Contract Sum, and Payment Bond in the amount of one hundred percent (100%) of the Contract Sum and One Year Warranty Bond in the amount of ten percent (10%) of the Final Contract Sum, which is the cumulative amount that will have been paid to Contractor for all of the Work performed under the Contract once the Project has been completed and the Work has been accepted by the County.]
- B. All bonds required, whether Bid bonds, Performance, Payment, Warranty or other bonds, shall be issued by an admitted surety insurer authorized by the California Insurance Commissioner to transact surety insurance in the state. The same admitted surety insurer must issue the Bid Bond, Performance Bond, Payment Bond, and Warranty Bond. The payment, performance and warranty bonds required by these specifications will neither be accepted nor approved by the Owner unless the bonds are underwritten by an admitted surety and the requirements of California Code of Civil Procedure section 995.630 are met. The bonds must include a physical mailing address, phone number, FAX number, and contract person for the admitted surety insurer. The Owner further reserves the right to satisfy itself as to the acceptability of the surety and the form of bond. Upon request of the Owner, the bidder must submit the following documents:
 1. The original, or a certified copy, of the unrevoked appointment, power of attorney, bylaws, or other instrument authorizing the person who executed the bond to do so.
 2. A certified copy of the certificate of authority of the insurer issued by the California Insurance Commissioner.
 3. A certificate from the county clerk that the certificate of authority has not been surrendered, revoked, canceled, annulled, or suspended, or in the event that it has, that renewed authority has been granted.

4. A financial statement of the assets and liabilities of the insurer to the end of the quarter calendar year prior to thirty (30) days next preceding the date of the execution of the bond, in the form of an officers' certificate as defined in Corporations Code section 173.

2.37 RIGHTS AND REMEDIES

- A. The duties and obligations imposed by the Contract Documents and the rights and remedies available hereunder shall be in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.
- B. No action or failure to act by the Owner, or by the Project Manager or Architect, regarding any deficiency, breach or default in performance by the Contractor under the Contract Documents, shall be deemed or construed to constitute acquiescence of the Owner in connection therewith or with regard to any subsequent deficiency, breach or default in performance by the Contractor; nor shall any such prior act of failure to act by or on behalf of Owner be deemed or construed as a waiver of any rights in favor of Owner regarding any such deficiency, breach or default in performance by the Contractor, regardless of the similarity to the prior incident or circumstance when no action was taken regarding any alleged deficiency, breach or default in performance by the Contractor.

2.38 TIME, DELAYS AND LIQUIDATED DAMAGES

A. DEFINITIONS

1. Unless otherwise provided, the contract time is the period of time allotted in the Contract Documents for completion of the Work, including authorized adjustments thereto.
2. The Date of Commencement of the Work is the date established in the Notice to Proceed.
3. The Date of Completion of the Work is the date on which the work is certified as complete by the Project Manager as specified in the Notice of Completion.
5. The term "day" as used in the Contract Documents shall mean calendar day unless specifically designated otherwise.

B. PROGRESS AND COMPLETION

1. Time is of the essence regarding all time limits stated in the Contract Documents. By executing the Agreement, the Contractor confirms that the contract time is a reasonable period for performing the Work.
2. The Contractor shall begin the Work on the Date of Commencement. The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required herein to be furnished by the Contractor. The Date of Commencement of the Work shall not be changed by the effective date of such insurance.
3. The Contractor shall carry the Work forward expeditiously with adequate forces and shall achieve Completion of the Work within the contract time.

C. DELAYS AND EXTENSIONS OF TIME

1. Delays in prosecution of parts or classes of the Work that are not demonstrated to prevent or delay completion of the entire Project or specific milestones within the contract time are not "unavoidable delays" for purposes of this section.
2. In all cases, the time authorized for extension of the contract time shall be no greater than the number of days directly attributable to the event or circumstances which causes unavoidable delay in the completion of the Project. Contractor shall be entitled, in the case of unavoidable delays, to an extension in the contract time, but not to any increase to the Contract Sum. "Unavoidable delay" for this purpose shall be defined as follows:
 - a. Unavailable Materials. That materials or articles called for in the Contract Documents are not obtainable within the time required for timely completion; provided that such materials or articles were listed by the Contractor in the schedule required by Section 2.17 - CONTRACTOR'S CONSTRUCTION SCHEDULE; that the Contractor demonstrates that the unavailability of the materials is in fact the cause for the delay, and could not have been avoided by an appropriate adjustment in the Construction Schedule; and that the unavailability of such materials is due to circumstances beyond the Contractor's control. If good cause for delay is demonstrated pursuant to this subsection, the Owner, at its sole discretion, may grant a time extension.

- b. Force Majeure. That delays in construction have resulted from circumstances beyond the control of the Contractor and which the Contractor could not have provided against by the exercise of reasonable care, prudence, foresight, and diligence. Unavoidable delays within the meaning of this subparagraph shall be those caused by acts of God, war, insurrection, civil disorder, fire, floods, epidemic, or strikes.
 - c. Unseasonable Weather. An extension of contract time may be granted due to weather which is unsuitable for the Work currently in progress, upon the determination of the Owner that the weather conditions in fact caused the delay in completion of the Project and that such weather conditions were not, and could not in the exercise of reasonable diligence, have been foreseen by the Contractor. Seasonable weather that, in the exercise of reasonable foresight and diligence, should be expected in the area at the time of year in question is not cause for an extension of time.
 - d. Time Extensions Due to Contract Change Orders or Work Authorizations. A time extension may be granted due to additional work that results in a delay in the Project caused by the approval by the Owner of a Contract Change Order or Work Authorization. The Contractor shall be entitled to a contract time extension Change Order only when the extra Work is demonstrated by the Contractor to have caused a delay in the Project.
 - e. Owner Caused Delays. In the event that the Project is delayed by acts of the Owner not authorized by the Contract Documents which the Contractor demonstrates will or have caused an unavoidable delay, the Contractor shall be entitled to a contract time Change Order to offset the extra time incurred by the Contractor. The Contractor will not be entitled to adjustments in the Contract Sum. Extra time shall be limited to that which is directly identified as critical by the delay.
- 4. The Contractor specifically agrees that a time extension as provided herein is its sole remedy for Owner-caused delays, and agrees to make no claim or demand for additional damages, nor claim an acceleration of the time for performance.
 - 5. The Contractor shall not be entitled to any contract time extension nor Contract Sum adjustment for alleged Owner delays if the Owner has acted within the time limits specified by the Contract Documents.

D. NOTICE OF DELAYS

1. Contractor shall notify the Project Manager promptly whenever the Contractor foresees any event or circumstance that may delay the prosecution of the Work and in Contractor's opinion may provide grounds for an extension, and shall in any event notify the Project Manager immediately upon the occurrence of any such delay. The Contractor shall take immediate steps to prevent, if possible, the occurrence or continuance of the delay. If this cannot be done, the Project Manager shall determine how long the delay shall continue and to what extent the prosecution and completion of the Work are being delayed thereby. Such notification shall specify with detail the cause asserted by the Contractor to constitute grounds for an extension. Failure of the Contractor to submit such a notice within ten (10) days after the initial occurrence of the event-giving rise to the delay shall constitute a waiver by the Contractor of any request for a time extension, and no extension shall be granted as a consequence of such delay.
2. If the Contractor believes that the delay in prosecution in the Work will result in an unavoidable delay in completion of the entire Project, the Contractor shall submit evidence to support that belief, together with its request for a time extension. Such evidence shall include a demonstration that the delayed portion of the Work will affect the Critical Path Scheduling of the entire Project. The Contractor shall also submit a proposed revised Construction Schedule, which accounts for the delay in completion of the entire Project caused by the delay in prosecution of part of the Project, and includes a revised Critical Path demonstrating how the Project will be completed within the proposed revised contract time.

E. INVESTIGATION; PROCEDURE.

1. Upon receipt of a request for Time extension, the Project Manager shall conduct an investigation of the facts asserted by the Contractor to constitute grounds for an extension. The results of this investigation shall be reported by the Project Manager to the Contractor and shall indicate whether he/she will recommend for or against such extension to the Owner. The performance of this investigation by the Project Manager shall not be construed as direction or recommendation to the Contractor regarding scheduling of the work. Scheduling this work is the sole responsibility of the Contractor.
2. The Project Manager may, in his/her sole discretion, defer this recommendation to allow the accumulation of time extensions due to Work Authorizations into a periodic or final Contract Change Order request.

3. Upon receiving the Project Manager's recommendation to the Owner regarding the Contractor's request for a time extension, the Contractor may either withdraw its application for extension or request that it be scheduled for action by the Owner. If the Owner disallows the request, there shall be no allowance made for the time during which the request was pending, and the Contractor shall remain obligated to complete the Work in the time specified.
4. If the Owner approves the time extension Contract Change Order, the new Construction Schedule submitted by the Contractor and approved by the Owner shall be deemed to amend the original Construction Schedule approved by the Owner; thereafter, the amended Construction Schedule shall have the same force and effect as the originally approved Progress Schedule.
5. The revised Construction Schedule must be submitted within seven (7) calendar days of the date on which the Owner approves the change.
6. The Contractor agrees that the Owner's determination as to the existence of grounds for an extension and, the duration of any such extension, shall be final and binding upon both Owner and Contractor.

F. DISCRETIONARY TIME EXTENSION FOR BEST INTEREST OF OWNER

1. The Owner reserves the right to extend the contract time for completion of the Work if the Director of Public Works and Planning or designee determines that such extension is in the best interest of the Owner.
2. In the event that such discretionary extension is made at the request of the Contractor, the Owner shall have the right to charge to the Contractor all or any part, as the Board may deem proper, of the actual cost to the Owner for engineering, inspection, supervision, contract administration, incidental and other overhead expenses that accrue during the period of such extension, and to deduct all or any portion of such amounts from the final payment for the Work.
3. In the event such extension is ordered over the objection of the Contractor, the Contractor shall be entitled to a Contract Change Order adjusting the price paid to reflect the actual costs incurred by the Contractor as a direct and proximate result of the delay, upon his/her written application therefor, accompanied by such verification of costs as the Project Manager requires. Only additional direct costs incurred at the site will be reimbursable by Contract Change Order.

G. LIQUIDATED DAMAGES

1. If the Work is not completed by Contractor in the time specified in the Work Order or within any period of extension authorized pursuant to this Article, the Contractor acknowledges and admits that the Owner will suffer damage, and that it is impracticable and infeasible to fix the amount of actual damages. Therefore, it is agreed by and between the Contractor and the Owner that the Contractor shall pay to the Owner as fixed and liquidated damages, and not as a penalty, the sum specified in Section 005213, Agreement, Article III for each calendar day of delay until the Work is completed and accepted, and that both the Contractor and the Contractor's surety shall be liable for the total amount thereof, and that the Owner may deduct said sums from any monies due or that may become due to the Contractor.
2. This liquidated damages provision shall apply to all delays of any nature whatsoever, save and except only unavoidable delays approved by the Owner pursuant to the provisions of Article 2.38.C.2 hereinabove, or discretionary time extensions approved by the Board of Supervisors pursuant to the provisions of Article 2.38.F hereinabove.

H. EXTENSION OF TIME NOT A WAIVER.

1. Any extension of contract time granted pursuant to this Article shall not constitute a waiver by the Owner, nor a release of the Contractor, from his/her obligations to perform the Work within the allotted contract time.
2. Granting of a time extension due to one (1) circumstance on one (1) request therefore shall not constitute a granting by the Owner of an extension of time for any other circumstance or the same circumstance occurring at some other time, and shall not be interpreted as a precedent for any other request for extension.

2.39 PROTECTION OF PERSONS AND PROPERTY

A. SAFETY PRECAUTIONS AND PROGRAMS

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

B. SAFETY OF PERSONS AND PROPERTY

The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

1. All employees on the Work and all other persons who may be affected thereby;
 2. All the work and all materials and equipment to be incorporated therein, whether in storage or off the site, and that is under the care, custody or control of the Contractor or any of the Contractor's Subcontractors or Sub-subcontractors;
 3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction; and
 4. The work of the Owner or other separate contractors.
- C. The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss.
- D. The Contractor shall erect and maintain, as required by existing conditions and the progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent facilities.
- E. When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.
- F. The Contractor shall promptly remedy all damage or loss to any property referred to above caused in whole or in part by the Contractor, any Subcontractor, any Sub-subcontractor, anyone directly or indirectly employed by any of them, or any one for whose acts any of them may be liable, and for which the Contractor is responsible under the above noted clauses, except damage or loss attributable solely to the acts or omissions of the Owner, the Project Manager, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable in any degree to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under the Indemnification provisions provided herein.
- G. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and the Project Manager.

H. The Contractor shall not load or permit any part of the Work to be loaded in a manner that could endanger its safety or pose a risk to anyone working at the Project site.

I. EMERGENCIES

In any emergency affecting the safety of persons or property the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in the provisions herein for Changes in the Work.

2.40 INSURANCE

A. CONTRACTOR'S INSURANCE

1. Bidders' attention is directed to the insurance requirements below. It is highly recommended that Bidders confer with their respective insurance carriers or brokers to determine in advance of bid submission the availability of the insurance certificates and endorsements required below. A bidder who is awarded a contract and thereafter fails to comply strictly with the insurance requirements, will be deemed to be in default of its obligations.
2. Contractor shall procure and maintain for the duration of the Contract, and for 3 years thereafter, insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, his agents, representatives, employees, or subcontractors. The cost of such insurance shall be included in the Contractor's bid.
3. No later than ten (10) calendar days following the Award of the Contract, and prior to execution of the Agreement for Construction by the Owner, the Contractor shall submit certificates of insurance, signed by an authorized agent of the insurer, attesting to insurance coverage of the Contractor as required by this Article.

B. MINIMUM SCOPE AND LIMITS OF INSURANCE

Coverage shall be at least as broad as:

1. Commercial General Liability (CGL): Insurance Services Office (ISO) Form CG 00 01 covering CGL on an "occurrence" basis, including products and completed operations, property damage, bodily injury and personal & advertising injury with limits no less than five million dollars (\$5,000,000) per occurrence and an annual aggregate of ten million dollars (\$10,000,000). If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (ISO CG 25 03 or 25 04) or the general aggregate limit shall be three times the required occurrence limit.

2. Automobile Liability: Insurance Services Office (ISO) Form CA 0001 covering Code 1 (any auto), with limits no less than five million dollars (\$5,000,000) per accident for bodily injury and property damage. Coverage should include owned and non-owned vehicles used in connection with this Agreement and all applicable endorsements.
3. Workers' Compensation insurance as required by the State of California, with Statutory Limits, and Employers' Liability insurance with a limit of no less than one million dollars (\$1,000,000) per accident for bodily injury or disease.
4. If Contractor is a licensed professional or employs professional staff, (e.g., Architect, Engineer, Surveyor, etc.) in providing services, Professional Liability with limits no less than \$2,000,000 per occurrence or claim, and \$3,000,000 annual aggregate.
5. Builder's Risk (Course of Construction) insurance utilizing an "All Risk" (Special Perils) coverage form, with limits equal to the completed value of the project and no coinsurance penalty provisions.
6. Contractors' Pollution Legal liability and/or Asbestos Legal Liability and/or Errors and Omissions with limits no less than \$1,000,000 per occurrence or claim and \$2,000,000 policy aggregate.

If Contractor maintains broader coverage and/or higher limits than the minimums shown above, the Owner requires and shall be entitled to the broader coverage and/or 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 Owner.

Self-Insured Retentions

Self-insured retentions must be declared to and approved by the Owner. At the option of the Owner, either: the Contractor shall obtain coverage to reduce or eliminate such self-insured retentions as respects the Owner, its officers, officials, employees, and volunteers; or the Contractor shall provide a financial guarantee satisfactory to the Owner guaranteeing payment of losses and related investigations, claim administration, and defense expenses. The policy language shall provide, or be endorsed to provide, that the self-insured retention may be satisfied by either the named insured or Owner.

C. OTHER INSURANCE PROVISIONS

Contractor's insurance policies are to contain, or be endorsed to contain, the following provisions:

1. The coverage shall contain no special limitations on the scope of protection afforded to the Owner, its officers, officials, employees or volunteers.

2. The County of Fresno, its officers, officials, employees, and volunteers are to be named individually and collectively, as additional insureds on the CGL policy with respect to liability arising out of work or operations performed by or on behalf of the Contractor including materials, parts, or equipment furnished in connection with such work or operations and automobiles owned, leased, hired, or borrowed by or on behalf of the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the Owner, its officers, officials, employees or volunteers.
3. The insurer shall agree to waive all rights of subrogation against the Owner, its officers, officials, employees and volunteers for losses arising from work performed by the Contractor for the Owner
4. For any claims related to this project, the Contractor's insurance coverage shall be primary insurance coverage at least as broad as ISO CG 20 01 04 13 as respects the Owner, its officers, officials, employees, and volunteers. Any insurance or self-insurance maintained by the Owner, its officers, officials, employees, or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.
5. Any failure to comply with reporting provisions of the policies shall not affect Coverage provided to the Owner, its officers, officials, employees, agents, Engineers, Consulting Engineers, or volunteers.
6. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
7. All Contractor's insurance policies for coverage required under this agreement shall not be cancelled or changed without a minimum of thirty (30) days advance written notice given to Owner.
8. The insurer shall agree to waive all rights of subrogation against the Owner, its officers, officials, employees and volunteers for losses arising from work performed by the Contractor for the Owner.
9. The Builder's Risk (Course of Construction) policy shall be an "All Risk" (Special Perils) coverage form, with limits equal to the completed value of the project and no coinsurance penalty provisions. All subcontractors shall be insured to the extent of their portion of the work under the Contractor. The Contractor shall request, and is responsible to confirm with its insurer, that the County of Fresno and all subcontractors are named, both as additional insured and as additional loss payees, on the Builder's Risk insurance policy. The Contractor and all subcontractors waive all rights, each against the others, for damages arising from perils covered by the insurance required under the terms of this article, except such rights as they may have to the proceeds of the Builder's Risk insurance obtained and maintained by the Contractor.

D. ACCEPTABILITY OF INSURERS

Contractor shall obtain the policies and coverages specified herein from an admitted insurer in good standing with and authorized to transact business in this state by the California Department of Insurance, and having a Best's rating of no less than A FSC VIII.

E. SUBCONTRACTORS

Contractor shall include all Subcontractors as insureds under the Contractor's insurance policies required herein, provided however, if the Contractor does not include a Subcontractor as an insured under the Contractor's insurance policies required herein, the Contractor shall cause that Subcontractor to be insured as required herein to the extent of its portion of the Work under the Contractor and furnish to Owner separate certificates and endorsements for that Subcontractor.

F. EVIDENCE OF COVERAGE

Within ten (10) days of bid award, Contractor shall furnish the Owner with original Certificates of Insurance including all required amendatory endorsements (or copies of the applicable policy language effecting coverage required by this Article 2.40) and a copy of the Declarations and Endorsement Page of the CGL policy listing all policy endorsements to Owner. However, failure to obtain the required documents prior to the work beginning shall not waive the Contractor's obligation to provide them. The Owner reserves the right to require complete, certified copies of all required insurance policies, including endorsements, required by these specifications, at any time.

Certificates of Insurance and Endorsements for all policies must be signed by a person authorized by the insurer to bind coverage on its behalf, indicate the name and address of the official who will administer this contract, state that such insurance coverages have been obtained and are in full force and effect, and clearly indicate that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days' prior written notice has been given to the Owner.

Commercial General Liability Endorsements must name the County of Fresno, its officers, agents and employees, individually and collectively, as additional insured, but only insofar as the operations under this Agreement are concerned; that such coverage for additional insured shall apply as primary insurance and any other insurance, or self-insurance, maintained by Owner, its officers, agents and employees, shall be excess only and not contributing with insurance provided under Contractor's policies herein.

2.41 UNCOVERING WORK

- A. This Section shall apply to any Work installed and covered up by the Contractor that is required by the Building Code or other statutory or regulatory requirement

to undergo inspection or special inspection and/or testing approval by an appropriate official representing the Owner or other public authority having jurisdiction to conduct such inspection and/or testing. Work covered up by the Contractor, Contractor's Subcontractor's or Suppliers prior to inspection/special inspection and/or testing approval shall be uncovered and repaired or replaced after inspection approval at the sole expense of the Contractor. This shall apply to all labor and material needed to complete both physical and cosmetic repairs, and any additional inspection costs associated with restoring the Work.

- B. This Section also shall apply to any Work installed and covered up by the Contractor, Contractor's Subcontractor's or Suppliers that is determined by the Owner or its Project Manager, during construction or within the Warranty period, to be defective, broken or inoperative. Work covered up by the Contractor, Contractor's Subcontractor's or Suppliers that is found to be defective, broken or inoperative shall be uncovered and repaired or replaced at the sole expense of the Contractor. This shall apply to all labor and material needed to complete both physical and cosmetic repairs, and any additional inspection costs associated with restoring the Work.

2.42 CORRECTION OF WORK

- A. The Contractor shall promptly correct all Work rejected by the Project Manager as defective or as failing to conform to the Contract Documents, whether or not fabricated, installed or completed. The Contractor shall submit a plan of action, within twenty-four (24) hours of notification of the rejected work by the Project Manager, for correcting the rejected work. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the additional architectural and/or engineering services made necessary thereby.
- B. If, within 365 Calendar Days after the date of acceptance of the Work as specified in the Notice of Completion, or designated portion thereof, or within 365 Calendar Days after acceptance by the Owner of designated equipment, or within such longer period of time as may be prescribed by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found by Owner to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. This obligation shall survive both final payment for the Work or designated portion thereof and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.
- C. The Contractor shall, at his/her sole expense, remove from the site all portions of the Work that are defective or nonconforming and which have not been corrected under Articles 2.32, 2.42.A, and 2.42.B, unless the Owner waives removal.

- D. If the Contractor fails to submit a plan of action, within twenty-four (24) hours of notification of the rejected work by the Project Manager, for correcting the rejected work, or fails to correct defective or nonconforming Work as provided herein in Articles 2.32, 2.42.A, and 2.42.B, the Owner may correct it in accordance with Article 2.08.C.
- E. If the Contractor does not take action under the plan to initiate such correction of such defective or nonconforming Work within ten (10) days of written notice from the Project Manager, the Owner may remove it and may store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten (10) days thereafter, the Owner may, upon ten (10) additional days' written notice, sell such Work at auction or at private sale and shall account for the proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Project Manager, Architect, or other Professional's additional services made necessary thereby. If such proceeds of sale do not cover all costs that the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Supplemental Work Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.
- F. The Contractor shall bear the cost of making good all work of the Owner or separate contractors destroyed or damaged by such correction or removal.
- G. Nothing contained in this Section 2.42 shall be construed to establish a period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents, including Section 2.32 hereof. The establishment of the time periods noted in this Section 2.42, or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents, relates only to the specific obligation of the Contractor to correct the defective or nonconforming Work, and has no relationship to the time within which the Contractor's obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the defective or nonconforming Work.

2.43 ACCEPTANCE OF DEFECTIVE OR NONCONFORMING WORK

If the Owner prefers to accept defective or nonconforming Work, the Owner may do so instead of requiring its removal and correction, in which case a Contract Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable. Such adjustment shall be given effect whether or not final payment has been made. The Project Manager shall determine the amount of reduction in the Contract Sum.

2.44 TERMINATION BY THE OWNER

- A. If the Contractor is adjudged bankrupt, or makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of the Contractor's insolvency, or stop notices are served upon the Owner, or if the Contractor persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or fails to make prompt payment to Subcontractors or for materials or labor, or persistently disregards applicable laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or otherwise is guilty of a substantial violation of a provision of the Contract Documents, and fails after written notice to commence and continue correction of such default, neglect or violation with diligence and promptness, the Owner upon certification by the Project Manager that sufficient cause exists to justify such action, may, after an additional written notice and without prejudice to any other remedy the Owner may have, terminate the Contract and take possession of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever methods the Owner may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished.
- B. If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including compensation for the Project Manager's and Architect's additional services made necessary thereby, Contractor will only be paid for his/her actual unpaid costs from such excess. If such costs exceed the unpaid balance, the contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or to the Owner, as the case may be, shall be certified by the Project Manager, upon application, in the manner provided in Section 2.24 and this obligation for payment shall survive the termination of the Contract.

2.45 SUBSTITUTION OF MATERIALS

- A. When a specific manufacturer, trade name or material is specified, or indicated, it is to establish a standard of quality and shall not be construed as limiting competition. The intent of the Contract Documents is to specify high-grade standard material and equipment, and it is not the intent of these Contract Documents to exclude or omit the products of any responsible manufacturer, if such products are equally acceptable in terms of quality, finish, performance, durability, and serviceability, in the judgment of the Owner and the Architect, to those specified herein. Wherever an article, or any class of materials, is specified by the trade name or by the name of any particular patentee, manufacturer or dealer, it shall be taken as intending to mean and specify the article of material

described or any other equal thereto in quality, finish, performance, durability, and serviceability, in the judgment of the Owner and the Architect, for the purpose for which it is or they are intended.

- B. If the Contractor desires to use material or equipment other than that specified, he/she shall submit a request for approval of such substitution, in writing, to the Project Manager by no later than 10 days prior to bid opening. Substitution requests will not be considered if received after the time stipulated.
- C. The Owner does not guarantee that alternative articles, components, materials or equipment other than the item specified by trade name or other specific identification, will fit within the design parameters of the Project without alteration of the Project design by the Contractor.
- D. The Owner has the right to reject any proposed alternative material which requires alteration of the project design which impacts the safety of the public or the user of a completed facility. If the proposed alternative material requires alteration of the design of the Project or any aspect thereof and said alterations are acceptable to the Owner, the Contractor shall be responsible for performing said alterations at no additional cost to the Owner.
- E. Submittals for approval of substitute materials shall contain sufficient detailed information, descriptive brochures, drawings, samples or other data as is necessary to provide a detailed side-by-side comparison to the specified materials. It is the sole responsibility of the Contractor to submit complete descriptive and technical information so the Project Manager can make proper appraisal. Lack of either proper or sufficient information shall constitute cause for rejection. Reference to product data will not be acceptable.
- F. It is the Contractor's responsibility to confirm and correlate all quantities and dimensions and coordinate with all trades whose work may be affected by the requested substitution.

2.46 REFERENCE TO STANDARDS

- A. Reference to known standards shall mean and intend the latest edition or amendment published prior to date of these Specifications, unless specifically indicated otherwise, and to such portions of it that relate and apply directly to the material or installation called for on the Project.
- B. Where material is specified solely by reference to standard specifications, the Contractor shall, if requested by the Project Manager, submit to the Project Manager for his/her approval, data on all such material proposed to be incorporated into the Work of the Contractor, listing the name and address of the

vendor, the manufacturer or producer, and the trade or brand names of such materials.

2.47 SPECIFICATIONS

- A. The Specifications are organized into Divisions, Sections, and Trade headings based on the Construction Specifications Institute's Master format and the Master format numbering system. This organization shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of the Work to be performed by any trade. The Contractor shall be responsible for examining all Sections of the Specifications for inter-related items of the Work, and for furnishing each item identified or specified.
- B. No responsibility will be assumed by the Owner, Architect or the Project Manager for omissions or duplications by the Contractor in the completion of the Contract due to any alleged discrepancy in the arrangement of the material in these Specifications, nor shall any such segregation of work and materials operate to make the Project Manager an arbiter in defining the limits to the agreements between the Contractor and his/her Subcontractors or suppliers.
- C. The misplacement, addition or omission of any letter, word or punctuation mark shall in no way damage the true spirit, intent or meaning of these Specifications.
- D. The words "shown", "indicated", "noted", "scheduled" or words of that effect shall be understood to mean that reference is made to Drawings accompanying these Specifications.
- E. Where reference herein is made to colors or finishes "as selected", the reference is to the Architect with concurrence by the Owner.

2.48 APPROVED APPLICATORS

- A. Where specific instructions in these Specifications require that a particular product and/or materials be installed and/or applied by an "approved applicator" of the manufacturer, it shall be the Contractor's responsibility to insure that any Subcontractors used for such work be approved applicators.
- B. Contractor accordingly shall bear any and all costs, and shall reimburse Owner for any such costs incurred by Owner, resulting from Contractor's failure to insure the use of an "approved applicator".

2.49 DELIVERY AND STORAGE OF MATERIALS

- A. Deliver all manufactured materials in the original packages, containers or bundles (with the seals intact), bearing the name or identification mark of all manufacturers.
- B. Deliver fabrications in as large assemblies as practicable and where specified to be shop-primed or shop-finished; they shall be packaged or crated as required to preserve such priming or finish intact and free from abrasion.
- C. Store all materials in such manner as necessary to properly protect same from damage, as materials or equipment damaged by handling, weather, dirt or from any other cause will not be acceptable.
- D. Store materials so as to cause no obstructions (i.e. stored off all sidewalks and other walkways, roadways, and underground services). The Contractor shall be responsible for protecting from damage all material and equipment furnished under the Contract.

2.50 QUALITY OF WORK

- A. Where not more specifically described in any of the various Sections of these Specifications, the quality of work shall conform to all of the methods and operations of best standards and accepted practices of the trade or trades involved, and shall include all items of fabrication, construction, or installation regularly furnished or required for completion of the work (including any finish), and for successful operation as intended of the Project and the component thereof corresponding to that work.
- B. All Work shall be executed by mechanics skilled in their respective lines of work.
- C. When completed, all parts shall have been durably and substantially built and shall present a neat, finished appearance.

2.51 HOURS OF WORK

- A. Eight (8) hours of labor shall constitute a legal day's work upon all work done hereunder, and it is expressly stipulated that no worker employed at any time by the Contractor, or by a Subcontractor under this Contract, upon the Work, shall be required or permitted to work thereon more than eight (8) hours in any one (1) calendar day and forty (40) hours in any one (1) calendar week, except as provided in Sections 1810-1815 inclusive, of the Labor Code of the State of California, all the provisions of which are deemed to be incorporated herein as if set forth in full; and it is further expressly stipulated that for each and every

violation of said last named stipulation, said Contractor shall forfeit, as a penalty to the Owner, fifty dollars (\$50.00) for each worker employed by the Contractor in the execution of this Contract, for each calendar day during which said worker is required or permitted to labor more than eight (8) hours in any one (1) calendar day and forty (40) hours in any one (1) calendar week in violation of any of said provisions of the Labor Code.

- B. Notwithstanding the above stipulations, pursuant to Section 1815 of the Labor Code, work performed by employees of contractors in excess of eight (8) hours per day and forty (40) hours during any one (1) week shall be permitted on the Project upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and a half (1 1/2) times the basic rate of pay.

2.52 WAGE RATES AND RELATED LABOR COMPLIANCE REQUIREMENTS

- A. This Project is subject to compliance monitoring and enforcement by the Department of Industrial Relations (DIR), including the obligation to submit certified payroll records directly to the DIR Compliance Monitoring Unit (CMU) at least monthly using the CMU's eCPR system. Detailed information may be obtained on the State of California's Department of Industrial Relations website, www.dir.ca.gov/dlse/cmu/CMU.

The Contractor shall also submit certified payroll records of the Contractor, Subcontractors and all Sub-subcontractors of any tier to the Inspector of Record at least monthly.

- B. Contractor shall, and shall cause each of its Subcontractors (as defined in Labor Code section 1722.1) to provide written proof that they are currently registered with the California Department of Industrial Relations at the time of bid submittal, and have paid the applicable annual fee and are thereby qualified to submit a bid and to perform public work pursuant to Labor Code section 1725.5, prior to award of this Contract or any subcontract hereunder. No bid shall be accepted, nor shall this Contract or any subcontract hereunder, be entered into without such proof.
- C. Pursuant to Section 1770-1780 of the Labor Code of the State of California, the Director of the Department of Industrial Relations has determined the general prevailing rates of wages and rates for legal holidays and overtime in the locality in which this work is to be performed, which under Labor Code Section 1773.1 are deemed to include employer payments for health and welfare, pension, vacation, travel time and subsistence pay, and apprenticeship or other authorized training programs, for each craft or type of worker or mechanic needed to perform this contract. Said wage rates are available only at the Fresno County Department of Public Works and Planning, Design Division, and will be made available to any interested person upon request. Minimum wage rates for this Project, as

predetermined by the Secretary of Labor, are set forth in the Special Provisions. If there is a difference between the minimum wage rates predetermined by the Secretary of Labor and the Prevailing Wage Rates predetermined by the Director of the Department of Industrial Relations of the State of California for similar classifications of labor, the contractor and his subcontractors shall pay not less than the higher wage rate.

- D. It shall be mandatory upon the Contractor to whom the Contract is awarded, and upon any Subcontractor under him/her to pay not less than the said specified rates to all laborers, workers, and mechanics employed by them in the execution of the Contract, and to pay all laborers, workers and mechanics not less often than once weekly. The Contractor to whom the Contract is awarded shall post a copy of the determination of prevailing wages at the job site. The Contractor shall require all Subcontractors to comply with Sections 1770-1780 of the Labor Code of the State of California and shall insert into every subcontract the requirements contained therein.

- E. The Contractor shall comply with Labor Code Section 1775. In accordance with said Section 1775, it is hereby further agreed that the Contractor shall forfeit to the Owner, as a penalty, fifty dollars (\$50.00) for each laborer, worker, or mechanic employed for each calendar day or portion thereof, who is paid less than the said stipulated rates for any work done under the Contract, by him/her or by any Subcontractor under him/her. The difference between said stipulated rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than said stipulated rate shall be paid to each worker by the Contractor. The Contractor, and each Subcontractor, shall keep or cause to be kept an accurate record 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/her or her in connection with the public work. The records shall be open at all reasonable hours to the inspection of the Owner, to its officers and agents, and to the Division of Labor Law Enforcement of the State Department of Industrial Relations, its deputies and agents, or as otherwise provided by applicable law (including but not limited to Labor Code 1776).

- F. In case it becomes necessary for the Contractor or any Subcontractor to employ on the Work under this Contract any person in a trade or occupation (except executive, supervisory, administrative, clerical or other non-manual workers as such) for which no minimum wage rate is specified, the Contractor shall immediately notify the Owner who shall promptly thereafter determine the prevailing rate for such additional trade or occupation from the time of the initial employment of the person affected and during the continuance of such employment.

2.53 APPLICATION OF HIGHEST STANDARDS AND REQUIREMENTS

Whenever two (2) or more standards or requirements appear in these General Conditions or in any other part of the Contract Documents that form the Contract, the highest standard or requirement shall be applied and followed in the performance under this Contract.

2.54 NONDISCRIMINATION IN EMPLOYMENT

Contractor shall comply with all Federal and State Laws prohibiting discrimination in employment, including the following:

- A. California Labor Code Section 1735, which prohibits discrimination in employment on any basis listed in subdivision (a) of Section 12940 of the Government Code, as those bases are defined in Sections 12926 and 12926.1 of the Government Code, except as otherwise provided in Section 12940 of the Government Code, and applies to all employers, employment agencies and labor organizations.
- B. Title VII of the Federal 1964 Civil Rights Act (42 U.S.C. Section 2000e - 2000e - 17) which prohibits employment discrimination on the basis of race, color, sex, religion, or national origin, and applies to all employers that employ at least fifteen (15) workers during each working day in each of twenty (20) or more calendar weeks in the current or preceding year.
- C. In addition to these two (2) laws of general application listed in the immediately preceding paragraphs A and B, there are other Federal and State laws that prohibit employment discrimination in particular cases.
- D. The Owner is an Affirmative Action Employer and expects all of its contractors and suppliers to familiarize themselves with, and comply with, all applicable laws relating to employment discrimination.
- E. To the extent required by law, the Contractor shall meet all requirements of law relating to the participation of minority, women, and disabled veteran business enterprise contracting goals, and shall comply with Public Contract Code 10115 et seq. and all applicable regulations. Contractor further agrees that, when required, Contractor shall ensure compliance by all Subcontractors and shall complete all forms required by all agencies exercising jurisdiction over the Project.

2.55 APPRENTICES

- A. Pursuant to Sections 1770-1780 of the Labor Code of the State of California, the Director of the Department of Industrial Relations has determined the general

prevailing rate of wages in the locality for each craft or type of worker needed to execute the work. Said wage rates pursuant to Section 1773.2 of the Labor Code are on file with the Clerk of the Fresno County Board of Supervisors, and will be made available to any interested person on request. A copy of this wage scale may also be obtained at the following Web Site: www.dir.ca.gov/dlsr.

- B. Pursuant to Section 1775 of the Labor Code of the State of California, nothing in this Article shall prevent the employment of properly registered apprentices upon public works. Every such apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he/she is employed, and shall be employed only at the work of the craft or trade to which he/she is registered.
- C. Only apprentices, as defined in Section 3077, who are in training under apprenticeship standards and written apprentice agreements under Chapter 4 (commencing at Section 3070), Division 3, of the Labor Code, are eligible to be employed on public works. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which he/she is training.
- D. Fresno County is committed to increasing the availability of employment and training opportunities, with particular attention to the plight of those who are most economically disadvantaged. In an effort to advance that purpose, the County will require that the Contractor and each subcontractor employed on this Project shall use their best efforts to ensure that thirty-three percent (33%) of apprentice hours, as determined by California Labor Code Section 1777.5 for each contractor and subcontractor of any tier on this Project, are performed by qualified participants in state approved apprenticeship programs who also are current or former "Welfare-to-Work" participants in the CalWORKs program. Provided, that nothing contained in this Paragraph D shall be interpreted to relieve or in any way diminish the obligation of the Contractor and each subcontractor to comply fully with all applicable apprenticeship laws in accordance with the California Labor Code and the California Code of Regulations; and accordingly such requirements as are contractually imposed by this Paragraph D shall be in addition to such legally mandated requirements, and applicable only to the extent fully consistent therewith.
- E. Incentives whereby the Contractor or Subcontractor receives partial reimbursement for the wages paid to apprentices who qualify may be available. The incentive program is administered by the County of Fresno, Department of Social Services. For questions regarding the incentive program, contact the Department of Social Services at (559) 230-4008.

2.56 PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted, and this contract shall be read and enforced as though it were included, and if through mistake or otherwise any provision is not inserted or is not correctly inserted, upon application of either party the contract shall be amended to make the insertion or correction.

2.57 DRUG FREE WORKPLACE CERTIFICATION

- A. The Contractor shall comply with Government Code Section 8355 in matters relating to providing a drug-free workplace.
- B. The Contractor shall publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession, or use of controlled substance is prohibited and specifying actions to be taken against employees for violations, as required by Government Code Section 8355(a).
- C. The Contractor shall establish a Drug-Free Awareness Program as required by Government Code 8355(a)(2), to inform employees about all of the following:
 - 1. The dangers of drug abuse in the workplace,
 - 2. The Contractor's policy for maintaining a drug-free workplace,
 - 3. Any available counseling, rehabilitation and employee assistance programs,
 - 4. Penalties that may be imposed upon employees for drug abuse violations.
- D. Provide as required by Government Code 8355(c), that everyone who provides work under the Agreement.
 - 1. Will receive a copy of the company's drug-free policy statement, and
 - 2. Will agree to abide by the terms of the Contractor's statement as a condition of employment on the contract.

2.58 BUILDING PERMIT AND OTHER PERMITS

The Building permit shall be obtained and paid for by the Owner. All other required permits are the responsibility of the Contractor to obtain. Fees for all other required

permits shall be reimbursed to the Contractor at actual cost when the County is presented with a valid receipt.

2.59 CODES AND REGULATIONS

All work, materials and equipment shall be in full compliance with the California Building Code; California Plumbing Code; California Electrical Code; California Mechanical Code; California Fire Code; California Energy Code; as those codes may be amended from time to time; Cal/OSHA Safety Regulations; and all Federal, State and Local laws, ordinances, regulations and Fresno County Charter provisions in effect and applicable in the performance of the work.

END OF SECTION

SECTION 020100 - SUBSURFACE EXPLORATION

PART 1 - GENERAL

A. DESCRIPTION:

1. Soil and subsurface investigations may have been conducted in the past at the site by an independent testing laboratory and a log of borings prepared.
2. The report is obtained only for the Owner's use in foundation and parking area design and is not a part of the Contract Documents. The report and log of borings are available for the Contractor's information, but is not a warranty of the subsurface conditions. The Contractor may use a report at his own risk.
3. The Owner does not assume responsibility for variations in kind, depth, quantity and conditions of soils. The Owner disclaims responsibility for accuracy, true location, and extent of soils investigation that has been prepared by others; and it further disclaims responsibility for interpretation of that data by the Contractor as in projecting soil bearing values, rack profiles, soil stability, and presence, level and extent of underground water.
4. The Contractor should visit the site and acquaint himself with site conditions. Prior to bidding, the Contractor may make, at his expense, his own subsurface investigation to satisfy himself with site and subsurface conditions. The Contractor shall obtain authorization of the Owner prior to start of borings or subsurface investigations.
5. The Owner may retain a Soils Engineer to observe the performance of all work related to preparation, filling and compacting of soils under this Section or required by the Contract Documents. If, in the opinion of the Soils Engineer, any work performed under this Section does not meet the technical or design requirements stipulated for the work, make all necessary readjustments to his approval. No deviations from the Contract Documents shall be made without specific and written approval of the Soils Engineer or the Owner.
6. The Soils Engineer's review of the Contractor's performance does not include review of the Contractor's safety measures in, on, or near the jobsite or connected in any way with the performance of the work of this Section.

END OF SECTION 020100

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

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. Form-facing material for cast-in-place concrete.

1.3 DEFINITIONS

- A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.
- B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .
 - 1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction, movement, contraction, and isolation joints
 - c. Forms and form-removal limitations.
 - d. Anchor rod and anchorage device installation tolerances.

1.5 INFORMATIONAL SUBMITTALS

- A. Minutes of preinstallation conference.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
 2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.
 - a. For architectural concrete specified in Section 033300 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).

2.2 FORM-FACING MATERIALS

- A. As-Cast Surface Form-Facing Material:
1. Provide continuous, true, and smooth concrete surfaces.
 2. Furnish in largest practicable sizes to minimize number of joints.
 3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:
 - a. Plywood, metal, or other approved panel materials.
 - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - 1) APA HDO (high-density overlay).
 - 2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
 - 3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
 - 4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.
- B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.
1. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class.
1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

2.3 RELATED MATERIALS

- A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
- C. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes .
- C. Limit concrete surface irregularities as follows:
 - 1. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips
 2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
1. Determine sizes and locations from trades providing such items.
 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- L. Construction and Movement Joints:
1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 3. Place joints perpendicular to main reinforcement.
 4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
 - a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 6. Space vertical joints in curbs and walls as indicated on Drawings .
 - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
- N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 3. Clean embedded items immediately prior to concrete placement.

3.3 REMOVING AND REUSING FORMS

- A. Formwork for sides of slabs, beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work.
 - 1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
 - 2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
 - 1. Align and secure joints to avoid offsets.
 - 2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

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. Steel reinforcement bars.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .
 - 1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction contraction and isolation joints.
 - c. Steel-reinforcement installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of steel reinforcement.
 - 2. Bar supports.
- B. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Minutes of preinstallation conference.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
 - 1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60 , deformed.

2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- B. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
 - 1. Finish: Plain .

2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:

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1. Steel-reinforcement placement.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. It is understood that the finish material of the floors in this project are the concrete slab on grade. Therefore, concrete placement technique, finishing and curing among other items is of the utmost importance to the District for the final product.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: fly ash: materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Concrete Subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.
- D. Samples: For vapor retarder.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Curing compounds – Not Allowed.
 - 7. Floor and slab treatments.
 - 8. Bonding agents.
 - 9. Adhesives.
 - 10. Vapor retarders.
 - 11. Joint-filler strips.
 - 12. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.
- D. Mockups: Cast concrete slab-on-grade panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
 - 1. Build panel approximately 200 sq. ft. for slab-on-grade in the location indicated or, if not indicated, as directed by Architect in the field.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures. Trial batches are not the responsibility of the District.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301.
 2. ACI 117.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
 3. Overlaid Finnish birch plywood.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

- D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type II/V, gray.
 - 2. Fly Ash: ASTM C 618, Class F.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data

of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
7. Shrinkage Reducing Admixture: ASTM C157

F. Water: ASTM C 94/C 94M and potable.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
 - a. Barrier-Bac; Inteplast Group, Ltd.
 - b. Fortifiber Building Systems Group.
 - c. GCP Applied Technologies Inc. (formerly Grace Construction Products).
 - d. Insulation Solutions, Inc.
 - e. Poly-America, L.P.
 - f. Raven Industries, Inc.
 - g. Reef Industries, Inc.
 - h. Stego Industries, LLC.
 - i. Tex-Trude, Inc.

2.7 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - a. 102 V-Seal Concrete Sealers, LLC.
 - b. AWRC Corporation.
 - c. BASF Corporation; Admixture Systems.
 - d. ChemMasters, Inc.
 - e. ChemTec Int'l.
 - f. Concrete Sealers USA.
 - g. Curecrete Distribution Inc.
 - h. Dayton Superior.
 - i. Euclid Chemical Company (The); an RPM company.
 - j. Kaufman Products, Inc.
 - k. L&M Construction Chemicals, Inc.
 - l. Metalcrete Industries.
 - m. Moxie International.
 - n. NewLook International, Inc.
 - o. Nox-Crete Products Group.
 - p. PROSOCO, Inc.
 - q. SpecChem, LLC.
 - r. US SPEC, Division of US MIX Company.
 - s. Vexcon Chemicals Inc.

2.8 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 15 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Aggregate combined grading shall be well graded.
- E. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use Shrinkage Reducing admixture in concrete slabs on grade and concrete walls.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated on Drawings at 28 days.
2. Maximum W/C Ratio: As indicated on Drawings.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size, unless indicated otherwise on Drawings

B. Lean Concrete: Normal-weight concrete.

1. Minimum four (4) sack concrete mix.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 5 inches, plus or minus 1 inch.

C. Slabs-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated on Drawings at 28 days.
2. Maximum W/C Ratio: As indicated on Drawings
3. Minimum Cementitious Materials Content: 520 lb/cu. yd..
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size, unless indicated otherwise on Drawings.
6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
7. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.5 lb/cu. yd..

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of walls and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 36 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 12 inches and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 - 3. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to

blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Not Allowed.
 - 4. Curing and Sealing Compound: Not Allowed.

3.12 LIQUID FLOOR TREATMENT APPLICATION

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than 28 days' old.
 - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least three month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with

- patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

- C. Inspections:

1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.
6. Verification of concrete strength before removal of shores and forms from beams and slabs.

- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of three standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of three standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M;
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. Test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

3.16 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 051200 - 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 Requirements:
 - 1. Section 133419 "Metal Building Systems" for structural steel.

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.
- D. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

- B. Coordinate installation of 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.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Structural-steel materials
2. High-strength, bolt-nut-washer assemblies
3. Threaded rods
4. Forged-steel hardware
5. Shop primer
6. Galvanized-steel primer
7. Etching cleaner
8. Galvanized repair paint

- 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.
7. Identify demand critical welds.

- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

1.7 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

- C. Mill test reports for structural steel, including chemical and physical properties.
- D. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Shop primers.
 - 6. Nonshrink grout.
- E. Survey of existing conditions.
- F. Source quality-control reports.
- G. Field quality-control and special inspection reports.

1.8 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- B. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.9 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.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
 1. Finish: Hot dipped galvanized
- B. Channels, Angles-Shapes: ASTM A 36/A 36M.
 1. Finish: Hot dipped galvanized
- C. Plate and Bar: ASTM A 36/A 36M, unless indicated otherwise.
 1. Finish: Hot dipped galvanized
- D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade C, structural tubing.
 1. Finish: Hot dipped galvanized
- E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
 1. Weight Class: as indicated.
 2. Finish: Hot dipped galvanized
- F. Steel Castings: ASTM A 216/A 216M, Grade WCB, with supplementary requirement S11
 1. Finish: Hot dipped galvanized
- G. Steel Forgings: ASTM A 668/A 668M.
 1. Finish: Hot dipped galvanized
- H. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 1. Finish: Plain.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- D. Unheaded Anchor Rods: ASTM F 1554, Grade 36, unless indicated otherwise.
 1. Configuration: Straight.
 2. Nuts: ASTM A 563hex carbon steel.
 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
 5. Finish: Plain.
- E. Threaded Rods: ASTM A 36/A 36M.
 1. Nuts: ASTM A 563hex carbon steel.
 2. Washers: ASTM F 436, Type 1, hardened carbon steel.
 3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M.

2.3 FORGED-STEEL STRUCTURAL HARDWARE

- A. Clevises and turnbuckles: Made from cold-finished carbon-steel bars, ASTM A 108, AISI C1035.
- B. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, AISI C1030
- C. Sleeve Nuts: Made from cold-finished carbon-steel bars, ASTM A 108, AISI C1018

2.4 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/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 1, "Solvent Cleaning." or SSPC-SP 2, "Hand Tool Cleaning." or SSPC-SP 3, "Power Tool Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel 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.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Pretensioned.

- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A 123/A 123M.

1. Fill vent and drain holes that are exposed in the finished work unless they function as weep holes, by plugging with zinc solder and filling off smooth.

2.9 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.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces enclosed in interior construction.

- 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. 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.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections 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 are not accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified 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 existing conditions. Include 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. Baseplates: Clean concrete bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. 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 are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Pretensioned.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

END OF SECTION 051200

SECTION 054000 - COLD-FORMED METAL 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. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing.
4. Roof rafter framing.
5. Ceiling joist framing.
6. Soffit framing.

- B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Cold-formed steel framing materials.
2. Load-bearing wall framing.
3. Exterior non-load-bearing wall framing.
4. Interior non-load-bearing wall framing.
5. Vertical deflection clips.
6. Single deflection track.
7. Drift clips.
8. Roof-rafter framing.
9. Ceiling joist framing.
10. Soffit framing.
11. Post-installed anchors.
12. Power-actuated anchors.
13. Sill sealer gasket.
14. Sill sealer gasket/termite barrier.

- B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Certificates: For each type of code-compliance certification for studs and tracks.
- D. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency .
 1. Steel sheet.
 2. Expansion anchors.
 3. Power-actuated anchors.
 4. Mechanical fasteners.
 5. Vertical deflection clips.
 6. Horizontal drift deflection clips
 7. Miscellaneous structural clips and accessories.
- E. Research Reports:
 1. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
 2. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. 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.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AllSteel & Gypsum Products, Inc.
 2. CEMCO; California Expanded Metal Products Co.
 3. ClarkDietrich.
 4. Consolidated Fabricators Corp.; Building Products Division.
 5. Craco Manufacturing, Inc.
 6. Custom Stud.
 7. Design Shapes in Steel.
 8. Formetal Co. Inc. (The).
 9. Jaimes Industries.
 10. MarinoWARE.
 11. MBA Building Supplies.
 12. MRI Steel Framing, LLC.
 13. Nuconsteel, A Nucor Company.
 14. Olmar Supply, Inc.
 15. SCAFECO Steel Stud Company.
 16. Southeastern Stud & Components, Inc.
 17. State Building Products, Inc.
 18. Steel Construction Systems.
 19. Steel Structural Systems.
 20. Steeler, Inc.
 21. Super Stud Building Products Inc.
 22. Telling Industries.
 23. The Steel Network, Inc.
 24. United Metal Products, Inc.
 25. United Steel Deck, Inc.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
1. Grade: ST33H .
 2. Coating: G60 , A60 , AZ50 , or GF30 .

- B. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 33 .
 - 2. Coating: G60 .

2.3 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0677 inch .
 - 2. Flange Width: 2 inches .
 - 3. Section Properties: As Indicated on Drawings .
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch .
 - 2. Flange Width: 1-1/4 inches .
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0677 inch .
 - 2. Flange Width: 2 inches .
 - 3. Section Properties: As Indicated on Drawings .

2.4 INTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As Indicated .
 - 2. Flange Width: 1-5/8 inches .
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As Indicated, minimum matching steel stud thickness .
 - 2. Flange Width: 1-1/4 inches .
- C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - 1. Minimum Base-Metal Thickness: As Indicated .
 - 2. Flange Width: 1 inch plus the design gap for one-story structures .
- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As Indicated on Drawings .
 - 2. Flange Width: As Indicated on Drawings , minimum.
 - 3. Section Properties: As Indicated on Drawings .

2.6 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As Indicated .
 - 2. Flange Width: 1-5/8 inches , minimum.

2.7 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As Indicated .
 - 2. Flange Width: 1-5/8 inches , minimum.

2.8 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.

3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole-reinforcing plates.
11. Backer plates.

2.9 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
- B. Anchor Bolts: ASTM F1554, Grade 36 , threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C .
- C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC193 ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.
 1. Uses: Securing cold-formed steel framing to structure.
 2. Type: Torque-controlled expansion anchor or adhesive anchor.
 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.
- D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.10 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780/A780M MIL-P-21035B or SSPC-Paint 20.

- B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.
- D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- E. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.11 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, conditions, and abutting structural framing 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 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.
- C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.
- E. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 INSTALLATION OF LOAD-BEARING WALL FRAMING

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: As Indicated on Drawings .
- B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track.
 - 1. Fasten both flanges of studs to top and bottom tracks.
 - 2. Space studs as follows:
 - a. Stud Spacing: As indicated on Drawings .
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
 - 2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically 48 inches . Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INSTALLATION OF INTERIOR NONLOADBEARING WALL FRAMING

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated on Drawings .
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed steel metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - 1. Install solid blocking at 96-inch centers .
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 INSTALLATION OF JOIST FRAMING

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.

2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
 1. Joist Spacing: As indicated on Drawings .
- D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.
 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at smaller intervals of those indicated on drawings or on Shop Drawings. Fasten bridging at each joist intersection as follows:
 1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.7 INSTALLATION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.8 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.9 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Shop fabricated miscellaneous ferrous metal items, galvanized and prime painted, not included in Section 05 12 00, Structural Steel. Items include, but are not limited to, brackets, lintels, ladders, architectural features and similar items as indicated.
- B. Stainless steel metal items such as fascias, shade louvers, countertops and railings, not included in Section 05 12 00, Structural Steel.
- C. Related Sections:
 - 1. Section 05 12 00, Structural Steel Framing

1.2 REFERENCES

- A. American Society of Mechanical Engineers (ASME)
 - 1. ASME B18 Fasteners
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM A36/A36M Carbon Structural Steel
 - 2. ASTM A48/A48M Gray Iron Castings
 - 3. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless
 - 4. ASTM A123 Zinc (Hot-Dip Galvanized) on Coatings on Iron and Steel Products
 - 5. ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 6. ASTM A276 Stainless Steel Bars and Shapes
 - 7. ASTM A283/A 283M Low and Intermediate Tensile Strength Carbon Steel Plates
 - 8. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 - 9. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes
 - 10. ASTM A513 - Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
 - 11. ASTM A563 - Carbon and Alloy Steel Nuts
 - 12. ASTM A653/A 653M Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - 13. ASTM A666 Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar (non magnetic).
 - 14. ASTM D520 - Standard Specification for Zinc Dust Pigment.
 - 15. ASTM A780 - Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - 16. ASTM C1107 - Packaged Dry Hydraulic – Cement Grout (Non-Shrink)
 - 17. ASTM F594 Stainless Steel Nuts
 - 18. ASTM F1554 - Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
- C. American Welding Society (AWS)

1. AWS A2.4 - Standard Symbols for Welding, Brazing and Non Destructive Examination
2. AWS A5.1 - Carbon Steel Covered Arc-Welding Electrodes

D. California Code of Regulations (CCR)

1. Title 8, Chapter 3.2
2. Title 8, Division 1, Subchapter 7, Group 1, Article 4, Section 3277, Fixed Ladders
3. Cal/OSHA, Subchapter 4 Construction Safety Orders
4. Title 24, Part 2, 2010 California Building Code (CBC), Chapter 22A.
5. Title 12, California Fire Code Chapter 26 Welding and Other Hot Work.

E. Steel Structures Painting Council (SSPC)

1. SSPC SP-2 - Steel Preparation

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
2. Structural steel primer paint.
3. Shrinkage-resistant grout.

C. Shop Drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.

1. Fabricator and detailer shall be responsible for coordination of all contract documents for required steel work. Comply with AISC – Code of Standard Practice for Steel buildings and Bridges, Section 4.
2. Indicate welds by standard AWS symbols, Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories distinguishing between shop and field welds, and show size, length, and type of each weld. Include erection drawings, elevations and details where applicable. Indicate welded connections using standard AWS A2.4 Welding Symbols. Indicate net weld lengths.
3. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
4. Where drawings are in conflict, detailing shall not be completed for affected items until the detailer has requested clarification/revision from the Architect and has received written directive for such change as may be required. Request for clarification/revision shall be by RFI or by clouded comment on the initial shop drawing submittal. Fabricator shall be responsible for changes to the shop drawings required where shop drawings have progressed prior to resolution of discrepancies.

5. Detailing shall allow for minor coordination changes and revisions as a part of the contract services.

D. Welder Certifications (in accordance with AWS qualification requirements):

E. Manufacturer's Certificates certifying welders employed on the work have been AWS qualified within the previous 12 months, in accordance with AWS-WHB-1.

F. Written Welding Procedure Specification (WPS)

G. Inspection reports conducted on shop and field High-Strength 'Slip Critical' bolted and welded connections: Include data on type(s) of tests conducted and test results.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following

1. AWS D1.1, Structural Welding Code--Steel.
2. AWS D1.3, Structural Welding Code--Sheet Steel.
3. AWS Certified welders.
4. AWS D1.6, Structural Welding Code--Stainless Steel.

B. Coating applicator - Galvanized Metal Fabrications: Company specializing in hot-dip galvanizing after fabrication and following the procedures in the *Quality Assurance Manual* of the American Galvanizers Association.

1.5 FIELD MEASUREMENTS

A. Verify field measurements prior to submittal of shop drawings and fabrication.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Sections: ASTM A992 for W-Shape sections and ASTM A36 for all other members.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Bending or cold-formed steel ASTM A283, Grade C.

- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars ASTM A240, Type 304, Type 304L, Commercial Grade No. 4 finish, 16 gauge minimum, unless otherwise indicated. Stretcher-leveled standard of flatness for countertops.
- E. Stainless-Steel Bars and Shapes ASTM A276, Type 304L.
- F. Steel Round Structural Tubing ASTM A500, Grade B.
- G. Pipe ASTM A53, Grade B, Type E or S, Schedule 40, galvanized where indicated.
- H. Cast Iron ASTM A48/A48M, Class 30, unless another class is indicated or required by structural loads.
- I. Square and rectangular steel tubing structural, carbon steel conforming to ASTM A500.
- J. Mechanical Tubing: ASTM A 513 hot- or cold-rolled carbon steel for non-structural tubing, electric welded tubing.

2.3 FASTENERS

- A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 and ANSI B18.2.1; and, where indicated, flat washers and ASTM A325 as indicated on drawings.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, nuts and, where indicated, flat washers; ASTM F593/(ASTM F738M) for bolts and ASTM F594/F836M) for nuts, Alloy Group (A1) (A4).
 - 1. Stainless Steel Fastenings and Fittings at Food Preparation areas
 - a. Bolts and screws with countersunk flat heads at interior and exterior visible or accessible surfaces.
 - b. Use concealed fastenings where possible.
- D. Anchor Bolts ASTM F1554, Grade 36.
- E. Machine Screws ASME B18.6.3.
- F. Lag Bolts ASME B18.2.1.
- G. Wood Screws Flat head, carbon steel, ASME B18.6.1.
- H. Plain Washers Round, carbon steel, ASME B18.22.1.
- I. Lock Washers Helical, spring type, carbon steel, ASME B18.21.1.
- J. Threaded rods, steel yokes and plates – ASTM A36.
- K. Self-drilling, self-tapping screws, ASTM C954, galvanized, minimum #10 unless noted otherwise on drawings. By Buildex/Tomarco or equal.

- L. Anchorage Devices, Drilled Expansion Anchors Minimum 5/8-inch diameter with 3 inch embedment unless noted otherwise on drawings. Allowable shear and tension values as permitted in ICC-ES, ESR-1917 Hilti Kwik Bolt TZ Concrete Anchor or Hilti Kwik Bolt 3, ESR-1385 for masonry anchors, by Hilti Inc., Tulsa, OK.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primer Fabricator's rust inhibitive primer suitable for finish scheduled in Section 09 91 00.
- B. Galvanizing Repair Compound for metal to be painted: ASTM D520 Type III, "ultra pure" high purity grade. Touch-Up products for Galvanized Surfaces Ready mixed Zinc rich galvanizing compound, 95% zinc.
 - 1. Finish: ZRC Products Company, Marshfield, MA or equal. Primer for repaired galvanized to receive a painting finish.
- C. Zinc-Based Solders/Alloys for exposed galvanized finish: Solder Zinc Alloy for Repair ASTM A780 Annex A1; Welco Gal-Viz self-fluxing solder alloy, Galvalloy, Galvabar or equal, ASTM A780, paragraph A1. Repair Using Zinc-Based Alloys.
- D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. Welding Materials: AWS A5.1, E70XX for Grade 40, E90XX for Grade 60, type and procedures required by electrode manufacturer for materials being welded.
- E. Grout ASTM C1107, Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 8,000 psi at 7 days; of consistency suitable for application and a 30 minute working time.

2.5 FABRICATION

- A. Fit and shop assemble in largest practical sections for delivery to site.
- B. Ease exposed edges to small uniform radius.
- C. Fabricate items with joints tightly fitted and secured.
- D. Welded Joints. Seal joined members by continuous welds. Dress welded joints, leaving no burrs, or sharp or abrasive corners, edges or surfaces.
 - 1. Where exposed to view in finished, interior and exterior habitable spaces, dress welds in accordance with NOMMA Guidelines for Finish 1.
 - 2. Where exposed to view in utility type spaces and roof tops, dress welds in accordance with NOMMA Guidelines for Finish 2.
 - 3. Where concealed, dress welds in accordance with NOMMA Guidelines for Finish 3.
- E. Exposed Mechanically Fastened Joints. Make exposed, mechanically fastened joints hairline-tight, flush, butt joints. Secure with flush-mount, countersunk, screws or bolts; unobtrusively located; consistent with design of component, except where specifically indicated otherwise.

- F. Provide components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as related metal fabrication, unless expressly indicated otherwise.
- G. Stainless Steel Countertops
 - 1. Fabricate from 0.060-inch, minimum, Type 304 stainless steel sheet
 - 2. Exposed surfaces and edges shall have No. 4 (satin) finish.
 - 3. To the extent practicable, fabricate tops in a single piece for each run of casework. Do not locate needed joints within 30-inches of a sink.
 - a. Factory joints: electrically welded, ground smooth and finished to match exposed top surface.
 - b. Field joints: not permitted within openings and serving areas.
 - c. Fabricate field joints to be mechanically cinched with continuous splines and draw bolts resulting in flat level surfaces and a hairline-tight seam, supported the full length of joint.
 - 4. Fabricate tops to be installed without field cutting or drilling. Take measurements at the Site and coordinate fabrication with related casework.
 - 5. Back and end splashes shall be 4-inches high, unless expressly indicated otherwise, and shall meet horizontal surface of top with integral, coved joint. Form tops and backsplashes from single sheet of metal.
 - 6. Reinforce tops with continuous stainless steel channels welded to the underside along length to prevent twisting, oil canning, or buckling of surface. Reinforce tops at the perimeter of sinks.

2.6 FINISHES

- A. Steel and Iron
 - 1. Clean surfaces of rust, scale, grease and foreign matter prior to finishing. Prepare in accordance with SSPC SP-2. Dress all welds.
 - 2. Galvanize steel items indicated to zinc coating thickness in accordance with ASTM A123, minimum Coating Grade 80 (1.9 oz/sq. ft.). Surfaces shall be free of icicles, spangles and puddling. Provide venting holes at all enclosed sections, "V" notch, and drilled holes are acceptable. Locate to prevent rainwater from entering enclosed sections at exterior galvanized items. For sheet steel items, galvanize per ASTM A653 G60 Coating Designation.
 - 3. Galvanized items to be painted: Do not use quenching solutions or treatments immediately after galvanizing. Refer to individual sections for galvanized items to be painted and to Section 09 91 00.
 - 4. Do not prime surfaces in direct contact with concrete or where field welding is required.
 - 5. For painted surfaces, prime items with two coats in accordance with requirements of primer specified herein and as required to prevent steel items exposed to elements from rusting prior to application of finishes.
- B. Stainless Steel Finishes
 - 1. Remove tool and die marks and stretch lines or blend into finish.

2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of individual pieces, except adjacent lapped or abutted pieces that form a larger panel shall have the grain running in the same direction as directed by Architect.
3. Bright, Directional Satin Finish No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Allow for erection loads and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on shop drawings.
 1. Weld joints using shielded metallic electric arc (SMAW) method. Use coated welded rods, not fluxed, or type recommended by manufacturer for use with parent metal. Use only certified welders for structural construction.
 2. Grinding: Grind welds on surfaces subject to traffic or contact to smooth flush joints (prior to galvanizing or priming).
 3. Peening: Remove flux and weld spatter as necessary to eliminate unsightly conditions and grind off sharp projections.
 4. Permanently Concealed Welds: No treatment required other than preparation for painting or galvanizing.
- D. Perform field welding in accordance with AWS standards and procedures for metal alloy welded.
- E. Obtain Architect approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions and surfaces not shop primed or that are damaged during erection, except surfaces to be in contact with concrete.

- G. Repair of Galvanized Surfaces to be Painted: Ready mixed, zinc-rich galvanizing compound, ASTM D520, ASTM A780 - A2. Repair Using Paints Containing Zinc Dust, minimum thickness 5 mils.
- H. Repair of Galvanized Surfaces to be Exposed: ASTM A782 Annex A1, apply Gal-Viz while metal is still hot. Tin surface with Gal-Viz with wire brush. Do not direct flame on alloy. Minimum thickness, 5 mils.

3.4 ERECTION TOLERANCE

- A. Maximum Variation From Plumb: 3/16 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 3/16 inch, non-cumulative.

3.5 FINISHES

- A. Paint with Gloss Polyurethane High Performance Coatings in Special Coatings per Section 09 91 00 Painting.

3.6 SCHEDULE

- A. Schedule is a list of principal items only. Refer to Drawing details and other specification sections for items not specifically scheduled including various miscellaneous steel angles pipes, threaded rods, tubes and similar shapers used for brackets, clips and supports for various items located throughout.
- B. Fasteners: Provide sufficient fasteners and connectors of approved types, whether indicated or not for solid secure attachment and installed in straight lines of uniform pattern. Match finish of steel unless otherwise indicated.
- C. Interior Vertical Access Ladder: as detailed in drawings for field painting.
- D. Steel Backing Plates 1/4 inch thick x widths and lengths required to support wall bumper, plumbing fixture hanger, equipment and as detailed. Cope wood studs and screw plates flush to surface with No. 14 x 2 1/2" wood screws at top and bottom of each stud (16" o.c. max.).
- E. Railing and Handrails as detailed:
 - 1. Galvanized Finish steel pipe and brackets at exterior stairs, ramps and landings where indicated in drawings.
 - 2. Steel pipe guardrails primed for field painting at interior stairs, ramps and landings where indicated in drawings.
- F. Stainless Steel fabrications: 16 gauge Countertops from formed sheet metal and 16 gauge stainless steel wall armor and corner guards. Profiles, shapes, and sizes as indicated in drawings.
- G. Steel brackets and supports for counter tops as detailed.
- H. Steel framing and support for plumbing, mechanical and/or electrical equipment.

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METAL FABRICATIONS
SECTION 055000 - 9

END OF SECTION 055000

SECTION 061900 - MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Framing with dimension lumber (also see Section 06 10 00).
 2. Rooftop equipment bases and support curbs.
 3. Wood blocking, cants, and nailers.
 4. Wood furring and grounds.
 5. Wood sleepers.
 6. Installation of Interior wood trim and plywood paneling not specified elsewhere.
 7. Plywood backing panels.
 8. Installation of Finish Door Hardware furnished by others.
 9. Wood backing for wall & ceiling mounted fixtures & equipment.
 10. Finish plywood paneling.
- B. Related Sections include the following:
1. Division 06 Section 06 10 00 "Rough Carpentry" for structural framing material and procedures which take precedence over requirements of section 06 19 00 in case of conflict.
 2. Division 06 Section 16 40 00 "Interior Architectural Woodwork" for Interior Woodwork and cabinetry.

1.2 REFERENCES

- A. FSC – Forest Stewardship Council Principles and Criteria.
- B. ANSI/ASME B18.6.1

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
 2. NHLA: National Hardwood Lumber Association.
 3. NLGA: National Lumber Grades Authority.
 4. WCLIB: West Coast Lumber Inspection Bureau.
 5. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with

- requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
- 1. Preservative-treated and Fire-retardant treated wood.
 - 2. Power-driven fasteners.
 - 3. Powder-actuated fasteners.
 - 4. Expansion anchors.
 - 6. Metal framing anchors.

1.5 QUALITY ASSURANCE

- A. Erector Qualifications: All work to be organized and directed by an experienced, competent carpentry supervisor; and performed by skilled workers experienced with similar work for public school projects.
- B. Requirements of Regulatory Agencies, Codes: Conform to 2013 CBC, Part 2. Chapter 23, and 2005 ANSI/AF & PA NDS.
- C. Allowable Tolerances; Framing Alignment: 3/16" maximum permissible variation from true plane measured from 10' straight edge; 1/8" maximum variation between any two adjacent framing members.
- D. Source Quality Control; Grade Marks: Identify all lumber and plywood by official grade mark of an approved agency.
- E. Standards
 - 1. Grading: In accordance with Section 06 10 00.
 - 2. Preservative Treatment
 - a. CBC, 2303 1.8 based on various Standard Specifications of American Wood Preservers Bureau (AWPB); Quality Mark by Association approved Agency. AWPA, Standard U1 and M4. Preservative shall be listed in Section 4 of AWPA U1.
- F. All Plywood shall be free of urea-formaldehyde binders and adhesives.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.
- C. Certified wood shall be kept separate from non-certified wood. Auditing process as mandated by certifiers shall be complied with.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete within 8" of exposed soil or exposed to weather.

2.3 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent.
- B. Non-Load-Bearing Interior Partitions: No. 2 grade or better of any species.
- C. Other Framing: No. 2 grade and any of the following species:
 - 1. Douglas fir-larch; WCLIB or WWPA.
 - 2. Spruce-pine-fir; NLGA.
 - 3. Hem-fir; WCLIB or WWPA.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.

2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Grounds.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species, at time of installation unless indicated otherwise.
- C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 INTERIOR WOOD TRIM AND PLYWOOD PANELING

- A. General: Provide kiln-dried finished (surfaced) material without finger-jointing, unless otherwise indicated.
- B. Lumber Trim for Opaque (Painted) Finish: Either finger-jointed or solid lumber, of one of the following species and grades:
1. Grade Finish eastern white pine; NeLMA or NLGA.
- C. Plywood Paneling: 5/8" ACX Birch Veneered or as indicated on drawings.

2.6 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

- A. General: Where structural-use panels are indicated for the "following concealed types of applications," provide APA-performance-rated panels complying with requirements of specification Section 06 10 00 and as designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).
1. Thickness: Provide panels meeting requirements specified but not less than thickness indicated.
 2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30,"APA Design/Construction Guide: Residential & Commercial."

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements of specification section 06 10 00 and as specified in this Article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 2. Fasteners shall be installed with proper means and methods, in properly sized holes and locations as detailed.
 3. Nails for attachment of plywood or OSB wall sheathing to sill plates on concrete slabs and footings at or within 8" of exposed soil shall be hot-dipped zinc coating per ASTM A153.
- B. Nails, Brads, and Staples: ASTM F 1667.
1. All nails shall be Common Wire Nails unless otherwise specified. Box, casing or other nails shall not be used unless specifically referenced.

2. Nails, Spikes and Staples: Section 2304.9 CBC, Galvanized for exterior exposed applications, high humidity locations and installation into treated wood; plain finish for other interior and protected locations; size and type to suit application and as specified. Comply with Table 2304.9.1 unless detailed otherwise. Use common nails only.
- C. Powder-Driven Fasteners: ICC ESR-2269.
1. HILTI X-U drive pins of lengths indicated for application required. Designated lengths shall be verified with the supplier for proper application prior to installations.
- D. Wood Screws: ASME B18.6.1.
1. Connecting wood to wood: Wood screws shall be pre-drilled. The lead hole receiving the shank shall be no more than 7/8 of the shank diameter. The lead hold receiving the threaded portion shall no more than 7/8 the diameter of the shank at the threaded portion. Wood screws shall not have upset threads. Decking screws are not allowed. Soap or other lubricant may be used on wood screws to facilitate insertion.
 2. Connecting plywood to light gauge steel: Self-drilling, flat Phillips head, zinc-plated steel screws.
 3. Connecting plywood to steel shapes: Thread cutting, flat Phillips head, zinc-plated steel screws with blunt points and tap-fluted pilots.
- E. Lag Bolts: ASME B18.2.1. – A 307. See structural drawings for lead hole requirements.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and flat washers to all wood surfaces at heads and nuts.
- G. Fasteners: Expansion type or powder actuated type for anchorage to solid masonry or concrete. Refer to Division 01, General Requirements for acceptable types and required testing. Where installation and torque verification of wedge-type anchors is inspected by the IOR, testing of anchors will not be required unless directed by the SEOR for structural tension applications.
- H. Machine-Driven Nailing Approval Procedure:
1. Should Contractor wish to use machine-driven nailing, he shall make specific written request, prior to beginning nailing work, for approval of exact fasteners, equipment, and methods proposed.
 2. Request will be reviewed by Architect/Engineer and Division of the State Architect (DSA).
 3. Approval, if given, will be in writing, subject to satisfactory field performance.
 - a. Use of machine nailing is subject to a satisfactory job-site demonstration for each Project and approval by Architect or Structural Engineer and DSA. The approval is subject to continued satisfactory performance. Machine nailing will not be approved in 5/16" plywood. If nail heads penetrate the outer ply more than would be normal for a hand hammer or if minimum allowable edge distances are not maintained, the performance will be deemed unsatisfactory.
- I. Metal Framing Anchors:
1. General: provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:

- a. Standard manufactured, stamped or formed steel, galvanized; types indicated for specific uses; complete with nails.

2.8 MIXES – DRYPACK /GROUT

- A. Mix Proportions: One part Portland cement, 1-1/2 parts sand.
- B. Mixing: With sufficient water to make a stiff mixture, which can be molded, into a sphere.
- C. Strength: Minimum 5,000 psi compressive strength.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Do not splice structural members between supports, unless otherwise indicated.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- E. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities of wood framed construction as indicated and as follows:
 1. Fire block concealed spaces of wood-framed walls and partitions at not more than 120 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
- F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 1. Use inorganic boron for items that are continuously protected from liquid water.
 2. Use copper naphthenate for items not continuously protected from liquid water.

- H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. HILTI for powder-driven fasteners, Type X-DN1 for sill plate to concrete.
 - 2. Table 2304.9.1, "Fastening Schedule," in the California Code of Regulations, 2013 California Building Code.
- I. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated. Nail heads may be flush with plywood surface but shall not penetrate the second lamination layers.

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 ALIGNMENT

- A. On framing members to receive a finished surface, align the finish subsurface to vary not more than 1/8" from the plane of surfaces of adjacent furring and framing members.
- B. Provide solid furring strips of plywood (or hardboard where less than 1/4" thick) over framing member as required to match differing thicknesses of framing members where installing new framing in existing walls and/or to provide flush finished surfaces.

3.4 WOOD TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.
 - 1. Match color and grain pattern across joints.
 - 2. Install trim after gypsum board joint-finishing operations are completed.
 - 3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads and fill holes.
 - 4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
- B. Install plywood paneling full length, in the vertical direction.
 - 1. Fasten with 8d finish nails @ 6" o.c. edges and 12" o.c. in field.

2. Provide horizontal blocking @ top of panel for nailing of paneling and drywall, and provide full length vertical blocking for all vertical joints of paneling.

3.5 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

3.6 FINISH HARDWARE INSTALLATION

- A. This section is applicable to the installation of finish hardware where not specifically covered by other specification sections for the doors and/or frames upon which hardware is to be installed.
- B. Site verification of conditions:
 1. Prior to the execution of the work under this specification section, inspect the installed work executed under other specification sections of this Project Manual which affect the execution of the work under this specification section.
 2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 3. Execution of work under this specification section shall constitute acceptance of existing conditions.
- C. Coordination:
 1. Coordinate the work under this specification section with work specified under other specification sections prior to walls and ceilings being closed in with finish materials to ensure proper and adequate interface of work specified under this specification section.
 - a. Coordinate electrical power needs for those hardware items requiring electrical interface.
 - b. Coordinate electrical alarm needs (security, fire/smoke detection) for those hardware items requiring electrical alarm interface.
 2. Obtain all required hardware templates.
- D. Surface preparation:
 1. Prepare surface in accordance with manufacturer's instructions and recommendations.
 2. Coordinate the blocking required for all wall mounted hardware.
 3. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.), which could impair bond of materials specified within this section.
- E. Installation:
 1. Install in accordance with manufacturer's instructions and recommendations unless specifically noted otherwise.

- a. Hardware distributor shall assist and advise installer in correcting field problems arising during installation of hardware.
 - b. Hardware distributor shall be on Project within 48 hours upon being notified by the Contractor.
 - c. Hardware distributor shall assist installer in the proper adjustment of all door closers, and other operating devices.
 2. Install in accordance with approved shop drawings.
 3. Install in accordance with regulatory requirements including latest edition of California Disabilities Act Guidebook (CalDAG).
 4. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by the Architect.
 - a. Steel Doors and Frames: "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames: by the Door and Hardware Institute.
 - b. CBC Chapter 11B and Cal DAG, latest version.
 - c. Door opening devices shall be installed at 30" minimum to 44" maximum height.
 5. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where indicated and where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections.
 - a. Do not install surface-mounted items until finishes have been completed on the substrate involved.
 6. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
 7. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
 8. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 Section "Sealants and Caulking."
 9. Weather-stripping and seals shall comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.
- F. Field Quality Control Inspection:
1. Contractor shall inspect all hardware to assure that is was installed correctly and is in proper working order.
 2. The Contractor shall schedule an inspection prior to substantial completion, and notify the Owner's Inspector and any regulatory agencies of the time 48 hours prior to the inspection.
 - a. The inspection shall cover checking all locks and verifying that they have been installed in accordance with the hardware schedule and the keying schedule.
- G. Adjusting:
1. Adjust and check each operating item of hardware and each door to ensure proper operations or function of every unit.
 - a. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
 - (1) Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation

during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area.

- (2) Clean operating items as necessary to restore proper function and finish of hardware and doors.
- (3) Adjust door control devices to compensate for final operations of heating and ventilating equipment.

H. Cleaning:

1. Clean in accordance with Specification Sections 01 74 00 – Cleaning and 01 77 00 – Project Closeout.
2. Clean any adjacent soiled surfaces by hardware installation immediately.
3. Finish shall be clean and ready for the application of any additional finishes.

I. In accordance with Specification Section 01 77 00 – Project Closeout.

1. Provide the services of a factory-authorized service representative to demonstrate and train Owner's maintenance personnel as specified below.
 - a. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

END OF SECTION 061900

SECTION 064000 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
 - 2. Wood and Plastic-laminate cabinets.
 - 3. Plastic-laminate and solid surface countertops.
 - 4. Closet and Utility Shelving.
 - 5. All Cabinet hardware for complete and proper operation.
 - 6. Provide Woodwork Institute certification of all new cabinetry.
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for metal supports for installing woodwork.
 - 2. Division 06 Section "Miscellaneous Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
 - 3. Division 08 Section "Pre-Finished Wood Doors" for wood doors and wood frames.
- C. Cabinet Locks:
 - 1. Provide locking hardware for cabinetry doors and drawers as indicated by the schedule at the end of the section.

1.2 REFERENCES

- A. California Title 17 Division 3 Subchapter 7.5 Air Bourne Toxic Control Measures, Section 93120.1 through 93120.12.
- B. SCAQMD – South Coast Air Quality Management District Regulations Rule 1168 Adhesive and Sealant Applications.
- C. SJVAPCD – San Joaquin Valley Air Pollution Control District regulations.
- D. FSC – Forest Stewardship Council Principles and Criteria.
- E. Green Seal Standard GS-36, Commercial Adhesives.
- F. CHPS Low-emitting Materials list (http://ww.chps.net/manual/lem_table.htm).
- G. Greenguard Children and Schools (<http://www.greenguard.org/>).

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including hardwood veneers, cabinet hardware and accessories and finishing materials and processes.
- B. Product Data: For high-pressure decorative laminate, adhesive for bonding plastic laminate, cabinet hardware and accessories, and finishing materials and processes.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 2. Show locations and sizes of cutouts and holes for plumbing fixtures faucets and other items installed in architectural woodwork.
 - 3. Apply WI-certified compliance label to first page of Shop Drawings.
- D. Samples for Initial Selection:
 - 1. Shop-applied transparent finishes.
 - 2. Shop-applied opaque finishes.
 - 3. Plastic laminates.
 - 4. PVC edge material.
 - 5. Thermoset decorative panels.
- E. Samples for Verification: (following final color selection):
 - 1. Lumber and panel products with shop-applied opaque finish, min. 12" long x width of material for lumber and 8 by 10 inches for panels, for each finish system and color, with 1/2 of exposed surface finished.
 - 2. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with 1 sample applied to core material with specified edge material applied to 1 edge.
 - 3. Thermoset decorative-panels, 8 by 10 inches, for each type, color, pattern, and surface finish.
- F. Product Certificates: For each type of product, signed by product manufacturer.
- G. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.
- H. Qualification Data: For fabricator.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that 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. Shop is a licensee of WI's Certified Compliance Program.
- B. Installer Qualifications: Fabricator of products Licensee of WI's Certified Compliance Program.
- C. Quality Standard: Unless otherwise indicated, comply with WI's "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide WI-certified compliance labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified. Provide shop preliminary inspection prior to delivery and in-place inspection following installation. Contractor shall pay all WI inspection/certification fees including follow-up of deficiencies.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is 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 woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: Provide AA white maple, plain sliced and of uniform color and grain pattern, or other equivalent species/grade as selected by Architect.
- C. Wood Species for Opaque Finish: Any closed-grain hardwood.
- D. Wood Products: Comply with the following:
 1. Hardboard: AHA A135.4.

2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 3. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
 4. Softwood Plywood: DOC PS 1.
 5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
- E. Thermoset Decorative Panels: At concealed locations only, it is acceptable to use particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semi-exposed edges that match color and pattern of interior faces.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard at interior concealed and semi-exposed surfaces only, as indicated in drawings.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - a. Formica Corporation.
 - b. Nevamar Company, LLC; Decorative Products Div.
 - c. Wilsonart International; Div. of Premark International, Inc.
- G. Solid Surface Counters and Facing as indicated in drawings: Cut, formed, built-up and machined to shapes and dimensions indicated in drawings and in accordance with manufacturer's recommendations.
1. Quartz Surfaces: $\frac{3}{4}$ " thickness, color as selected by Architect. Submit full line from 3 manufacturers.
- H. Glass counters, supports, shelving and related accessories, attachments etc. as indicated: Provided by Division 8 Section, Glazing. Coordinate for fit and attachment.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. Provide hardware as indicated on the Drawings and as listed in the Architectural Woodwork Standards, but no less than the following: (all hardware, where exposed to view) must be finished in a Brushed Chrome (Verify prior to ordering)
1. Adjustable shelf standards and supports: Flush mounted
 - a. LD 32mm line boring system 5 mm pins (under 32" wide).
 - b. Knappe and Vogt/No. 255 with No. 256 supports (shelving 32" and wider).
 - c. Provide earthquake pins in back row or notch shelves.
 - d. 32 MM drilled hole system with steel pin shelf supports.
 2. Cabinet Hinges: Minimum 160° opening. Hinge type as selected by Owner & Architect.
 - a. Rockford Process Control (RPC) or approved equal/5 Knuckle Hinges of wrap-around or overlay/specialty configuration to suit conditions for minimal exposure as approved by Owner.
 - b. Frameless concealed hinges (European Type): BHMA A156.9, B01602, self-closing, adjustable.
 3. Cabinet Pulls: Wire type, 3 $\frac{1}{2}$ " center to center, Brushed Chrome.
 - a. Baldwin Hardware manufacturing Corp./No. 4674

- b. Stanley hardware/No. 448 3 ½"
 - c. The Engineered Products Co./No. MX-4023.5
 - d. Amerock BP-867
 4. Drawer Slides: Full extension, 100 lb. capacity type with ball bearing steel rollers.
 - a. Grass 6610
 - b. Knappe and Vogt/No. 1429
 - c. Accuride 3832 (3834 at file drawers) – preferred product.
 5. Door and Drawer Locks (with pin tumblers):
 - a. Door and drawer locks shall be National C-8173-915KA-26D and C-8178-915KA-26D respectively.
 6. Elbow Catches for inactive door at pair:
 - a. Bradley Co. No. 2a-92 Ives A10
 7. Cabinet Door Latch System:
 - a. Magnetic Catch: KV-916 (KV-918 on wardrobe doors).
 - b. Friction Catch: 2120 FlexaCatch by Bainbridge.
 - c. Slide Bolt: Surface Bolt by Quality Hardware.
 8. Chain Bolts:
 - a. Stanley 1055 3"
 9. Flipper Door Slide: Install with appropriate bumpers and bearings so as door is not adversely affected by operation nor does the hardware contact the face of the door.
 - a. Grant #513
 - b. Accuride #113 – preferred product
 10. Label holders indicated)
 - a. Brainerd 0736 – B.P.
 11. Lock number tag
 - a. MCS 89602
 12. Wardrobe Hanger Rod
 - a. Hettich oval 2mm x 15mm nickel plated w/009-033 sockets injection molded Plastic Cable Grommet (hole cover) Hafele America Co./No 429-99 series 40mm with outer ring and cover other as available.
 13. Toe Kicks (door mounted) at wheelchair accessible, knee space doors.
 - a. PF Toe Kick (Sunbelt Displays, 1-888-999-7003) with setback to match cabinets for adhesive attachment of rubber topset base to be provided by flooring contractor.
 14. Glass Door Lock:
 - a. KV 965 (opening size under 16 square ft.).
 - b. National C-8140 Pin Tumbler (opening size 16 square ft. or larger).
 15. Sliding Glass Door Track:
 - a. KV 1092 (opening size under 16 square ft.).
 - b. KVP-992 roll easy (opening size 16 square ft. or larger).
 16. Support (Glass Shelves): KV #256-R or LD-KV348.
 17. Sliding Glass Door Pull: KV #831 or Mepla 70.1.
 18. Counter Top Hinge--Soss #204.
- B. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
1. Product: Subject to compliance with requirements, provide "OG series" by Doug Mockett & Company, Inc.
- C. Exposed Hardware Finishes: Brushed chrome or as otherwise indicated or selected by Architect.

- D. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 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 nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) or other latest adopted regulations:
 - 1. Wood Glues: 30 g/L.
 - 2. Contact Adhesive: 250 g/L.
- E. Adhesive for Bonding Plastic Laminate: Resorcinol, unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive.

2.4 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard except provide Premium grade at hardwood veneer cabinets and at laminated plastic casework with visible/open interiors. Construct all floor supported cabinets with integral base/toe kick.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- D. 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.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, 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.
 - 1. Seal edges of openings in countertops with a coat of varnish and waterproof sealant.

2.5 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Grade: Premium.
- B. Wood Species and Cut: White Maple, plain sliced, no knots.
- C. For trim items wider than available lumber, use veneered construction. Do not glue for width.
- D. Backcut or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- E. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.6 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Grade: Custom.
- B. Wood Species: Any closed-grain hardwood.
- C. Backcut or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- D. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.7 PLASTIC-LAMINATE CABINETS (only where indicated)

- A. Grade: Custom, with upgraded requirements as indicated.
- B. WI Type of Cabinet Construction: Flush overlay.
- C. WI Construction Style: Style A, Frameless.
- D. WI Construction Type: Type I, multiple self-supporting units rigidly joined together.
- E. WI Door and Drawer Front Style: Flush overlay.
- F. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS, Nominal 0.048".
 - 2. Post-formed Surfaces: Grade HGP, Nominal 0.039".
 - 3. Vertical Surfaces: Grade HGS, Nominal 0.048".
 - 4. Edges: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish. Door and drawer edges to be 3 mm solid color PVC as selected by Architect.
 - 5. Color, Pattern & Finish: Match adjacent existing cabinetry or be complimentary to it.
- G. Materials for Semi-exposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.

- a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
 - b. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
 2. Drawer Sides and Backs: Thermoset decorative panels, 1/2" thick.
 3. Drawer Bottoms: Thermoset decorative panels, 1/2" thick.
- H. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High- pressure decorative laminate, Grade BKL.
- I. 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 selected by Architect from laminate manufacturer's full range of colors, patterns and finishes.
- J. All open shelving and other cabinets shelving more than 30" wide shall be full 1" thick plastic laminate faced plywood (no particle board or melamine).

2.8 PLASTIC-LAMINATE COUNTERTOPS & SPLASHES (only where indicated)

- A. Types and sizes:
1. Shop fabricate countertops and splashes to the types and dimensions shown on the Drawing. Custom Grade.
 2. In wet areas where splashes are called for, provide 4" or higher (as noted) covered splash and square edges unless noted otherwise. Verify all edge types with Architect prior to fabricating. Where required to not interfere with electrical outlet locations, increase height of backsplash up to 10" as directed by Architect at no additional cost to eliminate interference problems.
- B. High-Pressure Decorative Laminate Grade: HGP, Nominal .048".
- C. 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 manufacturer's designations.
 2. Match Architect's sample.
 3. As selected by Architect from manufacturer's full range of colors, patterns and finishes.
- D. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- E. Core Material: Particleboard made with exterior glue.
- F. Core Material at Sinks: Minimum 5-ply plywood made with exterior glue.
- G. Paper Backing: Provide paper backing (adhered and sealed) on underside of countertop substrate.

2.9 CLOSET AND UTILITY SHELVING

- A. Grade: Custom.
- B. Shelf Material: Full 1-inch thermoset decorative panel with PVC or polyester edge banding on plywood (no particle board).

- C. Cleats: 3/4-inch thermoset decorative panel.
- D. Opaque Finish:
 - 1. Grade: Custom.
 - 2. WI Finish System 2: Water-reducible acrylic lacquer.
 - 3. Color: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

2.10 HARDWOOD CABINETS, TOPS & COMPONENTS

- A. Grade: Premium
- B. Provide as indicated in Contract Documents with shop applied transparent finish in accordance with Division 9 Section "Painting".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and back priming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to concrete, metal strapping or wood blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated. Comply with anchorage details in drawings.
- F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Stagger joints in adjacent and related standing and running trim.

2. Cope at returns and miter at corner to produce tight-fitting joints with full surface contact throughout length of joint.
 3. Use scarf joints for end to end joints.
 4. Match color and grain pattern across joints.
 5. Install trim after gypsum board joint-finishing operations are completed.
 6. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads and fill holes with wood putty matching wood surface, and sand smooth.
 7. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 8. Install wall railings on indicated metal brackets securely fastened to wall framing.
 9. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- G. Cabinets: Install without distortion so doors and drawers fit openings properly 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.
1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 2. Maintain veneer sequence matching of cabinets with transparent finish.
 3. Fasten wall cabinets through back, near top and bottom, within 3" of cabinet ends and not more than 12 inches o.c. with No. 14 wafer-head screws sized for 1-inch penetration min. 16 GA. Steel strapping or 1-1/2-inch penetration into wood framing, blocking, or hanging strips. Anchors into concrete walls/curbs/floors shall be 3/8" dia. Hilti Kwik Bolt TZ or Simpson Strong-Bolt 2 expansion bolts with 2" embedment.,
- H. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop. Anchor solid surface tops with low voc adhesive.
1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 3. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
- I. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- J. Refer to Division 09 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.
- 3.3 ADJUSTING AND CLEANING
- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
 - B. Clean, lubricate, and adjust hardware.

- C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 CABINET LOCK SCHEDULE:

- A. Provide locks at doors and drawers as described elsewhere in this section at the following locations (verify specific door/drawers w/Owner):

As indicated on drawings.

END OF SECTION 064000

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cold applied water based emulsified asphalt dampproofing for exterior below grade foundations.
 - 2. Cold applied water based emulsified asphalt vapor retarding coating for exterior above grade planter walls.
- B. Related Sections:
 - 1. Section 03 30 00 - Cast-in-Place Concrete.

1.2 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide material complying with the following requirements:
 - 1. Nonflammable.
 - 2. VOC Content:
 - a. 0.25 pounds per gallon (30 g/L) less water and exempt solvents.
 - 3. Service Temperature Range:
 - a. Minus 40 degrees F (Minus 40 degrees C) to 150 degrees F to (66 degrees C).
 - 4. Compliance:
 - a. Brush, roller and spray applied fiber free Hydrocide 600 complying with ASTM D1187, Type 1, and ASTM D1227, Type 3, Class I.
 - b. Brush, roller and spray applied short fiber reinforced Hydrocide 700B complying with ASTM D1227, Type 2, Class I, and ASTM D1187, Type 1.

1.3 SUBMITTALS

- A. Comply with Section 01 33 00.
- B. Product Data: Submit manufacturer's technical bulletins and MSDS on each product.
- C. Submit list of project references as documented in this Specification under Quality Assurance Article. Include contact name and phone number of person charged with oversight of each project.
- D. Quality Control Submittals:
 - 1. Provide protection plan of surrounding areas and surfaces not to receive dampproofing.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer Qualifications: Company with minimum 10 years of experience in manufacturing of specified products and systems.

2. Applicator Qualifications: Company with minimum of 5 years experience in application of specified products and systems on projects of similar size and scope, and is acceptable to product manufacturer.
- 1.5 DELIVERY, STORAGE, AND HANDLING
 - A. Comply with Section 01 61 00,
 - B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
 - C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - D. Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.
 - 1.6 PROJECT CONDITIONS
 - A. Environmental Requirements:
 - a. Keep from freezing in the container.
 - b. Do not apply at temperatures below 40 degrees F (4 degrees C) or when temperatures are expected to fall to 40 degrees F (4 degrees C) within 24 hours.
 - c. Protect from rain until coating has set.
 - d. Application shall be protected or covered within 7 days of application.
 - e. Do not expose to long-term UV.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products from the following manufacturer:
 1. BASF Building Systems
889 Valley Park Drive

Shakopee, MN 55379

Customer Service: 800- 433-9517

Technical Service: 800-243-6739

Direct Phone: 952-496-6000

Internet: <http://www.BASFbuildingsystems.com>
- B. Substitutions: Comply with Section 01 25 00.
- C. Specifications and Drawings are based on manufacturer's proprietary literature from BASF Building Systems. Other manufacturers shall comply with minimum levels of

material, color selection, and detailing indicated in Specifications or on Drawings. Architect will be sole judge of appropriateness of substitutions.

2.2 MATERIALS

- A. Cold applied water based emulsified asphalt:
 - 1. Non-fibrated Product: Hydrocide 600 by BASF Building Systems.
 - 2. Short-fiber Fibrated Product: Hydrocide 700B by BASF Building Systems.
- B. Protection Board: Asphalt coated fiberboard with top edge fully coated.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Protect adjacent Work areas and finish surfaces from damage during damproofing application.
- B. Surface should be free of oil, grease, dirt, laitance, and loose material. Dry surfaces shall be dampened with water and kept damp until application.

3.2 APPLICATION

A. EXTERIOR SURFACES BELOW GRADE

- 1. 3-Coat System:
 - a. Apply prime coat of asphalt emulsion of Hydrocide 600 non-fibrated material, cut 20 percent by volume with clean water. Allow prime coat to dry tacky to touch and apply 1 coat of short fiber fibrated material.
 - b. Fill in crevices and grooves, providing continuous coating and free from breaks and pinholes. Carry coating over exposed top and outside edge of footing. Spread around joints, grooves, and slots, and into chases, corners, reveals, and soffits. Bring coating to finished grade.
 - c. Second Coat: Within 24 hours, apply Hydrocide 700B at rate of one gallon per 35 SF. Allow to dry tacky to touch.
 - d. Third Coat: Within 24 hours, apply Hydrocide 700B same as second coat. Allow at least 48 hours, but no more than 96 hours before backfilling.
 - e. Place backfill at least 24 to 48 hours after application, but within 7 days. Do not rupture or damage film or displace coating or membranes.
- B. At walls against building areas install below grade protection board immediately following curing of final coat of Hydrocide 700B. Do not allow dirt, rocks or debris between damproofing membrane and protection board. Locate top edge of protection board 1" to 2" below finish grade of earth at face of wall.

3.3 CLEANING

- A. Clean tools and equipment immediately with hot, soapy water. Cured material can be removed with solvent.
- B. Clean up and properly dispose of debris remaining on Project site related to application.

- C. Remove temporary coverings and protection from adjacent Work areas.

3.4 PROTECTION

- A. Protect application from damage during construction.

END OF SECTION 071113

SECTION 071313 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Modified bituminous sheet waterproofing for installation below roofing, sheet metal and plaster assemblies where indicated.
 - 2. Coordinate installation of self-adhering sheet waterproofing with installers of adjacent finisher and sheet metal flashing,

1.2 SUBMITTALS

- A. Product data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- C. Samples: For the following products:
 - 1. 12-by-12-inch square of waterproofing and flashing sheet.
- D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.
- G. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that is acceptable to waterproofing manufacturer for installation of waterproofing required for this Project.
- B. Source Limitations: Obtain waterproofing materials through one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- C. Maintain adequate ventilation during preparation and application of waterproofing materials.

PART 2 - PRODUCTS

2.1 SHEET WATERPROOFING

- A. Rubberized Asphalt Sheet: Not less than 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to a 8-mil-thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
 - 1. Products: Grace Perm-A-Barrier Wall Flashing:

2. Physical Properties:
 - a. Tensile Strength: 800 psi minimum; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: 200 percent minimum; ASTM D 412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
 - d. Puncture Resistance: 80 lbf minimum; ASTM E 154.
 - e. Hydrostatic-Head Resistance: 150 feet minimum; ASTM D 5385.
 - f. Water Absorption: 0.10 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
 - g. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.
3. Provide at all exterior wall door, window, louver openings and miscellaneous wall penetrations.

2.2 ROOF UNDERLAYMENT WATERPROOFING

- A. Butyl Rubber Sheet: Not less than 30-mil- thick, cold applied, self-adhering sheet consisting a high density, cross laminated, polyethylene on one side with a butyl rubber adhesive film with release liner on adhesive side. Polyethylene surface is embossed slip resistance. Material is formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Products: Grace Ultra Underlayment:
2. Physical Properties:
 - a. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: 250 percent minimum; ASTM D 412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
 - d. Adhesion to plywood 3.0 lbs./in width ASTM D903.
 - e. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.
 - f. Service Temperature: 300 degrees F per ASTM D1204.
3. Provide below all metal roofing, edge flashing, valley, hip & ridge flashing and cap flashing as noted on drawings.

2.3 ROOF UNDERLAYMENT WATERPROOFING

- A. Butyl Rubber Sheet: Not less than 40-mil- thick, cold applied, self-adhering sheet consisting a high density, cross laminated, polyethylene on one side with a butyl rubber adhesive film with release liner on adhesive side. Polyethylene surface is embossed slip resistance. Material is formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
 - 1. Products: Grace Ice & Water Shield HT Underlayment:
 - 2. Physical Properties:
 - a. Tensile Strength: MD 33 I6/IN CD 31 16/IN; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: 250 percent minimum; ASTM D 412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
 - d. Adhesion to plywood 5.0 lbs./in width ASTM D903.
 - e. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.
 - f. Service Temperature: 300 degrees F per ASTM D1204.
 - 3. Provide below all metal roofing, edge flashing, valley, hip & ridge flashing and cap flashing as noted on drawings.

2.4 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of sheet waterproofing material.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.
- D. Substrate Patching Membrane: Low-viscosity, two-component. asphalt- modified coating.
- E. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.

- F. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present for compliance with requirements and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application. Obtain IOR inspection and acceptance of structural plywood decks and shear panels prior to beginning membrane installation.
- B. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- C. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM 0 4258.
- D. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
 - 1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:

- E. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 SHEET AND UNDERLAYMENT WATERPROOFING APPLICATION

- A. Install waterproofing sheets and underlayment according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135. Provide sheet waterproofing over sheathed exterior walls that are outward sloped for protection of the sheathing below plaster assemblies and in conjunction with sheet metal flashing at all wall openings and terminations. Provide roof underlayment waterproofing below all sheet metal roofing, roof flashing and roof caps.
- B. Apply primer to required substrates at required rate and allow to dry. Limit priming to areas that will be covered by waterproofing in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 3-1/2-inch- minimum side lap widths and 6" minimum end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.
 - 1. When ambient and substrate temperatures range between 25 and 40deg F, install self-adhering, modified bituminous sheets produced for low temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
- D. Horizontal Application: Apply sheets from low point to high point of roof decks to ensure that side laps shed water.
- E. Apply continuous sheets over sheet metal strips bridging substrate cracks, construction, and contraction joints.
- F. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.

- G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

- H. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 PROTECTION AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.

- B. Protect waterproofing from damage and wear during remainder of construction period.

- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071313

SECTION 072100 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concealed building thermal insulation.
 - 2. Sound attenuation insulation at wall and ceiling assemblies indicated.
 - 3. Vapor Retarder
- B. Related Sections:
 - 1. Division 6 Sections "Rough Carpentry" and "Miscellaneous Carpentry."
 - 2. Divisions 20 through 23 for pipe and duct insulation.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Fire Resistance Rating: ASTM E119.
- C. Thermal and Sound-insulating materials shall comply with CBC Section 719 and have a flame spread index of not more than 25 and a smoke-developed index of not more than 450 (including vapor retarders).

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 BATT/BLANKET INSULATION

- 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. CertainTeed Corporation.
 - 2. Guardian Building Products, Inc.
 - 3. Johns Manville.

4. Knauf Insulation.
 5. Owens Corning.
- B. Unfaced, Glass-Fiber Thermal Batt/Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. The width of batts shall provide for a snug fit between framing members.
1. R-19: At all exterior 6" metal framed walls, use with separate vapor retarder.
 2. R-19: At interior walls between conditioned and unconditioned space.
- C. Unfaced, Glass-Fiber Sound Isolating Insulation: ASTM C 665, Type I (for metal framing), unfaced.
1. 3" minimum thickness by width to provide a snug fit between wall framing below and above ceiling levels.
 2. Provide at interior walls indicated in drawings except at walls between conditioned and unconditioned space.
- F. Verify type of insulation required to suit wood or metal materials and framing conditions and to securely hold in place and provide best product available, subject to approval of Architect.

2.2 OTHER INSULATION TYPES

- A. Spray-on Cellulose Fiber Acoustic Insulation.
1. Celbar, 1-1/2" minimum thickness, STC 51 minimum rating at plumbing walls and in sound walls where tight, broken up spaces are difficult to insulate with batts.

2.3 VAPOR RETARDERS

- A. Reinforced-Polyethylene Vapor Retarders: Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft., with maximum permeance rating of 0.0507 perm.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Raven Industries Inc.; DURA-SKRIM 6WW.
 - b. Reef Industries, Inc.; Griffolyn T-65.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, use NT related to exposure, and Use O related to vapor-barrier-related substrates.

2.4 BATT/BLANKET INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.

- b. Gemco; Spindle Type.
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.
 - B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.; SC150.
 - b. Gemco; S-150.
 2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Attic spaces.
 - C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGM Industries, Inc.; TACTOO Adhesive.
 - b. Gemco; Tuff Bond Hanger Adhesive.

PART 3 - EXECUTION

3.1 PREPARATION & SCOPE

- A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.
- B. Select the best insulation type and R-Value to suit building conditions and to provide a contiguous thermal envelope with minimum R-19 at perimeter walls full height up to R-30 minimum at roof deck or ceiling (at ventilated attics where indicated). Obtain direction from Architect in advance where conditions are not clear.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- 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. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce

thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber Batt/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 clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
 - a. With faced batt/blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- C. Set vapor retard faced units with facing toward the warm side of construction except as otherwise indicated. Do not obstruct ventilation spaces, except for fire blocking.
 - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure air-tight installation.
- D. Apply Celbar spray-on acoustical insulation in accordance with manufacturer's recommendations to the inner face of drywall, plywood sheathing or other wall finish to proper thickness within wall cavity between studs, sealing tightly around structural, plumbing and electrical piping/devices within wall. Allow proper drying time before installing second face of drywall.

3.4 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
 - 1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.5 PROTECTION

- A. Protect installed insulation and vapor retarders 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 072100

SECTION 072413 - INSULATED METAL WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Foamed-insulation-core concealed fastener metal wall panels, with related metal trim and accessories.

1.2 RELATED REQUIREMENTS

- A. Division 05 Section "Structural Steel Framing" for steel framing supporting metal panels.
- B. Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal panels.
- C. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashing items in addition to items specified in this Section.
- D. Division 07 Section "Metal Wall and Roof Panels" for factory-formed metal wall, roof, and soffit panels.
- E. Division 13 Section "Metal Building Systems" for steel framing supporting metal panels.

1.3 REFERENCES

- A. American Architectural Manufacturer's Association (AAMA): www.aamanet.org:
 - 1. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
 - 2. AAMA 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.
- B. American Society of Civil Engineers (ASCE): www.asce.org/codes-standards:
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International (ASTM): www.astm.org:
 - 1. ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 - 3. ASTM A 792 - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - 4. ASTM A 240 - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - 5. ASTM C 518 - Standard Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 6. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
 - 7. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics.

8. ASTM D 1622 - Apparent Density of Rigid Cellular Plastics.
9. ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
10. ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
11. ASTM D 6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics
12. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
13. ASTM E 84 - Test Methods for Surface Burning Characteristics of Building Materials.
14. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
15. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
16. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

D. National Fire Protection Association (NFPA)

1. NFPA 259 – Test Method for Potential Heat of Building Materials.
2. NFPA 285 – Evaluation of Fire Propagation Characteristics of Exterior Non-Load Bearing Wall Assemblies.
3. NFPA 286 – Fire Test of Evaluating Conditions of Wall and Ceiling Finish to Roof Fire Growth.

1.4 QUALITY ASSURANCE

- A. Manufacturer/Source: Provide metal panel assemblies and accessories from a single manufacturer approved under an accredited third-party quality control program
- B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum ten years' experience in the manufacturing of similar products and successful use in similar applications.
 1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Product data, including certified independent test data indicating compliance with requirements.
 - b. Samples of each component.
 - c. Sample submittal from similar project.
 - d. Project references: Minimum of five installations not less than five years old, with Owner and Architect contact information.
 - e. Sample warranty.
 - f. Certificate from an accredited third-party Quality Control Program.
 2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements
 3. Approved manufacturers must meet separate requirements of Submittals Article.

- C. Installer Qualifications: Experienced Installer certified by metal panel manufacturer with minimum of five years experience with successfully completed projects of a similar nature and scope.
 - 1. Installer's Field Supervisor: Experienced mechanic certified by metal panel manufacturer supervising work on site whenever work is underway.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, metal panel installer, metal panel manufacturer's technical representative, inspection agency and related trade contractors.
 - 1. Coordinate building framing in relation to metal panel system.
 - 2. Coordinate openings and penetrations of metal panel system.

1.6 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets for specified products.
- B. Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, and special details. Make distinctions between factory and field assembled work.
 - 1. Include data indicating compliance with performance requirements.
 - 2. Indicate points of supporting structure that must coordinate with metal panel system installation.
 - 3. Include structural data indicating compliance with performance requirements and requirements of local authorities having jurisdiction.
- C. Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.
- D. Samples for Verification:
 - 1. Provide 12-inch- (305 mm) long section of each metal panel profile.
 - 2. Provide color chip verifying color selection.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Results: Indicating compliance of products with requirements.
- B. Accreditation Certificate: Indicating that manufacturer is accredited under an accredited third-party Quality Control Program, including IAS AC472 and based upon chapter 17 of the International Building Code (IBC).
- C. Warranty:
 - 1. Submit manufacturer's written two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
 - 2. The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance data.

- B. Manufacturer's Warranty: Executed copy of manufacturer's warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping. Protect painted surfaces with a protective covering before shipping.
 - 1. Deliver, unload, store, and erect metal panels and accessory items without deforming panels or exposing panels to surface damage from weather or construction operations.
 - 2. Store in accordance with Manufacturer's written instructions.
 - 3. Shield foam insulated metal panels from direct sunlight until all components are installed.

1.10 WARRANTY

- A. Special Manufacturer's Warranty: Submit Manufacturer's two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
- B. The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.
- C. Special Panel Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.
 - 1. Fluoropolymer Two-Coat System:
 - a. Color fading in excess of [5] or [10] for copper, silver metallic and bright red; Hunter units per ASTM D 2244.
 - b. Chalking in excess of [6] for copper, silver metallic and bright red or [8] rating per ASTM D 4214.
 - c. Failure of adhesion, peeling, checking, or cracking.
 - 2. Modified Silicone-Polyester Two-Coat System:
 - a. Color fading in excess of [5] or [7] for crimson red; Hunter units per ASTM D 2244.
 - b. Chalking in excess of [7] for crimson red or [8] rating per ASTM D 4214.
 - c. Failure of adhesion, peeling, checking, or cracking.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design Manufacturer: MBCI, a Division of NCI Group, Inc.; Lewisville, Texas
Tel: 877-713-6224; Email: info@mbci.com; Web: mbci.com.
- B. Provide basis of design product, or comparable product approved by Architect prior to bid.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
- B. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E 72 or ASTM E 1592 applied in accordance with ICC AC 04, Section 4, Panel Load Test Option or Section 5, Panel Analysis Option:
 - 1. Wind Loads: Determine loads based on applicable building code, wind speed, importance factor, exposure category, and internal pressure coefficient indicated on drawings.
 - a. Wind Negative Pressure: Certify capacity of metal panels by testing of proposed assembly.
 - 2. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of [1/120] [1/180] [1/240] of the span with no evidence of failure.
- C. Fire Performance Characteristics: Provide metal panel systems with the following fire-test characteristics determined by indicated test standard as applied by testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Surface-Burning Characteristics: The insulating core shall have been tested per ASTM E 84. The core shall have:
 - a. Flame spread index: 25 or less.
 - b. Smoke developed index: 450 or less.
 - 2. Room Test Performance: FM Global 4880: The panel assembly shall not support a self-propagating fire which reaches any limits of the 50' (15.24m) high corner test structure as evidenced by flaming or material damage of the ceiling of the assembly.
 - 3. Fire Propagation: The fire assembly shall meet the requirements of the standard for NFPA 285
 - 4. Fire Growth: The fire assembly shall meet the requirements of the standard for NFPA 286
 - 5. Potential Heat: Determined in accordance with NFPA 259
 - 6. IBC Chapter 26: Panel Performance under the above test methods, shall meet the requirements of IBC, Chapter on foam plastics.
- D. Air Infiltration, ASTM E 283:
 - 1. Maximum 0.0002 cfm/sq. ft. (0.001 L/s per sq. m) at static air pressure difference of 1.57 lbf/sq. ft. (75 Pa).
 - 2. Maximum 0.0009 cfm/sq. ft. (0.005 L/s per sq. m) at static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
 - 3. Maximum 0.01 cfm/sq. ft. (0.050 L/s per sq. m) at static-air-pressure difference of 20 lbf/sq. ft. (958 Pa).
- E. Water Penetration Static Pressure:
 - 1. ASTM E 331: No uncontrolled water penetration at a static pressure of 20 lbf/sq. ft. (958 Pa).
 - 2. ASTM E 331 Modified (2 hour duration): No uncontrolled water penetration at a static pressure of 6.24 lbf/sq. ft. (300 Pa).

- F. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.
- G. Thermal Performance: When tested in accordance with ASTM C 518, Measurement of Steady State thermal Transmission, the panels shall provide a k factor of 0.14 btu/sf/hr/deg F at a 75° F (24° C) mean temperature, as required by code, or 0.126 btu/sf/hr/deg F at a 40° F (4° C) mean temperature.

2.3 INSULATED METAL WALL PANELS

- A. Concealed Fastener, Insulated Metal Wall Panels with foam core: Structural metal panels consisting of flat exterior metal sheet with 7.2 rib pattern, and interior metal sheet with mesa profile, with factory foamed-in-place polyurethane core in thermally-separated profile, with tongue-and-groove panel edges, attached to supports using concealed fasteners.
 - 1. Basis of Design: MBCI, CF 7.2 Insul-Rib
 - 2. G-90 galvanized coated steel conforming to ASTM A 653 and/or AZ50 aluminum-zinc alloy coated steel, conforming to ASTM A 792/A 792M, minimum grade 33, prepainted by the coil-coating process per ASTM A 755/A 755M
 - a. Exterior Face Sheet: 26 gauge thickness, with stucco embossed surface
 - 1) Finish: Fluoropolymer two-coat system
 - 2) Color: As selected by Architect from manufacturer's standard colors
 - b. Interior Face Sheet: 26 gauge thickness, with stucco embossed surface and Mesa profile
 - 1) Finish: Modified silicone-polyester two-coat system
 - 2) Color: As selected by Architect from manufacturer's standard colors
 - 3. Panel Width: 36 inches (914 mm)
 - 4. Panel Thickness: 2 inch (51 mm). Panel thickness measured from inside skin to top of high cell.
 - 5. Insulating Core: Polyurethane with zero ozone depletion potential blowing agent
 - a. Closed Cell Content: 90% or more as determined by ASTM D 6226
 - b. Compressive Strength: As required to meet structural performance requirements and with a minimum of 15 psi as determined by ASTM D 1621
 - c. Minimum Density: 2.0 pcf (32 kg/m³) as determined by ASTM D 1622
 - d. Thermal Resistance R-Value: 11.3 deg. F * hr * sq. ft./Btu (K * sq. m/W) per ASTM C 518 at 75 degrees Fahrenheit mean temperature.
 - 6. Heat Transfer Coefficient (U-factor): 0.0746 Btu/hr * sq. ft. * deg. F (W/K * sq. m) as determined by ASTM C 1363 at 75 degrees Fahrenheit mean temperature. Tested specimen must include at least two engaged side joints. For actual overall R and U values, refer to the Technical Bulletins on mbc.com

2.4 METAL WALL PANEL ACCESSORIES

- A. General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
- B. Flashing and Trim: Match material, thickness, and finish of metal panels.

- C. Panel Clips: ASTM A 653/A 653M, G90 (Z180) hot-dip galvanized zinc coating, one-piece, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.
- D. Panel Fasteners: Self-drilling or Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
- E. Joint Sealers:
 - 1. Sealants: Provide Tape Mastic Sealants, Non-skinning sealants, and Urethane Sealants in accordance with manufacturers standards
 - 2. Vertical Joint Gasket: Manufacturers standard EPDM gasket. Color: [Black] [Or custom color].

2.5 FABRICATION

- A. General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.
- B. Fabricate metal panel joints configured to accept sealant providing weathertight seal.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

2.6 FINISHES

- A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
- B. Exterior Face Sheet Coil-Coated Finish System
 - 1. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621, [meeting solar reflectance index requirements].
 - a. Basis of Design: MBCI, Fluoropolymer.
- C. Interior Face Sheet Coil-Coated Finish System
 - 1. Silicone-Polyester Two-Coat System: 0.20 – 0.25 mil primer with 0.7 – 0.8 mil color coat
 - a. Basis of Design: MBCI, Silicone Polyester

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.
 - 1. Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.

2. Panel Support Tolerances: Confirm that metal panel supports are within tolerances acceptable to metal panel manufacturer but not greater than the following:
 - a. 1/4 inch (6 mm) in 20 foot (6100 mm) in any direction.
 - b. 3/8 inch (9 mm) over any single wall plane.
 - c. Girt Spacing 8 feet (2438 mm) or more: 1/4 inch (6 mm) out only.
 - d. Girt Spacing Less Than 8 feet (2438 mm): 1/8 inch (3 mm) out only.
 - e. CF Architectural girt spacing less than 4 feet (1219 mm): 1/16 inch (1.5 mm) inch out only.
- B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

3.2 METAL PANEL INSTALLATION

- A. Concealed-Fastener Insulated Metal Panels with foam core: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- B. Attach panels to metal framing using screws, fasteners, sealants, and adhesives recommended for application by metal panel manufacturer.
 1. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer.
 2. Cut panels in field where required using manufacturer's recommended methods.
 3. Provide weatherproof jacks for pipe and conduit penetrating metal panels.
 4. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer
- C. Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers
- D. Joint Sealers: Install sealants where indicated and where required for weatherproof performance of metal panel assemblies
 1. Seal panel base assembly, openings, panel head joints, and perimeter joints using sealants indicated in manufacturer's instructions
 2. Seal wall panel joints; apply continuously without gaps in accordance with manufacturer's written instructions, approved shop drawings, and project drawings
 3. Prepare joints and apply sealants per requirements of Division 07 Section.

3.3 ACCESSORY INSTALLATION

- A. General: Install metal panel accessories with positive anchorage to building and weather tight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.

2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage an independent testing and inspecting agency acceptable to Architect to perform field tests and inspections and to prepare test reports.
- B. Water-Spray Test: After completing portion of metal panel assembly including accessories and trim, test 2-bay area selected by Architect for water penetration, according to AAMA 501.2.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.
- B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION 072413

SECTION 072500 - CONCRETE SLAB VAPOR EMISSIONS TREATMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Spray applied concrete sealer system.
- B. Install Vapor Emission Treatment Systems where tests reveal presence of more than acceptable moisture and alkali levels in accordance with Test method ASTM F 1869 or ASTM F 2170.
- C. Related Sections
 - 1. Section 03 30 00, Cast-in Place Concrete.
 - 2. Section 03 39 00, Concrete Curing.
 - 3. Division 09 sections for floor finishes that require maximum moisture and alkali levels.

1.2 PERFORMANCE REQUIREMENTS

- A. Vapor emissions floor treatment shall reduce vapor emissions from on-grade slabs to levels satisfactory to resilient flooring manufactures requirements and warranties.
- B. Vapor emission floor treatment shall prevent negative side moisture migration through concrete floor and shall allow for all types of flooring surface treatment systems.
- C. Vapor emission floor treatment shall be alkali-neutralizing and shall penetrate into concrete materials and chemically form protective crystalline barrier between surface. Inner barrier so formed shall not be affected by Ultra-violet light, abrasion and chemicals and shall permanently seal and waterproof concrete against harmful effects of water intrusion, freeze-thaw cycle damage, de-icing salts and chloride migration.

1.3 SUBMITTALS

- A. Product data describing physical and performance characteristics.
- B. Manufacturers written installation instructions.
- C. Manufacturer's certificate indicating applicator is accepted installer.

- D. Moisture vapor emission test results. Indicate environmental conditions, installation procedures used, deficiencies and corrective actions taken for filler, vapor emissions coating and membrane.

1.4 SYSTEM DESCRIPTION

- A. Sealer/Hardener/Vapor Barrier compound, with minimum of 5 years documented experience to control moisture vapor emission, having 34 percent solid content,

compatible with all flooring material, adhesives, bond breakers and Overlayments. Complying with STM C-309, ASTM C-1315. Surface treatment applied on new cured and existing slabs receiving new resilient flooring, sheet vinyl and vinyl composition tile, rubber tile, wood flooring, carpet, and resinous flooring.

1.5 QUALITY ASSURANCE

- A. Applicator: Company approved and certified by vapor emission floor treatment manufacturer.
- B. Requirements of Regulatory Agencies: Materials used in formulation of product shall conform to all local, State, and Federal air quality and environmental control standards.
- C. Pre-installation Conference
 - 1. Pre-installation meeting: Schedule before installing concrete floor slabs.
 - 2. Required Attendees: Contractor's representative, Architect's representative, Owner's representative, Manufacturer's representative, Subcontractor, Installer.
 - 3. Convene before installation of concrete.
 - 4. Advise Contractor of all Warranty requirements.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver material in original sealed containers, clearly marked with manufacturer's name and brand name.
- B. Store materials in accordance with manufacturer's recommendations.

1.7 WARRANTY

- A. Submit under provisions of Division 01, General Requirements.
- B. Provide 15-year Full System warranty issued to the Owner of the facility covering all labor and materials needed to replace all floor covering that fails due to concrete moisture vapor emission and moisture born contaminants such as alkalinity.
 - 1. Issue a certificate of insurance in amount of \$2,000,000.00
- C. Include all costs for replacement of failed flooring material installed over moisture seal membrane, cracks, joints and holes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products of following manufacturers form basis for design and quality intended.
 - 1. Creteseal, Anaheim, CA Product: CS 2000
 - 2. Or equal as approved prior to bid opening in accordance with Division 1, Section Substitution Procedures for substitution requests submitted at least 14 days prior to date for bid opening.

2.2 MATERIALS

- A. Vapor Emission floor Treatment: Silicate-based or epoxy-based solution to penetrate on-grade concrete floor surfaces to form protective crystalline moisture barrier.
- B. Accessory Materials: As recommended by manufacturer/or intended application.
- C. Verify floor treatment product is compatible with flooring material and adhesive. Provide letter or other documentation from flooring manufacturer that floor treatment product is acceptable for use with their flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Manufacturer's representative shall be on site to document and oversee the entire installation process.
- B. Verify surfaces are dry and free of dirt and contaminates.
- C. Verify moisture and alkalinity tests have been conducted per ASTM F 1869 or ASTM F 2170.
- D. Verify existing concrete conditions are suitable to receive the Work of this Section.
- E. Repair concrete where required according to manufacturer's recommendations.
- F. Do not begin application until unsuitable conditions have been corrected, and control joints have been sawcut. Sawcut of control joints after installation of treatment will not be accepted. Tool joints where indicated prior to installation of treatment.
- G. Beginning of Installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

- A. Prepare surface by removal of laitance, grease, adhesives, unapproved patching compounds and foreign matter from existing concrete. Use mechanical means (scarifying or bead blasting) where required for existing slabs.
- B. Thoroughly clean all cracks. Apply to structurally sound concrete surfaces, free of voids and cracks. If needed apply cementitious patch or approved epoxy filler to any voids or cracks. Groove out all cracks/control joints and fill with an approved patching compound.
- C. Clean expansion joints and control joints as required.
- D. Maintain building temperature above 65 degrees Fahrenheit for a period of 48 hours prior to start of installation to start of installation of base coat.

3.3 APPLICAITON

- A. Apply the products according to the manufacturer's instructions.
- B. Manufacturer technician will be on site the day of the concrete pour at the beginning of the Work to install or train in application, document and return on every application thereafter to verify that proper procedures are followed.
- C. Apply concrete Surface Treatment CS2000 / Sealer / Hardener/ Curing Compound after calcium chloride test and subsequent results have been performed as soon as harsh weather permits, prior to any other chemical treatments for concrete slabs either on grade, below grade or above grade receiving resilient flooring such as sheet vinyl, vinyl composition tile, rubber, wood flooring, carpet, epoxy coatings and overlays.
- D. Apply CS2000 to the concrete slabs as soon as final finishing operations are complete, control joints are tooled and concrete has hardened sufficiently to sustain foot traffic without damage.
- E. Spray Apply CS2000 at the rate of 200 square feet per gallon. If puddling or bird bathing occurs, lightly broom product evenly over the substrate until product has completely penetrated the surface.
- F. If within 2 hours after initial application areas are subjected to heavy rainfall and puddling occurs, reapply CS2000 product to these areas as soon as weather condition permits.

3.4 TESTING

- A. Moisture test per ASTM F 1869 or ASTM F 2170 after installation of system.
 - 1. ASTM F1869: 3 – 5 lbs.
 - 2. ASTM F2170: 75%
 - 3. ASTM F710: Alkalinity test: less than 90pH.

3.5 PROTECTION

- A. Prohibit traffic on finish floor surface prior to installation of finish floor covering.

END OF SECTION 072500

SECTION 074113 - INSULATED METAL ROOF PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Foamed-insulation-core standing seam metal roof panels, with related metal trim and accessories.

1.2 RELATED REQUIREMENTS

- A. Division 05 Section "Structural Steel Framing" for steel framing supporting metal panels.
- B. Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal panels.
- C. Division 07 Section "Metal Wall and Roof Panels" for factory-formed metal wall, roof, and soffit panels.
- D. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items in addition to items specified in this Section.
- E. Division 07 Section "Manufactured Roof Specialties" for manufactured copings, reglets, and roof drainage items in addition to items specified in this Section.
- F. Division 07 Section "Roof Accessories" for roof hatches, smoke vents, equipment curbs, and equipment supports.
- G. Division 07 Section "Joint Sealants" for field-applied Joint Sealants.
- H. Division 13 Section "Metal Building Systems" for steel framing supporting metal panels.

1.3 REFERENCES

- A. American Society of Civil Engineers (ASCE): www.asce.org/codes-standards:
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- B. ASTM International (ASTM): www.astm.org:
 - 1. ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 - 3. ASTM A 792 - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - 4. ASTM A 924 - General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 5. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
 - 6. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics.
 - 7. ASTM D 1622 - Apparent Density of Rigid Cellular Plastics.
 - 8. ASTM D 6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics

9. ASTM C 518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 10. ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
 11. ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
 12. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 13. ASTM E 84 - Test Methods for Surface Burning Characteristics of Building Materials.
 14. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 15. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
 16. ASTM E 1680 - Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems.
 17. ASTM E 1980 - Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- C. Cool Roof Rating Council (CRRC): www.coolroofs.org/productratingprogram.html:
1. CRRC-1-2016 – CRRC Product Rating Program.

1.4 QUALITY ASSURANCE

- A. Manufacturer/Source: Provide metal panel assemblies and accessories from a single manufacturer approved under an accredited third-party quality control program
- B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum ten years' experience in the manufacturing of similar products and successful use in similar applications.
 1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Product data, including certified independent test data indicating compliance with requirements.
 - b. Samples of each component.
 - c. Sample submittal from similar project.
 - d. Project references: Minimum of five installations not less than five years old, with Owner and Architect contact information.
 - e. Sample warranty.
 - f. Certificate from an accredited third-party Quality Control Program.

1.5 Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements

1.6 Approved manufacturers must meet separate requirements of Submittals Article.

- A. Installer Qualifications: Experienced Installer with minimum of five years' experience with successfully completed projects of a similar nature and scope.

1. Installer's Field Supervisor: Experienced mechanic [certified by metal panel manufacturer] supervising work on site whenever work is underway.

1.7 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, metal panel installer, metal panel manufacturer's technical representative, inspection agency, and related trade contractors.
 1. Coordinate building framing in relation to metal panel system.
 2. Coordinate openings and penetrations of metal panel system.
 3. Coordinate work of Division 07 Sections "Roof Specialties" and "Roof Accessories" and openings and penetrations and manufacturer's accessories with installation of metal panels.

1.8 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets for specified products.
- B. Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, curbs, vents, snow guards, lightning arresting equipment, and special details. Make distinctions between factory and field assembled work.
 1. Include data indicating compliance with performance requirements.
 2. Indicate points of supporting structure that must coordinate with metal panel system installation.
 3. Include structural data indicating compliance with performance requirements and requirements of local authorities having jurisdiction.
- C. Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.
- D. Samples for Verification:
 1. Provide 12-inch- long section of each metal panel profile.
 2. Provide color chip verifying color selection.

1.9 INFORMATIONAL SUBMITTALS

- A. Product Test Results: Indicating compliance of products with requirements.
- B. Accreditation Certificate: Indicating that manufacturer is accredited under an accredited third-party quality control program, including IAS AC472 and based upon chapter 17 of the International Building Code (IBC).
- C. Warranty:
 1. Submit manufacturer's written two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
 2. The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

1.10 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- B. Manufacturer's Warranty: Executed copy of manufacturer's warranty.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components, or other damage. Protect panels and trim bundles during shipping. Protect painted surfaces with a protective covering before shipping.
 - 1. Deliver, unload, store, and erect metal panels and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
 - 2. Store in accordance with Manufacturer's written instructions. Provide wood collars for stacking and handling in the field.
 - 3. Shield foam insulated metal panels from direct sunlight until installation.

1.12 WARRANTY

- A. Special Manufacturer's Warranty: Submit Manufacturer's two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.
- B. The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.
- C. Special Panel Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.
 - 1. Fluoropolymer Two-Coat System:
 - a. Color fading in excess of [5] or [10] for copper, silver metallic and bright red; Hunter units per ASTM D 2244.
 - b. Chalking in excess of [6] for copper, silver metallic and bright red or [8] rating per ASTM D 4214.
 - c. Failure of adhesion, peeling, checking, or cracking.
 - 2. Modified Silicone-Polyester Two-Coat System:
 - a. Color fading in excess of [5] or [7] for crimson red; Hunter units per ASTM D 2244.
 - b. Chalking in excess of [7] for crimson red or [8] rating per ASTM D 4214.
 - c. Failure of adhesion, peeling, checking, or cracking.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design Manufacturer: MBCI, a Division of the Cornerstone Building Brands family; Lewisville, Texas Tel: 972.221.6656; Email: info@mbci.com; Web: mbci.com
1. Provide basis of design product CFR Insulated Metal Panels, or comparable product approved by Architect prior to bid.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
- B. Roof Panel Radiative Property Performance:
1. Cool Roof Rating Council: Listed in CRRC Rated Product Directory, with minimum properties as required by applicable Energy efficiency or High-Performance Green Building standard.
- C. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E 72 or ASTM E 1592 applied in accordance with ICC AC 04, Section 4, Panel Load Test Option or Section 5, Panel Analysis Option:
1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
 - a. Roof Panel Wind Uplift Testing: Certify capacity of metal panels by testing of proposed assembly per ASTM E 72 or ASTM E 1592.
 2. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of 1/240 of the span with no evidence of failure.
- D. Fire Performance Characteristics: Provide metal panel systems with the following fire-test characteristics determined by indicated test standard as applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.
1. Surface-Burning Characteristics: Provide metal panel systems with the following characteristics when tested per ASTM E 84. The core shall have:
 - a. Flame spread index: 25 or less.
 - b. Smoke developed index: 450 or less.
 2. Fire Performance of Insulated Roof: Class 1 roof and wall panel per ANSI/FM 4880.
- E. Roof Panel Air Infiltration, ASTM E 1680: Maximum 0.023 cfm/sq. ft. (0.115 L/s per sq. m) at static-air-pressure difference of 12 lbf/sq. ft. (575 Pa).
- F. Roof Panel Water Penetration Static Pressure, ASTM E 1646: No uncontrolled water penetration at a static pressure of 20 lbf/sq. ft. (958 Pa).

- G. Test procedure for susceptibility to leakage of discontinuous roof systems protocol TAS 114: Water applied to a depth of 6" above the lowest section of roof profile. No water infiltration observed during the seven-day test period.
- H. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.
- I. Thermal Performance: When tested in accordance with ASTM C 518, Measurement of Steady State thermal Transmission, the panels shall provide a k factor of 0.14 btu/sf/hr/deg F at a 75° F (24° C) mean temperature, as required by code, or 0.126 btu/sf/hr/deg F at a 40° F (4° C) mean temperature.

2.3 INSULATED METAL ROOF PANELS

- A. Standing Seam, Foamed-Insulation-Core Metal Roof Panels: Structural metal panels consisting of an exterior standing seam with an interior tongue and groove joint, coupled with a vapor seal in the standing seam, and provides superior resistance to air and moisture intrusion. Attached with concealed fasteners to the structure.
 - 1. Basis of Design: MBCI, CFR Insulated Metal Panel.
 - 2. G-90 Galvanized Coated Steel: ASTM A 653 or Aluminum-Zinc Alloy-Coated Steel: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A 755/A 755M.
 - 3. Exterior Face Sheet: 24 gauge coated thickness, with stucco embossed surface.
 - 1) Finish: Fluoropolymer two-coat system.
 - 2) Color: As selected by Architect from manufacturer's standard colors.
 - 4. Interior Face Sheet: 26 gauge coated thickness, with stucco embossed surface Mesa profile.
 - 1) Finish: Modified silicone-polyester two-coat system.
 - 2) Color: As selected by Architect from manufacturer's standard colors.
 - 5. Endlaps: Provide panels with factory endlaps, notching, swedging and backer plates; where panel lengths permit.
 - 6. Low Eave Treatment: Provide cutback for trim/gutter installation; where panel lengths permit.
 - 7. Panel Width: 42 inches (1067 mm).
 - 8. Panel Thickness: 4 inch (102 mm).
 - 9. Insulating Core: Polyurethane with zero ozone depletion potential blowing agent
 - a. Closed Cell Content: 90% or more as determined by ASTM D 6226

- b. Compressive Strength: As required to meet structural performance requirements and with a minimum of 22 psi as determined by ASTM D 1621
 - c. Shear Strength: As required to meet structural performance requirements and with a minimum of 36 psi as determined by ASTM C 273
 - d. Tensile Strength: As required to meet structural performance requirements and with a minimum of 41 psi ASTM D 1623
 - e. Minimum Density: 2.0 pcf (32 kg/m³) as determined by ASTM D 1622
 - d. Thermal Resistance (R-Value): 21.4 deg. F * hr * sq. ft./Btu as determined by ASTM C 518 at 75 degrees Fahrenheit mean temperature.
8. Heat Transfer Coefficient (U-factor): 0.0414 Btu/hr * sq. ft. * deg. F as determined by ASTM C 1363 at 75 degrees Fahrenheit mean temperature. Tested specimen must include at least two engaged side joints.

2.4 METAL ROOF PANEL ACCESSORIES

- A. General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
- B. Flashing and Trim: Match material, thickness, and finish of metal panel face sheet.
- C. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Provide corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
- D. Joint Sealers: Provide Tape Mastic Sealants and Concealed Joint Sealants per Section 07 92 00, "Joint Sealants".
- E. Roof Accessories: Approved by metal panel manufacturer. Refer to Section 07 72 00 "Roof Accessories" for requirements for curbs, equipment supports, roof hatches, heat and smoke vents, ventilators, and preformed flashing sleeves.
- F. Snow Guards: Compatible with standing seam roof and approved by metal panel manufacturer. Refer to Section 07 72 53 "Snow Guards" for requirements for snow guards attached to metal roof panels.
- G. Roof Curbs: Compatible with standing seam roof and approved by metal panel manufacture. Refer to Section 07 72 10 "Roof Curbs" for requirements for roof curbs attached to metal roof panels.

2.5 FABRICATION

- A. General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.
- B. Fabricate metal panel joints configured to accept sealant tape providing weathertight seal and preventing metal-to-metal contact and minimizing noise resulting from thermal movement.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

2.6 FINISHES

- A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- B. Exterior Face Sheet Coil-Coated Finish System
 - 1. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, [meeting solar reflectance index requirements].
 - a. Basis of Design: MBCI, Fluoropolymer.
- C. Interior Face Sheet Coil-Coated Finish System:
 - 1. Silicone-Polyester Two-Coat System: 0.20 – 0.25 mil primer with 0.7 – 0.8 mil color coat
 - a. Basis of Design: MBCI, Silicone Polyester

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.
 - 1. Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.
 - 2. Panel Support Tolerances: Confirm that metal panel supports are within tolerances acceptable to metal panel manufacturer but not greater than the following:
 - a. 1/4 inch (6 mm) in 20 foot (6100 mm) in any direction.
 - b. 3/8 inch (9 mm) over any single roof plane.
 - c. At Purlin Spacing 7 feet (2133 mm) or less: 1/8 inches (3 mm), out only.
- B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

3.2 METAL PANEL INSTALLATION

- A. Standing Seamed, Concealed-Fastener Insulated Metal Panels: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- B. Attach panels to metal framing using clips, fasteners, and sealants recommended for application by metal panel manufacturer.

1. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer.
 2. Cut panels in field where required using manufacturer's recommended methods.
 3. Provide weatherproof jacks for pipe and conduit penetrating metal panels.
 4. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer.
- C. Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers.
- D. Joint Sealers: Install tape sealers and liquid sealants where indicated and where required for weatherproof performance of metal panel assemblies.
1. Seal panel side and perimeter joints using joint sealers indicated in manufacturer's instructions.
 2. Seal roof panel joints utilizing tape sealer and vapor seal bead of non-curing butyl.
 3. Prepare joints and apply sealants per requirements of Division 07 Section "Joint Sealants."

3.3 ACCESSORY INSTALLATION

- A. General: Install metal panel accessories with positive anchorage to building and weathertight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
 2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
 3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage an independent testing and inspecting agency acceptable to Architect to perform field tests and inspections and to prepare test reports.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.
- B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION 074113

SECTION 074213 - METAL WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Exposed fastener metal wall panels, with related metal trim and accessories.

1.2 RELATED REQUIREMENTS

- A. Division 05 Section "Structural Steel Framing" for structural steel framing supporting metal panels.
- B. Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal panels.
- C. Division 07 Section "Thermal Insulation" for thermal insulation installed under metal panels.
- D. Division 07 Section "Joint Sealants" for field-applied Joint Sealants.
- E. Division 13 Section "Metal Building Systems" for steel framing supporting metal panels.

1.3 REFERENCES

- A. American Architectural Manufacturer's Association (AAMA): www.aamanet.org:

- 1. AAMA 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.
- 2. AAMA 809.2 - Voluntary Specification Non-Drying Sealants.

- B. American Society of Civil Engineers (ASCE): www.asce.org/codes-standards:

- 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

- C. ASTM International (ASTM): www.astm.org:

- 1. ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- 2. ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
- 3. ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- 4. ASTM C 645 - Specification for Nonstructural Steel Framing Members.
- 5. ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- 6. ASTM C 920 - Specification for Elastomeric Joint Sealants.
- 7. ASTM D 1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.
- 8. ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- 9. ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.

10. ASTM E 283 - Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 11. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
 12. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
 13. ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
 14. ASTM E 1980 - Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- D. International Accreditation Service (IAS):
1. IAS AC 472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems, Part B.
- 1.4 ADMINISTRATIVE REQUIREMENTS
- A. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's technical representative, inspection agency and related trade contractors.
1. Coordinate building framing in relation to metal panel system.
 2. Coordinate openings and penetrations of metal panel system.
- 1.5 QUALITY ASSURANCE
- A. Manufacturer/Source: Provide metal panel assembly and accessories from a single manufacturer providing fixed-base roll forming, and accredited under IAS AC 472 Part B.
- B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum five years experience in manufacture of similar products in successful use in similar applications.
1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Product data, including certified independent test data indicating compliance with requirements.
 - b. Samples of each component.
 - c. Sample submittal from similar project.
 - d. Project references: Minimum of five installations not less than five years old, with Owner and Architect contact information.
 - e. Sample warranty.
 - f. IAS AC 472 certificate.
 2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
 3. Approved manufacturers must meet separate requirements of Submittals Article.

- C. Installer Qualifications: Experienced Installer with minimum of five years experience with successfully completed projects of a similar nature and scope.
 - 1. Installer's Field Supervisor: Experienced mechanic, able to communicate with Owner, Architect, and installers, supervising work on site whenever work is underway.

1.6 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets for specified products.
- B. Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, and special details. Make distinctions between factory and field assembled work.
 - 1. Indicate points of supporting structure that must coordinate with metal panel system installation.
 - 2. Include data indicating compliance with performance requirements.
 - 3. Include structural data indicating compliance with requirements of authorities having jurisdiction.
- C. Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.
- D. Samples for Verification: Provide 12-inch- (305 mm-) long section of each metal panel profile. Provide color chip verifying color selection.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Indicating compliance of products with requirements, witnessed by a professional engineer.
- B. Qualification Information: For Installer firm and Installer's field supervisor.
- C. IAS Accreditation Certificate: Indicating that manufacturer is accredited under provisions of IAS AC 472.
- D. Manufacturer's Warranty: Sample copy of manufacturer's standard warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- B. Manufacturer's Warranty: Executed copy of manufacturer's standard warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping.
 - 1. Deliver, unload, store, and erect metal panel system and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
 - 2. Store in accordance with Manufacturer's written instructions. Provide wood collars for stacking and handling in the field.

1.10 WARRANTY

- A. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal panel assemblies that fail in materials and workmanship within one year from date of Substantial Completion.
- B. Special Panel Finish Warranty: On Manufacturer's standard form, in which Manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within [25] years from date of Substantial Completion, including:
 - 1. Fluoropolymer Two- Coat System:
 - a. Color fading in excess of [5] Hunter units per ASTM D 2244.
 - b. Chalking in excess of No. [8] rating per ASTM D 4214.
 - c. Failure of adhesion, peeling, checking, or cracking.
 - 2. Modified Silicone-Polyester Two-Coat System:
 - a. Color fading in excess of [5] Hunter units per ASTM D 2244, for vertical applications.
 - b. Color fading in excess of [7] Hunter units per ASTM D 2244, for non-vertical applications.
 - c. Chalking in excess of No. [8] rating per ASTM D 4214, for vertical applications.
 - d. Chalking in excess of No. [6] rating per ASTM D 4214, for non-vertical applications.
 - e. Failure of adhesion, peeling, checking, or cracking.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design Manufacturer: MBCI Metal Roof and Wall Systems, Division of NCI Group, Inc.; Houston TX. Tel: (877)713-6224; Email: info@mbci.com; Web: www.mbc.com.
 - 1. Provide basis of design product, or comparable product approved by Architect prior to bid.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Provide metal wall panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
- B. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.
- C. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated:
 - 1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.

2. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of 1/240 of the span with no evidence of failure.
 3. Seismic Performance: Comply with ASCE 7, Section 9, "Earthquake Loads."
- D. Air Infiltration: ASTM E 283: Maximum 0.000 cfm/sq. ft. (0.000 L/s per sq. m) at 6.24 lbf/sq. ft. (300 Pa) static-air-pressure difference.
- E. Water Penetration: ASTM E 331: No uncontrolled water penetration at a static pressure of 13.24 lbf/sq. ft. (334 Pa).
- 2.3 METAL PANEL MATERIALS
- A. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A 755/A 755M.
- 2.4 METAL WALL PANELS
- A. Tapered-Rib-Profile, Exposed Fastener Metal Panels: Structural metal panel consisting of formed metal sheet with trapezoidal ribs, installed by lapping edges of adjacent panels.
1. Basis of Design: MBCI, 7.2 Panel, www.mbc.com/72.html.
 2. Coverage Width: 36 inches (914 mm).
 3. Continuous Rib Spacing: 7.2 inches (183 mm) on center.
 4. Rib Height: 1-1/2 inch (38.1 mm).
 5. Nominal Coated Thickness: 24 gage.
 6. Panel Surface: Smooth.
 7. Exterior Finish: Fluoropolymer two-coat system.
 8. Color: As selected by Architect from manufacturer's standard colors.
- 2.5 METAL PANEL ACCESSORIES
- A. General: Provide complete metal panel assembly incorporating base, corner, and opening trims and miscellaneous flashings, in [manufacturer's standard profiles] [profiles as indicated]. Provide required fasteners, closure strips, support plates, and sealants as indicated in manufacturer's written instructions.
- B. Flashing and Trim: Match material, thickness, and finish of metal panel face sheet.
- C. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer.
1. Exposed Fasteners: Long life fasteners with EPDM or neoprene gaskets, with heads matching color of metal panels by means of factory-applied coating.
- D. Joint Sealers: Manufacturer's standard or recommended liquid and preformed sealers and tapes, and as follows:
1. Tape Sealers: Manufacturer's standard non-curing butyl tape, AAMA 809.2.
- E. Steel Sheet Miscellaneous Framing Components: ASTM C 645, with ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized zinc coating.

2.6 FABRICATION

- A. General: Provide factory fabricated and finished metal panels and accessories meeting performance requirements, indicated profiles, and structural requirements.
- B. Panel Lengths: Form panels in continuous lengths for full length of detailed runs, except where otherwise indicated on approved shop drawings.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings. Form from materials matching metal panel substrate and finish.

2.7 FINISHES

- A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- B. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621[, meeting solar reflectance index requirements].
 - 1. Basis of Design: MBCI, Signature 300.
- C. Interior Finish: 0.5 mil total dry film thickness consisting of primer coat and wash coat of manufacturer's standard light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine metal panel system substrate and supports with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panel installation.
 - 1. Inspect metal panel support substrate to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable supports at recommended spacing to match installation requirements of metal panels.
 - 2. Panel Support Tolerances: Confirm that panel supports are within tolerances acceptable to metal panel system manufacturer but not greater than the following:
 - a. 1/4 inch (6 mm) in 20 foot (6.1 m) in any direction.
- B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with metal panel system installation.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, girts, furring, and other miscellaneous panel support members according to ASTM C 754 and manufacturer's written instructions.
- B. Flashings: Install flashings to cover exposed underlayment per Section 07 62 00 "Sheet Metal Flashing and Trim."

3.3 METAL PANEL INSTALLATION

- A. Exposed Fastener Metal Wall Panels: Install weathertight metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated, free of waves, warps, buckles, fastening stresses, and distortions. Anchor panels and other components securely in place. Provide for thermal and structural movement.

- B. Panel Sealants: Install manufacturer's recommended tape sealant at panel sidelaps and endlaps.
- C. Panel Fastening: Attach panels to supports using screws, fasteners, and sealants recommended by manufacturer and indicated on approved shop drawings.
 - 1. Fasten metal panels to supports at each location indicated on approved shop drawings, with spacing and fasteners recommended by manufacturer.
 - 2. Provide weatherproof jacks for pipe and conduit penetrating metal panels of types recommended by manufacturer.
 - 3. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.

3.4 ACCESSORY INSTALLATION

- A. General: Install metal panel trim, flashing, and accessories using recommended fasteners and joint sealers, with positive anchorage to building, and with weather tight mounting. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
 - 2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
 - 3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.
- B. Joint Sealers: Install joint sealers where indicated and where required for weathertight performance of metal panel assemblies, in accordance with manufacturer's written instructions.
 - 1. Prepare joints and apply sealants per requirements of Division 07 Section "Joint Sealants."

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage an independent testing and inspecting agency acceptable to Architect to perform field tests and inspections and to prepare test reports.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.
- B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION 074213

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following sheet metal flashing and trim:
 - 1. Formed roof drainage system.
 - 2. Formed low-slope roof flashing and trim where not part of Section 07 41 13.
 - 3. Formed wall flashing and trim (typical at perimeter of all wall openings).
 - 4. Self-adhering flexible membrane used in conjunction with sheet metal flashing where not part of Section 07 13 13 or 07 41 31.

- B. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrication" for stainless steel components.
 - 2. Division 6 Section "Miscellaneous Carpentry" for wood nailers, curbs, and blocking.
 - 3. Division 7 Section "Metal Roof Panels" for metal roofing and flashing, trim and accessories, and Self-Adhering Sheet Waterproofing" for flexible flashing at wall openings.
 - 4. Division 9 Section "Portland Cement Plastering" for installing flashing and trim integral with plaster finish at wall openings.
 - 5. Division 22 Section "Plumbing" for roof drains & pipe fittings that attach to sheet metal gutters.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

- B. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

- C. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.3 SUBMITTALS

- A. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identify material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.

3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.

1.4 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- B. Standard commercial items may be used for flashing, trim, reglets, and similar purposes provided such items meet or exceed the quality standards specified.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.6 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality, mill phosphatized for field painting.
- B. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet.

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads, suitable for galvanized steel, galvanized or cadmium plated.
 - 1. Nails for Stainless Steel Sheet: Series 300 stainless steel, 0.109 inch minimum and not less than 7/8 inch long, barbed with large head.
 - 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
 - 3. Blind Fasteners: Rivets High-strength aluminum, stainless-steel or as recommended for the particular use.
 - 4. Washers: As required, neoprene faced where water-tight condition is required.
 - 5. Bolts and Nuts: FF-B-578 C, FF-B-588C.
- C. Solder for Lead: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
- D. Solder for Zinc: ASTM B 32, 60 percent lead and 40 percent tin with low antimony, as recommended by manufacturer.
- E. Burning Rod for Lead: Same composition as lead sheet.
- F. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape, suitable for high temperature conditions.
- G. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.
- J. Self-Adhering, Polyethylene-Faced Sheet: ASTM D 1970, 40 mils thick minimum, consisting of slip-resisting polyethylene-film reinforcing and top surface laminated to SBS-modified asphalt adhesive, with release-paper backing; cold applied.
 - 1. Available Products:
 - a. Carlisle Coatings & Waterproofing, Div. of Carlisle Companies Inc.; "CCW WIP 300HT."
 - b. Grace, W. R. & Co.; "Ultra."
 - c. Owens Corning; "WeatherLock."
 - d. Protecto Wrap Company; "Rainproof 40."
- K. Slip Sheet: Building paper, minimum 5 lb/100 sq. ft., rosin sized.
- L. Underlayment Felt: Asphalt saturated organic felt per CBC Standard 32-1, 15 lb. minimum.

2.3 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. 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.
- C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 1. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
- F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
 - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

2.4 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate from materials as indicated by the drawings (match siding when exposed) to cross section indicated, complete with end pieces, outlet tubes, and other special pieces and accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness at a minimum of 36"o.c. or as indicated by the drawings and/or SMACNA. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
 - 1. Gutter Style: As indicated by drawings.
 - 2. Expansion Joints: Butt type.
 - 3. Accessories: Stainless steel wire ball downspout strainer.
- B. Downspouts: Fabricate downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Manufactured Hanger Style: 1-35A for rectangular downspouts and I-35J for round downspouts.
 - 2. Provide sheet metal terminal head in shapes indicated or as approved by Architect.

3. Coordinate with plumbing contractor for water-tight installation of horizontal and vertical roof drains in sheet gutters as indicated in drawings.

2.5 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Base Flashing: Fabricate from the following material:
 1. Galvanized Steel: 0.0276 inch, 22 gage, thick, unless indicated otherwise by drawings.
- B. Counterflashing: Fabricate from the following material:
 1. Galvanized Steel: 0.0217 inch, 24 gage, thick, unless indicated otherwise by drawings.
- C. Flashing Receivers: Fabricate from the following material:
 1. Galvanized Steel: 0.0217 inch, 24 gage, thick, unless indicated otherwise by drawings.
- D. Roof-Penetration Flashing: Fabricate from the following material:
 1. Lead: 4.0 lb/sq. ft., hard tempered.
- E. Openings Flashing in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high end dams. Fabricate from the following material:
 1. Galvanized Steel: 0.0217 inch, 24 gage, thick.
- F. Roof Edge Flashing (Gravel Stop) and Fascia Caps: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Furnish with 6-inch-wide joint cover plates.
 1. Joint Style: Butt, with 12-inch-wide concealed backup plate.
 - a. Stainless Steel: .031 inch, 22 gage, thick, unless indicated otherwise by drawings.
 - b. Galvanized Steel: 0.0396 inch, 24 gage thick, unless indicated otherwise by drawings.
- G. Copings/Parapet Caps: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, seal, and solder or weld watertight.
 1. Joint Style: Butt, with 12-inch-wide concealed backup plate.
 2. Fabricate copings from the following material:
 - a. Stainless Steel: .031 inch, 22 gage, thick, unless indicated otherwise by drawings.
 - b. Galvanized Steel: 0.0396 inch, 24 gage thick, unless indicated otherwise by drawings.

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 work.
 - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 2. Verify compliance with requirements for installation tolerances of substrates.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Install underlayment as indicated on Drawings.
- B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.
- C. Self-Adhering membrane underlayment: Install similar to underlayment at parapet caps and all wall and roof openings including door, window, lower opening perimeters and other wall/roof penetrations to seal substrate from moisture and shed water.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Form sheet metal accurately and to the dimensions and shapes required, finishing molded and broken surfaces with true, sharp, and straight lines and angles and, where intercepting other members, coping to an accurate fit and soldering securely.
 - 2. Unless otherwise specifically permitted by the Architect, turn exposed edges back 1/2".
 - 3. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 1. Make lock seam work flat and true to line, sweating full of solder.
 - 2. Make lock seams and lap seams, when soldered, at least 1/2" wide.
 - 3. Where lap seams are not soldered, lap according to pitch, but in no case less than 3".
 - 4. Make flat and lap seams in the direction of flow.
- C. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

- D. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- E. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.
- F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
 - 1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- G. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
 - 1. Join parts with rivets or sheet metal screws where necessary for strength and stiffness.
 - 2. Provide suitable watertight expansion joints for runs of more than 40'-0", except where closer spacing is indicated on the Drawings or required for proper installation.
- H. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
 - 1. Whenever possible, secure metal by means of clips or cleats, without nailing through the exterior metal.
 - 2. In general, space nails, rivets, and screws not more than 8" apart and, where exposed to the weather, use lead washers.
 - 3. For nailing into wood, use barbed roofing nails 1-1/4" long by 11 gage.
 - 4. For nailing into concrete, use drilled plugholes and plugs.
 - 5. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners unless noted otherwise.
 - 6. Stainless Steel: Use stainless-steel fasteners.
- I. Seal joints with elastomeric sealant as required for watertight construction. Install sealant tape where indicated.
 - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

- J. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches except where pre-tinned surface would show in finished Work.
 - 1. Perform soldering slowly, with a well heated copper, in order to heat the seams thoroughly and to completely fill them with solder.
 - a. Do not use open-flame torches for soldering.
 - b. Heat surfaces to receive solder and flow solder into joints.
 - c. Fill joints completely.
 - d. Completely remove flux and spatter from exposed surfaces.
 - 2. Perform soldering with a heavy soldering copper of blunt design, properly tinned for use.
 - a. Pre-tinning is not required for lead.
 - 3. Make exposed soldering on finished surfaces neat, full flowing, and smooth.
 - 4. After soldering, thoroughly wash acid flux with a soda solution.
- 3.4 ROOF FLASHING INSTALLATION (Where not included as part of Metal Panel Roofing System)
- A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
 - B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
 - 1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 16-inch centers.
 - C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
 - D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.
 - 1. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.
 - 2.
 - E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
 - 1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
 - 2. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Openings Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 MISCELLANEOUS PRODUCTS (if not detailed on the drawings)

- A. Sheet metal copings:
 - 1. Follow standards shown in SMACNA manual, CHAPTER 3
 - 2. Use 22 gage MIN. galvanized sheet metal, unless otherwise noted on the drawings.
 - 3. Slope surface toward roof side of wall with a minimum of 1/2":12" slope.
 - 4. Angle and return bottom edges for rigidity.
 - 5. Turn down a minimum of 4" at inside edges, or as otherwise detailed.
 - 6. Turn down outside a minimum of 4", or as otherwise indicated.
- B. Exposed platforms (if not detailed on the Drawings):
 - 1. Provide a single piece of 20 gage galvanized sheet metal cover over roofing felts as detailed or specified in the roofing sections.
 - a. Cover shall turn down no less than 4" and have corners soldered;
 - b. Where seams are required, use single lock standing seam (SMACNA Figure 3-3) or flat lock seam (SMACNA Figure 3-2).
 - c. Attach cover to platform using wood screws with neoprene washers every 12" on centers on the vertical surface where required.
 - d. Do not penetrate membrane below horizontal metal cover.
- C. Pitch pans (if applicable):
 - 1. Where unflashed projections extend through or rest upon the roof surface, and cannot be flashed with a prefabricated lead boot or SBS-modified bitumen, provide a primed pitch pan in accordance with SMACNA Manual, Plate 68, Figure E, with minimum 4" high collar and 6" flange, except where otherwise indicated.
 - 2. Pitch pan shall be spot welded and hot soldered to prevent bitumen loss.
 - 3. Set flange on last layer of SBS modified bitumen roofing membrane, and nail at 6" on centers.
 - 4. Cover flange with one layer of SBS-modified bitumen, extending onto roof 4", 8", and 12".
 - 5. Fill inside of pan with minimum 1-1/2" of modified elastomeric asphalt mastic over grout.
- D. Cold pipe flashing:
 - 1. Provide 4 lb lead manufactured flashings in accordance with SMACNA , Figure 4-14b.
 - 2. Integrate flanges within roofing plies.
- E. Provide custom hooded flashings at all ganged vertical pipes/penetrations, using curbed type flashings in accordance with SMACNA Manual, Figure 4-14A.

- F. Surface mounted counterflashings:
1. At concrete or masonry walls, provide a two-piece surface-mounted counterflashing system of galvanized steel (Fry or approved equal).
 2. Seal receiver to wall surface with a thermoplastic rubber sealant approved in advance by the Architect.
 3. Fasten the receiver into the wall at 12" on centers; snap in the second piece after base flashing has been installed.
 4. At concrete masonry units, provide a thermoplastic rubber sealant approved in advance by the Architect.
- G. Scuppers at exterior walls (if not detailed on the drawings) SMACNA Figure 1-26:
1. Minimum exterior dimensions shall be 4" x 8".
 2. Do not damage structural elements.
 3. Provide new galvanized sheet metal scuppers with a minimum 6" wide flange.
 4. Weld and hot solder in accordance with SMACNA chapter 1
 5. Prime and cover both sides of flange with bitumen.
 6. Integrate into roofing felts.
 7. Extend outlet a minimum of 2" beyond wall and form a drop at bottom edge.
 8. Caulk around at exterior of wall.
 9. Seal roofing into scuppers outlet bitumen.
 10. Provide leader boxes and downspouts where indicated.
 11. Unless otherwise indicated, overflow scupper openings shall be 2" above main scupper opening through wall.
- H. Drains: SMACNA Figure 1-37
1. Provide 4 lb lead drain pan in drains and overflows.
 2. Do not cut lead to fit corners.
 3. Install roof around the sump area as specified and cut roofing ply assembly flush with drain assembly at drain opening.
 4. Provide asphalt primed lead flashing on top of roofing felts; size the lead flashing to extend uninterrupted up cants or tapered edge strips, and to terminate just below deck line.
 5. Immediately install and tighten clamping ring into lead only, using caution not to break lead sheet.
 6. Hand nail perimeter 4" on centers with one row of 1" head ringshanked nails.
 7. Cover with roofing cap sheet.
 8. All edges shall exhibit minimum 1/4" bead of asphalt.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 ROOF FLASHING INSTALLATIONS

- A. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 24-inch centers.
 2. interlock interior leg of coping with continuous cleats anchored at 24-inch centers.

3.9 MISCELLANEOUS FLASHING INSTALLATION

- A. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.

3.10 TESTS

- A. Upon request of the Architect, demonstrate by hose or standing water that the flashing and sheet metal are completely watertight.

3.11 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a 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.

END OF SECTION 076200

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Throughout the Work, seal and caulk joints where shown on the Drawings and elsewhere as required to provide a positive barrier against passage of moisture, passage of air, and transmission of sound or noise.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, drawings and general provisions of Contract including General, Special and supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Firestopping of floor, wall, and ceiling penetrations, and joint firestopping systems are specified in Sections 07 84 10 and 07 84 43.

1.2 SUBMITTALS

- A. Product data: Within 45 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 - 4. Provide a letter from the manufacturer's representative stating that the proposed sealants are appropriate to the use and location in this project.
- B. Samples: Upon request of the Architect, submit Samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used. Provide samples of all exposed to view sealants to Architect for color selection.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not retain at the job site material which has exceeded the shelf life recommended by its manufacturer.

PART 2 - PRODUCTS

2.1 SEALANTS

- A. Provide the following noise, moisture & air penetration sealants, or equals approved in advance by the Architect, where called for on the Drawings or otherwise required for a complete and proper installation.

1. Horizontal Sealants
 - a. Self-leveling, complying with ASTM C920-79, grade P, class 25;
 - b. Acceptable products (or approved equal):
 - 1) "Vulkem 45, one-part;"
 - 2) Vulkem 245, two-part;"

2. Vertical Sealants:
 - a. Non-sag, complying with ASTM C920-79, type S, grade NS, class 25, use NT, M, A, and O;
 - b. Acceptable products (or approved equal):
 - 1) Sonolastic NP-1 Chemrex Inc.
 - 2) Vulkem 116", one-part;
 - 3) "Vulkem 921", one-part;
 - 4) "Chem-Calk 100" Bostick Construction Products Div.
 - 5) "PRC RubberCalk 7000", one-part Product Research & Chemical Corp.
 - 6) GC-9 Synthacalk", Pecora Corp.

3. Sealant Type D:
 - a. Silicone (vertical surfaces only), complying with Fed Spec TT-S-01543A, class A, low modulus;
 - b. Acceptable products (or approved equal):
 - 1) "Dow Corning 790 Sanitary Sealant;"

4. Sealant Type E:
 - a. Acrylic latex, complying with ASTM C834-76;
 - b. Acceptable products (or approved equal):
 - 1) "Pecora AC 20";

5. Acoustical Joint Sealants Type E:
 - a. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
 - b. 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.

- c. Available Products:
 - 1) Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - 2) United States Gypsum Co.; SHEETROCK Acoustical Sealant.
- 6. Acoustical Sealant for Concealed Joints : Manufacturer's standard, nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
 - a. Available Products:
 - 1) Pecora Corporation; BA-98.
 - 2) Tremco; Tremco Acoustical Sealant.
- 7. Sealant Type F:
 - a. Acoustical sealant (interior concealed conditions only)
 - b. Acceptable products (or approved equal):
 - 1) Sheetrock Acoustical Sealant.
- 8. Fire-stop Sealant complying with ASTM E84 and E814, UL 1479
 - a. Acceptable products (or approved equal): See Specification Section 07840.
- B. All sealants shall be reviewed and approved by the manufacturer as to the appropriateness of its application to the designated use. No sealant shall be selected or used for locations or conditions not in compliance with the manufacturer's recommendations.
- C. For other services, provide products especially formulated for the proposed use and approved in advance by the Architect.
- D. Colors:
 - 1. Colors for each sealant installation will be selected by the Architect from standard colors normally available from the specified manufacturer.
 - 2. Should such standard color not be available from an approved substitute manufacturer except at additional charge, provide such colors at no additional cost to the Owner.
 - 3. In concealed installations, and in partially or fully exposed installations where so approved by the Architect, use standard gray or black sealant.

2.2 PRIMERS

- A. Use only those primers which have been tested for durability on the surfaces to be sealed and are specifically recommended for this installation by the manufacturer of the sealant used.

2.3 BACKUP MATERIALS

- A. Use only those backup materials which are non-absorbent, non-staining, and specifically recommended for this installation by the manufacturer of the sealant used.

2.4 MASKING TAPE

- A. For masking around joints, provide an appropriate masking tape which will effectively prevent application of sealant on surfaces not scheduled to receive it, and which is removable without damage to substrate.

2.5 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Concrete and ceramic tile surfaces:
 - 1. Install only on surfaces which are dry, sound, and well brushed, wiping free from dust.
 - 2. At open joints, remove dust by mechanically blown compressed air if so required.
 - 3. To remove oil and grease, use sandblasting or wire brushing.
 - 4. Where surfaces have been treated, remove the surface treatment by sandblasting or wire brushing.
 - 5. Remove laitance and mortar from joint cavities.
- B. Steel surfaces:
 - 1. Steel surfaces in contact with sealant:
 - a. Sandblast as required to achieve acceptable surface for bond.
 - b. If sandblasting is not practical, or would damage adjacent finish, scrape the metal or wire brush to remove mill scale and rust.
 - c. Use solvent to remove oil and grease, wiping the surfaces with clean white rags only.
 - 2. Remove protective coatings on steel by sandblasting or by using a solvent which leaves no residue.
- C. Aluminum surfaces:
 - 1. Aluminum surfaces in contact with sealant:
 - a. Remove temporary protective coatings, dirt, oil, and grease.
 - b. When masking tape is used for protective cover, remove the tape just prior to applying the sealant.

2. Use only such solvents to remove protective coatings as are recommended for that purpose by the manufacturer of the aluminum work, and which are non-staining.

3.3 INSTALLATION OF BACKUP MATERIAL

- A. When using backup of tube or rod stock, avoid lengthwise stretching of the material. Do not twist or braid hose or rod backup stock.
- B. Installation tool:
 1. For installation of backup material, provide a blunt surfaced tool of wood or plastic, having shoulders designed to ride on the adjacent finished surface and a protrusion of the required dimensions to assure uniform depth of backup material below the sealant.
 2. Do not, under any circumstance, use a screwdriver or similar tool for this purpose.
 3. Using the approved tool, smoothly and uniformly place the backup material to the depth indicated on the Drawings or otherwise required, compressing the backup material 25% to 50% and securing a positive fit.

3.4 PRIMING

- A. Use only the primer approved by the Architect for the particular installation, applying in strict accordance with the manufacturer's recommendations as approved by the Architect.

3.5 BOND-BREAKER INSTALLATION

- A. Provide an approved bond-breaker where recommended by the manufacturer of the sealant, and where directed by the Architect, adhering strictly to the manufacturers' installation recommendations.

3.6 INSTALLATION OF SEALANTS

- A. Prior to start of installation in each joint, verify the joint type according to details on the Drawings, or as otherwise directed by the Architect, and verify that the required proportion of width of joint to depth of joint has been secured.

- B. Equipment:
 - 1. Apply sealant under pressure with power-actuated hand gun or manually-operated hand gun, or by other appropriate means.
 - 2. Use guns with nozzle of proper size, and providing sufficient pressure to completely fill the joints as designed.
- C. Thoroughly and completely mask joints where the appearance of primer or sealant on adjacent surfaces would be objectionable.
- D. Install the sealant in strict accordance with the manufacturer's recommendations, thoroughly filling joints to the recommended depth. Sealant should be continuous without skips, gaps or voids.
- E. Tool joints to the profile shown on the Drawings, or as otherwise required if such profiles are not shown on the Drawings.
 - 1. Provide uniformly smooth joints with slightly concave surface.
 - 2. Do not use tooling agent unless specifically so recommended in writing by the manufacturer of the sealant.
- F. Sealants that, in the opinion of the Architect, are not properly installed according to the manufacturer's recommendations shall be totally removed. The joint shall be thoroughly cleaned, taking care to protect adjacent surfaces. New sealant shall be installed in accordance with these specifications and manufacturer's recommendations.
- G. Cleaning up:
 - 1. Remove masking tape immediately after joints have been tooled.
 - 2. Clean adjacent surfaces free from sealant as the installation progresses, using solvent or cleaning agent recommended by the manufacturer of the sealant used.
 - 3. Upon completion of the work of this Section, promptly remove from the job site all debris, empty containers, and surplus material derived from this portion of the Work.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS, WINDOWS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Standard hollow metal doors and frames for doors and windows.
- B. Related Sections
 - 1. Division 1 Section "Submittal Procedures" for shop drawing, product data and sample submittals.
 - 2. Division 8 Sections "Prefinished Wood Doors" for doors installed in hollow metal frames and "Glazing" for glass lite in hollow metal frames and doors.
 - 3. Division 8 Section "Door Hardware" for door hardware for hollow metal doors and/or frames.
 - 4. Division 9 Sections "Painting" for field painting hollow metal doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated within 30 days of issuance or Notice to Proceed. Include construction details, material descriptions, core descriptions, and finishes.
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 5. Locations of reinforcement and preparations for hardware.
 - 6. Details of each different wall opening condition.
 - 7. Details of anchorages.
 - 8. Details of accessories.
- C. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Coordination with other trades:

1. Submittals shall flag areas of coordination with other trades or where materials that interface with materials specified herein are necessary. Indicate coordination of glazing frames and stops with glazing requirements; indicate coordination with finish hardware.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies: Assemblies complying with CBC Section 715.4 and NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing according to UL 10B or UL 10C. Label all such doors and frames accordingly.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.
 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Fleming Door Products Ltd.; an Assa Abloy Group company.
4. Steelcraft; an Ingersoll-Rand company.
5. Republic Builders Products.
6. Security Metal Products; an Assa Alboy Group company.

B. Grout: USG

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized, 18 gage minimum.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- H. Glazing: Comply with requirements in Division 8 Section "Glazing".
- I. Shop Applied Primer For Ferrous Metals: Manufacturer or fabricator's standard, fast-curing, lead free, "universal" primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated. Provide shop primer paint material that is compatible with finish paint systems indicated and is in compliance with the current EPA rules and regulations at the time and place of application.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 1. Design: Flush panel.

2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection ratings indicated.
 3. Vertical Edges for Single-Acting Doors: Beveled edge.
 - a. Beveled Edge: 1/8 inch in 2 inches.
 4. Top and Bottom Edges: Closed with flush 0.042-inch- thick, end closures or channels of same material as face sheets.
 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless). 16 gage faces.
 2. Exterior doors to be galvanized complying with ASTM A 525 (A60). Wipe coat galvanizing is not permitted.
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless). 16 gage faces.
 2. Classroom doors shall have a foam core capable of providing a minimum STC 39 rating for the door.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
6. Fabricate frames with mitered corners.
 7. Fabricate frames as face welded unless otherwise indicated.
 8. Frames for Level 3 Steel Doors: 0.067-inch (14 gage) thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet.
1. Fabricate frames with mitered corners.
 2. Fabricate frames as face welded unless otherwise indicated.
 3. Frames for level 3 steel doors 0.053 inch (16 gage) thick sheet steel.
 9. Frames for Wood Doors: 0.053-inch (16 gage) thick steel sheet.
 10. Frames for borrowed lights: 0.053 inch (16 gage) thick sheet steel.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 2. Post installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.042 (18 gage) inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.042 (18 gage) inch thick, fabricated from same material as frames in which they are installed.

2.7 LOUVERS

- J. Provide louvers for exterior and interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of minimum 0.020-inch thick, (24 gage) cold-rolled steel sheet set into 0.032-inch thick steel frame. Factory primed, rated when indicated by drawings. See mechanical drawings for size requirements.
 - 1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
 - 2. Fusible link type where indicated to be part of a rated assembly, minimum 14 gage construction.
 - 3. Unless noted otherwise, all exterior louvered openings shall be screened.

2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 2. Glazed Lites: Factory cut openings in doors.
 3. Astragals: Provide overlapping astragal on one leaf of pairs of doors. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush all joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Side Light Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - b. Anchor Fasteners: #8 x 1/2" zinc coated self tapping hex washer head screws, provide two per strap.
 6. Door Silencers: Except on gasketed doors, 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 silences.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
 - c. Do not provide holes or silencers at openings receiving weatherstripping.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame molding on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of hollow metal work.
 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.9 ACCESSORIES

- A, Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

2.10 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
 2. Clean, treat, and paint (primer) exposed surfaces of steel door and frame units, including galvanized surfaces.
 3. Clean steel surfaces of mill scale, rust, oil, grease dirt, and other foreign materials before the application of paint.
 4. Apply shop primer evenly to provide uniformly finished surfaces ready for finish painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- D. 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.

- E. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

- F. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable glazing stops located on secure side of opening.
 - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout. Anchor type shall not obstruct filling the frame with grout.
 - 5. When detailed for installation in prepared openings in concrete construction (dimpled frames), provide sealant between frame and concrete in accordance with provisions of "Joint Sealers" Section of these Specifications.
 - 6. Windows shall have strap anchors within 12" of each corner and at 24" o.c. max. Fasten to framing with 8 d nails.
 - 7. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

- c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within specified below. Shim as necessary. Comply with SDI-100.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat-or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth all rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Access doors and frames for walls, ceilings and plaster soffits.
- B. Related Sections include the following:
 - 1. Division 8 Section "Door Hardware" for mortise lock cylinders.
 - 2. Division 9 Sections for gypsum board and plaster assemblies. Division 9 Sections for special requirements related to special finishes.
 - 3. Plumbing, mechanical, electrical, and low voltage drawings and specifications for doors provided by respective disciplines.

1.2 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, hardware, and attachments to other work.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain access door(s) and frame(s) through one source from a single manufacturer.
- B. Size Variations: Obtain Architect's acceptance and approval of manufacturer's standard size units that may vary slightly from sizes indicated on Drawings

1.4 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to attic spaces, concealed plumbing, mechanical, electrical, fire alarm, fire sprinklers or other concealed work.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.

2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Steel Sheet: Uncoated or electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.
- D. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 2. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 3. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.
- E. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.
- F. Plaster Beads: Edge trim formed from 22 gauge galvanized perimeter plaster beads.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Babcock-Davis; A Cierra Products Co.
 2. Dur-Red Products.
 3. J. L. Industries, Inc.
 4. Karp Associates, Inc.
 5. Larsen's Manufacturing Company.
 6. Milcor Inc.
 7. Nystrom, Inc.
- B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
1. Locations: Wall and ceiling surfaces.
 2. Door: Minimum 0.060-inch- thick sheet metal, set flush with exposed face flange of frame.

3. Frame: Minimum 0.060-inch- thick sheet metal with 1-inch- wide, surface-mounted trim.
 4. Hinges: Spring-loaded, concealed-pin type.
 5. Latch: Cam latch operated by flush key with interior release.
- C. Exterior Flush Access Doors and Frames with Exposed Trim: Weatherproof with extruded door gasket.
1. Locations: Wall surfaces, plaster soffits.
 2. Door: Minimum 0.040-inch- thick, metallic-coated steel sheet; flush panel construction with manufacturer's standard 2-inch- thick fiberglass insulation.
 3. Frame: Minimum 0.060-inch- thick extruded aluminum.
 4. Hinges: Continuous piano, zinc plated.
 5. Lock: Preparation to accept a 1 1/8 inch mortise cylinder.
 6. Interior Latch Release: Mechanism to allow for panel to open from interior side-standard on all panels.

2.3 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 attachment devices and fasteners of type required to secure access panels to types of supports indicated.
1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
 2. Provide mounting holes in frames for attachment of units to metal framing.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
1. For cylinder lock, furnish two keys per lock and key all locks alike.
- E. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 083323 - OVERHEAD COILING DOORS

PART 1– GENERAL

1.01 SUMMARY

- A. Section Includes: Manual operated overhead rolling doors.
- B. Related Sections:
 - 1. 05 50 00 Metal Fabrications. Door opening jamb and head framing.
 - 2. 09 91 00 Painting, for field applied paint finish to door components.

1.02 SUBMITTALS

- A. Reference Section 01 33 00 Submittal Procedures; submit the following items:
 - 1. Product Data.
 - 2. Shop Drawings: Include special conditions not detailed in Product Data. Show interface with adjacent work.
 - 3. Quality Assurance/Control Submittals:
 - a. Provide proof of manufacturer ISO 9001:2000 registration.
 - b. Provide proof of manufacturer and installer qualifications - see 1.3 below.
 - c. Provide manufacturer's installation instructions.
 - 4. Closeout Submittals:
 - a. Operation and Maintenance Manual.
 - b. Certificate stating that installed materials comply with this specification.

1.03 QUALITY ASSURANCE

- A. Qualifications:

1. Manufacturer Qualifications: ISO 9001:2015 registered and a minimum of five years experience in producing doors of the type specified.
2. Installer Qualifications: Manufacturer's approval.

1.04 DELIVERY STORAGE AND HANDLING

- A. Reference Section 01 66 00 Product Storage and Handling Requirements.
- B. Follow manufacturer's instructions.

1.05 WARRANTY

- A. Standard Warranty: Two years from date of shipment against defects in material and workmanship.
- B. Maintenance: Submit for owner's consideration and acceptance of a maintenance service agreement for installed products.
- C. Curtain:
 1. 30-year film integrity warranty
 2. 25-year chalk and fade warranty

PART 2 – PRODUCTS

2.01 OVERHEAD COILING DOOR

- A. Basis-of-Design Product: Subject to compliance with requirements, provide MBCI Metal Roof and Wall Systems, Division of NCI Group, Inc.; Houston TX. Tel: (877) 713-6224; Email: info@mbci.com; Web: www.mbc.com, 2500 Series Commercial Roll-Up Door with Electric Operator Option or an equivalent product by an acceptable manufacturer from one of the following:
 1. Cornell Iron Works, Inc.
 2. Cookson Company
 3. Overhead Door Corporation
- B. Size as indicated in drawings.

- C. Substitutions: Reference Section 01 25 00 Substitution Procedures for requests submitted an approved prior to the bid.

2.02 MATERIALS

A. Curtain:

1. Material: 26-gauge galvanized, Grade E hard steel
2. Corrugation: 5/8" ribbed
3. Finish: Siliconized polyester WeatherXL™ paint over prime coat

B. Bottom Bar:

1. 6036-T6 extrusion: aluminum
2. 2" x 1 1/2" angles: galvanized steel
3. Bulb astragal
4. Nuts and bolts: Stainless steel

C. Axle-Drum Assembly:

1. Axle: 1 5/16" O.D., 11gauge steel (width≥10').
2. Drums: 12", 16 gauge, sheilded steel ball bearings
3. Full top sheet
4. Oil tempered torsion springs

D. A.C.E. Guide System:

1. 16-gauge galvanized steel
2. Adjustable bolt-on head stop
3. Polyethylene wear strip
4. Pre-punched for lock and attachment fasteners

E. Hardware:

1. Saddle Clamps with set fasteners
2. 10-gauge slide locks; 2 per door

3. 16-gauge step plate; 2 per door
 4. ¼" steel welded angle T-bracket
- F. Electric Operator: PRO-LH Commercial Limited Duty Belt Drive Jackshaft by Nice1- (877)888-1116 <https://micanan.com/en/product/pro-lh> with Emergency Chain Hoist
1. Warranty: 2 years

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C. Commencement of work by installer is acceptance of substrate.

3.02 INSTALLATION

- A. General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports for a secure full functioning door suitable for daily operation and long life.
- B. Mount the coil side of the unit to the inside of the building.
- C. Follow manufacturer's installation instructions.

3.03 ADJUSTING

- A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

3.04 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer.
- B. Remove surplus materials and debris from the site.

3.05 DEMONSTRATION

- A. Demonstrate proper operation to Owner's Representative.
- B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION 083323

SECTION 084113 - ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior aluminum storefront framing for windows as indicated in drawings.
2. Exterior heavy duty aluminum door frames for wood stile and rail door by others as indicated in drawings.
3. All required integral hardware, accessories fasteners and structural reinforcing required for a complete durable water tight system.
4. Installation of glazing.

B. Related Sections:

1. Division 8 Section "Door Hardware" for hardware provided under that section.
2. Division 8 Section "Glazing" for Glazing Requirements to the extent not specified in this section.
3. Division 8 Section "Aluminum Windows" for punched openings.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Door hardware:

1.3 DEFINITIONS

- A. ADA/ABA Accessibility Guidelines:** U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance:** Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
1. Movements of supporting structure indicated on Drawings including, but not limited to deflection from uniformly distributed and concentrated live loads.
 2. Dimensional tolerances of building frame and other adjacent construction.
 3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Noise or vibration created by wind and by thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units.

- C. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
- D. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 20 lbf/sq. ft.
 - 1. Maximum Water Leakage: According to AAMA 501.1 no uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.
- E. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- F. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.
- G. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F when tested according to AAMA 1503 or as otherwise required by the Title-24 Envelope requirements and as indicated in the drawings.
- H. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:
 - 1. Sound Transmission Class (STC): Minimum 30 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
 - 2. Outdoor-Indoor Transmission Class (OITC): Minimum 34 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.
- I. Design of Aluminum Framed Entrances and Storefronts shall meet the requirements of Chapters 16A and 24 of 2013 CBC.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, minimum half size scaled details, and attachments to other work.
 - 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior including adjacent flashing.

2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
 3. Indicate adjacent items furnished or installed by others.
- C. Samples for Initial Selection: Color charts for units with factory-applied color finishes to include standard and available special custom colors.
- D. Samples for Verification: For each type of exposed finish required and colors selected in manufacturer's standard sizes, minimum 4" x 6".
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.
- F. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- G. Warranties: Sample of special warranties as listed in this section.

1.6 QUALITY ASSURANCE

- A. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- B. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.
- C. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.

- b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - c. Failure of operating components.
 - d. Water leakage through fixed glazing and framing areas.
 - e. Adhesive or cohesive sealant failures.
2. Warranty Period: Three years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
1. Warranty Period: 15 years from date of Substantial Completion for organic color coat finish and 10 years for anodic finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Oldcastle Building Envelope Series 3000 2"x4-1/2" Multi-Plane Center Set thermally broken storefront system or comparable product by one of the following to match or exceed the basis-of-design system in style, performance, interface with adjacent construction and color, submitted under provisions for substitutions per Section 01 25 00, a minimum of 14 days prior to bid date.
1. EFCO
 2. United States Aluminum.
 3. Kawneer North America

2.2 MATERIALS

- A. Aluminum: Extruded 6063-T6 alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Structural Profiles: ASTM B 308/B 308M.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken with a structural thermal barrier.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Center.
 4. Provide heavy duty or reinforced frames where supporting doors, including stops.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum or stainless steel with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

D. Concrete and Masonry Inserts: Stainless steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Exposed Flashing: Form exposed flashings from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

G. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing." Storefront to accommodate 1" insulated glass assemblies unless specifically indicated otherwise or thicker assemblies are required for compliance with structural deflection criteria.

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ENTRANCE DOOR SYSTEMS – NOT USED (by Section 08 14 00 & 08 14 29)

A. Entrance Door Hardware: As specified in Division 8 Section "Door Hardware."

2.6 SLIDING SERVICE WINDOWS – NOT USED

2.7 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from exterior.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - 8. Provide integral door stops for doors provided by others (verify thickness),
- D. Storefront Framing: Fabricate components for assembly using a system that is compatible with the adjacent existing system.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- F. Entrance Doors: Provide by Section 08 14 00 and 08 14 29.
- G. Hardware Installation: Factory install hardware to frames to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A41/A44, Class I, 0.7 mils or thicker.
 - 1. Color: Etched, medium matte, clear anodic coating, clear anodized or etched, medium matte, dark bronze colored anodic coating as selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify door opening size and hardware requirements with door suppliers for wood doors provide by others prior to beginning aluminum frame installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.

4. Rigidly secure non-movement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior. Coordinate with installers of adjacent framing, finishes and flashings systems to assure a complete weathertight assembly at head, jambs and sill. Provide flashings compatible with storefront system where not indicated to be provided by other trades/sections as required for weathertight installation.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Division 8 Section "Glazing."
- G. Entrance Doors: Wood doors to be installed by others.
- H. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet vertically and 1/8 inch in 20 feet horizontally; 1/4 inch over total length.
 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 CLEANING

- A. Clean surfaces in compliance with manufacturer's recommendations; remove excess mastic, mastic smears, foreign materials and other unsightly marks.

END OF SECTION 084113

CONTRACT # 20-S-01

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series
 - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 - 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.

- c. Wiring instructions for each electronic component scheduled herein.
- 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
 - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

- F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
 2. Plans for existing and future key system expansion.
 3. Requirements for key control storage and software.
 4. Installation of permanent keys, cylinder cores and software.
 5. Address and requirements for delivery of keys.
- G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Five years for standard duty cylindrical (bored) locks and latches.
 - 2. Five years for exit hardware.
 - 3. Twenty five years for manual overhead door closer bodies.
 - 4. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 - 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 - 4. Hinge Options: Comply with the following:

- a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Manufacturers:
 - a. Hager Companies (HA) - CB Series.
- B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 1. Manufacturers:
 - a. Hager Companies (HA).

2.3 POWER TRANSFER DEVICES

- A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
 1. Manufacturers:
 - a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE) – EL-CEPT Series.
 - b. Securitron (SU) - EL-CEPT Series.
 - c. Von Duprin (VD) - EPT-10 Series.

2.4 DOOR OPERATING TRIM

- A. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
 1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 5. Keyway: Match Facility Standard.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
 1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Field verify and key locks to match Owner's existing system.
- E. Key Quantity: Provide the following minimum number of keys:
 1. Change Keys per Cylinder: Two (2)
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
- F. Construction Keying: Provide construction master keyed cylinders.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Cylindrical Locksets, Grade 2 (Standard Duty): ANSI/BHMA A156.2, Series 4000, Grade 2 certified.
 1. Locks are to be non-handed and fully field reversible.
 2. Manufacturers:

- a. Schlage (SC) - AL Series.

B. Narrow Stile Interconnected Locksets:

1. Interconnected locksets designed with a mortise case which contains both a latchbolt and deadbolt and allows simultaneous retraction of both the latchbolt and deadbolt with a single motion turning of the lever handle.
2. Locksets to be non-handed and available with a 1 1/8" or 1 1/2" standard backset.
3. Latchbolt and deadbolt shall be fabricated of wrought brass and bronze with a minimum 3/4" latchbolt throw and 1" deadbolt throw.
4. Manufacturers:
 - a. Adams Rite (AD) – 2190/2290 Series.

2.7 AUXILIARY LOCKS

- A. Cylindrical Deadlocks: ANSI/BHMA A156.36, Grade 1, cylindrical type deadlocks to fit standard ANSI 161 preparation and 1 3/8" to 1 3/4" thickness doors. Provide tapered collars to resist vandalism and 1" throw solid steel bolt with hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other locksets.
1. Manufacturers:
 - a. Schlage (SC) - B600 Series.

2.8 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 4. Dustproof Strikes: BHMA A156.16.

2.9 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:

- a. Von Duprin (VD) - 35A/98 XP Series.

2.10 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:

- a. Norton Door Controls (NO) - 7500 Series.

2.11 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as

indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.12 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 1. National Guard Products (NG).
 2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
 3. Reese Enterprises, Inc. (RE).

2.13 ELECTRONIC ACCESSORIES

- A. Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be expandable up to 16 individually protected outputs. Output modules

shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.

1. Manufacturers:
 - a. Securitron (SU) - AQD Series.

2.14 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.15 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Section "Closeout Procedures" for project punch and reporting requirements including compliance with approved submittals and verification door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handing and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate selection for the material and application.
- B. Manufacturer's Abbreviations:

PART 4 -

- 1. MK - McKinney
- 2. HA - Hager
- 3. PE - Pemko
- 4. VD - Von Duprin
- 5. SC - Schlage
- 6. AD - Adams Rite
- 7. SA - SARGENT

- 8. KA - Kaba Ilco
- 9. RO - Rockwood
- 10. NO - Norton
- 11. SU - Securitron
- 12. OT - Other

Hardware Sets

Set: 1.0

Doors: 100

1 Continuous Hinge	780-112HD (verify w/ door mtl)	Clear	HA
1 Narrow Stile Lock (with trim)	2190-411-303 (Square)	US32D	AD
1 Cylinder	26-098	626	SC
1 Thumbturn Cylinder	ADA7161	26D	KA
1 Door Closer	7500	689	NO
1 Wall Stop	409	US32D	RO
1 Threshold	Per Detail x FHSL14		PE
1 Gasket	By Door Manufacturer		
1 Sweep	18100CNB		PE

Set: 2.0

Doors: 101

2 Continuous Hinge	780-112HD (verify w/ door mtl)	Clear	HA
1 Exit Device	9947L-NL LBR	US26D	VD
1 Exit Device	9947EO LBR	US26D	VD
1 Cylinder	20-057	626	SC
2 Surface Closer	CLP7500R	689	NO
2 Kickplate	K1050 10" High x CSK	US32D	RO
1 Threshold	Per Detail x FHSL14		PE
1 Rain Guard	346C x Full Frame Width	AI	PE
1 Gasket	S44D Head & Jambs		PE
2 Sweep	57AV		PE
2 Astragal	29324CNB		PE

Set: 3.0

Doors: [104](#)

1 Continuous Hinge	CFMxxSLF-HD1		PE
1 Fail Secure Lock	ND80EU R D RX RHO	626	SC
1 Door Closer	PR7500	689	NO
1 Kickplate	K1050 10" High x CSK	US32D	RO
1 Door Stop	471 EXP	US26D	RO
1 Threshold	Per Detail x FHSL14		PE
1 Rain Guard	346C x Full Frame Width	AI	PE
1 Gasket	S44D Head & Jambs		PE

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1 Sweep	57AV		PE
1 Electric Power Transfer	EPT10	SP28	VD ⚡
1 Power Supply	AQDx (size as reqd)		SU ⚡
1 Card Reader	By Security Contractor		

Set: 4.0

Doors: 102, 103

1 Continuous Hinge	780-112HD (verify w/ door mtl)	Clear	HA
1 Privacy Lock w/ Indicator	L9496 L583-363 06A	626	SC
1 Door Closer	7500	689	NO
1 Kickplate	K1050 10" High x CSK	US32D	RO
1 Wall Stop	409	US32D	RO
1 Threshold	Per Detail x FHSL14		PE
1 Gasket	S44D Head & Jambs		PE
1 Door Bottom	2251AV	AI	PE

Set: 5.0

Doors: 101B

3 Hinge	BB1279	US26D	HA
1 Entrance/Office Lock	AL50 R D SAT	626	SC
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 6.0

Doors: 200, 203

1 Continuous Hinge	780-112HD (verify w/ door mtl)	Clear	HA
1 Nightlatch	AX 35A-NL-OP	US26D	VD
1 Cylinder	20-057	626	SC
1 Door Pull	BF157 Mtg-Type 12HD	US32D	RO
1 Drop Plate	As Required	689	NO
1 Door Closer	PR7500	689	NO
1 Door Stop	471 EXP	US26D	RO
1 Threshold	Per Detail x FHSL14		PE
1 Gasket	By Door Manufacturer		
1 Sweep	57AV		PE

Set: 7.0

Doors: 201, 202, 204

1 All Hardware	By Door Manufacturer		OT
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END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows, including for storefronts.
 - 2. Door lites for doors not specified to include glazing.
 - 3. Interior borrowed lites.
 - 4. Fire rated glazing and framing system.

- B. Related Sections:
 - 1. Division 8 Section "Hollow Metal Doors, Windows and Frames"
 - 2. Division 8 Section "Prefinished Wood Doors" and "Aluminum Clad Wood Doors"
 - 3. Division 8 Section "Aluminum Framed Entrances, and Storefronts"

1.2 DEFINITIONS

- A. Manufacturers of Glass Products: 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 C 1036.

- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

- D. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.3 PERFORMANCE REQUIREMENTS

- E. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

- F. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- G. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
 1. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 2. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

1.4 SUBMITTALS

- H. Product Data: For each glass product and glazing material indicated.
- I. Samples: For the following products, in the form of 12-inch- square Samples for glass.
 1. Each color of clear or tinted float glass.
 2. Fire rated glass.
 3. Insulating glass for each designation indicated.
 4. Laminated glass.
 5. For each color (except black) of exposed glazing sealant indicated.
- J. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- K. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
 1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.
 3. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.
- L. Product Test Listings and Reports: For each of the following types of glazing products:
 1. Insulating glass.
 2. Glazing sealants.
 3. Glazing gaskets.
 4. Fire Resistant Glazing
- M. Qualification Data: For installers.
- N. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- O. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass coated float glass and insulating glass.
- P. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- Q. Safety Glazing Products: Comply with CBC Section 2406, with testing requirements in 16 CFR 1201 and, for wired glass, with ANSI Z97.1.
 - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
 - 2. Where glazing units, including Kind FT glass are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- R. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
 - 2. Glazing Standards: GANA Glazing Manual and Sealant Manual
- S. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
 - 1. Insulating Glass Certification Council.
- F. Fire Rated Glass: Each lite shall bear a permanent, non-removable label of Underwriters Laboratories and/or Intertek Testing Services (Warnock-Hersey) certifying it for use in tested and rated fire protective assemblies.

1.6 DELIVERY, STORAGE, AND HANDLING

- T. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- U. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.7 PROJECT CONDITIONS

- V. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.8 WARRANTY

- A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: 10 years from date of Final Completion.
- B. Fire rated glazing and frame system: 5 years from date of Final Completion.

1.9 REFERENCES

- A. ASTM E 119 – Fire Tests of Building Construction Materials.
- B. ASTM E 2010 – Standard Test method for Positive Pressure Fire Tests of Window Assemblies.
- C. ASTM E 2074 – Standard Test Method for Fire Tests of Door Assemblies, including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.
- D. ASTM F 1915 – Standard Test Methods for Glazing for Detention Facilities.
- E. CSFM – Fire Tests for Doors and Window Assemblies.
- F. GANA – Glazing Manual.
- G. GANA – Sealant Manual.
- H. NFPA 80 – Fire Doors and Windows.
- I. NFPA 251 – Fire Test for Fire Endurance of Building Construction and Materials.
- J. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.
- K. NFPA 257 – Standard on Fire Test for Window and Glass Block Assemblies.
- L. UL 9 – Fire Tests of Window Assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
5. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 GLASS PRODUCTS - GENERAL

- A. Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.
 1. Comply with glass design requirements specified in Part 1 "Performance Requirements" article.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 1. Comply with glass design requirements specified in Part 1 "Performance Requirements" article.
 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 3. For uncoated glass, comply with requirements for Condition A.
 4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.
 6. Where indicated in drawing for Spandrel Glazing provide Kind HS float glass with ceramic frit on the backside (face 4) @ inner pane of dual glazed unit. Frit color to be selected by the Architect to match adjacent glass. Glass shall be a minimum of 1/4" thickness.
- C. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:
 1. Interlayer: Polyvinyl butyral or cured resin of .03 inch thickness or as otherwise indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
 - a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.
 - b. For cured-resin interlayers, laminate lites with laminated-glass manufacturer's standard cast-in-place and cured-transparent-resin interlayer.
 2. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

- D. Wired Glass: ASTM C 1036, Type II (patterned and wired flat glass), Class 1 (clear), Quality-Q-6; and of form and mesh pattern specified.
- E. Fire Rated Glass (20 minute door lites): ASTM E 2010, ASTM E 2074, monolithic, radiant heat reducing flat glass. Manufactured by Safti First, or approved Equal.
- F. Fire Rated Glazing (45 minute corridor wall windows): TGP Circular windows in field built framing with metal L-angles as indicated in drawings. Glazing to be minimum 3/16 inch thick impact resistant "Firelite" by TGP with 45 minute rating, tested in accordance ASTM E-163 and UKL I0C.
- G. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
 - 1. Comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 - 2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 - 3. Sealing System: Dual seal, with primary and secondary sealants as follows:
 - a. Manufacturer's standard sealants.
 - 4. Spacer Specifications: Manufacturer's standard spacer material and construction, color as selected by architect.

2.3 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 - 1. EPDM, ASTM C 864.
 - 2. 1/8" x 3/8" closed cell PVC tape at fire rated glazing.

2.4 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. Single-Component Neutral or Basic-Curing Silicone Glazing Sealants:

- a. Available Products:
 - 1) Dow Corning Corporation; 790.
 - 2) GE Silicones; SilPruf LM SCS2700.
 - 3) Tremco; Spectrem 1 (Basic).
- b. Type and Grade: S (single component) and NS (nonsag).
- c. Class: 100/50.
- d. Use Related to Exposure: NT (nontraffic).
- e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 - 1) Use O Glazing Substrates: Coated glass and galvanized steel.
- f. Applications: Glazing in steel window frames.

2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, 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: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.6 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze 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. Refer to the glass schedule at the end of this section.
 - 1. MONOLITHIC FLOAT-GLASS UNITS
 - a. Uncoated Clear Float-Glass Units: Class 1 (clear) float glass annealed or Kind HS (heat-strengthened) float glass where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with system performance requirements Kind HS (heat-strengthened) float glass or Kind FT (fully tempered) float glass.
 - 1) Thickness: As indicated by drawings and schedule.
 - 2. LAMINATED GLASS
 - a. Clear glass (unless otherwise indicated for tint), thickness as indicated by drawings and schedule for sound, safety and/or security purposes.
 - 3. MONOLITHIC FIRE RATED-GLASS UNITS
 - a. As indicated in Sections 2.02, E and F.
 - 4. INSULATING-GLASS UNITS
 - a. Passive Solar Low-E Insulating-Glass Units:

- 1) Basis-of-Design Product: PPG Clear Solarban 70 insulating glass or a comparable product.
 - 2) Overall Unit Thickness: 1 inch.
 - 3) Interspace Content: Argon gas
 - 4) Outdoor Lite: 1/4" annealed float glass.
 - a. Color: Clear by PPG Industries, Inc.
 - b. Kind FT (fully tempered) where indicated or required by codes for safety glazing.
 - 5) Indoor Lite: Clear annealed float glass 1/4 inch thick.
 - a. FT (fully tempered) where indicated or required by codes for safety glazing.
 - 6) Low-E coating on Number 2 layer at exterior windows.
5. Color: All interior glazing shall be clear and exterior glazing shall have clear lites or shall be tinted where otherwise specifically indicated.
 6. Provide Kind HS (heat strengthened) glass in lieu of float glass where needed to resist thermal stresses induced by differential shading.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, 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 system.
 3. Minimum required face or 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 will leave visible marks in the complete work.

3.3 GLAZING, GENERAL

- A. 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.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- 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 is glass

with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate 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 as follows:
 - 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 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.

3.4 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. 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; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project 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 GLASS SCHEDULE

Glass types for doors, windows in punched openings and storefront systems shall be as follows, unless otherwise indicated on drawings:

- A. Storefront Systems: Provide 1" insulated units per paragraph 2.06, A, 4 above.
- B. Aluminum Windows; See specifications section 08 51 13 Aluminum Windows. Window manufacturer to provide 1" insulating units per paragraph 2.06, A, 4 pre-installed in window frames.
- C. Aluminum clad wood doors: See specification Section 08 14 00. Door manufacturer to provide 1" insulating units per paragraph 2.06, A, 4 above, pre-installed in doors.
- D. Windows; 1/4" nominal clear laminated sound/safety glass: All non-fire-rated interior door and window locations, except as indicated otherwise for fire rated glazing.
- E. Corridor fire rated door lites: 3/8" clear 20 minute fire resistance rated glazing complying with CBC Section 715.4.3: All new interior one-hour fire rated corridor locations in 20 minute fire rated doors for door vision lite glazing (exempt from hose stream test). See paragraph 2.02 E.
- F. Corridor Fire Rated Windows: Fire Rated windows: 45 minute clear Firelite Glazing. See paragraph 2.02 F.

END OF SECTION 088000

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board for walls and ceilings.
- B. Related Sections include the following:
 - 1. Division 05 Section "Cold-Formed Metal Framing" for metal framing and backing.
 - 2. Division 06 Section "Miscellaneous Carpentry" for wood framing and furring that supports gypsum board.
 - 3. Division 07 Section "Building Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
 - 4. Division 09 Section "Tile Backer Board" for cementitious backer units installed as substrates for ceramic tile.
 - 5. Division 09 painting Sections for primers applied to gypsum board surfaces.
 - 6. Division 09 Section "Gypsum Board Suspension System" for gypsum board support system at ceilings and soffits where indicated.
 - 7. Division 09 Section "Glass-Mat Gypsum Sheathing" for exterior gypsum wall sheathing.

1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch long lengths for each trim accessory indicated.
 - 2. Textured Finishes: 24 inch square size for each textured finish indicated and on same backing indicated for Work.

1.03 QUALITY ASSURANCE

- 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.

1.04 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.05 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and environmental conditions are acceptable.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are 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

2.01 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.02 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum Co.
 - b. BPB America Inc.
 - c. G-P Gypsum.
 - d. National Gypsum Company.
 - e. Temple.
 - f. USG Corporation.
- B. Regular Type (Type "X" Fire Rated):
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- C. Type F. R. (Type C Fire Rated and impact resistant):
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- D. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board. Use Type C (Fire Rated where required for fire assemblies):
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- E. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.
 - 1. Core: 5/8 inch, Type F.R.

2. Long Edges: Tapered.
- F. Very Hi-Impact Wallboard: reinforced fiber mesh for increased indentation and penetration resistance, ASTM 636 ASTM C1278, Type X, 5/8" thick, tapered edges, ends cut square. Provide at toilet rooms and other walls indicated for Acrovyn or FRP wall panels and at corridor walls and similar high traffic areas.
 - G. Other types and thicknesses specifically indicated or otherwise required to achieve fire-rated and sound rated wall and ceiling assemblies.

2.03 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.04 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Wallboard: Reinforced Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use setting-type, sandable-type sandable topping compound.
 5. Skim Coat: When a level 5 finish is required, for the final coat use setting-type, sandable topping compound.

2.05 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Gypsum Board Adhesive:
 1. DAP Professional Drywall Construction Adhesive.
 2. Liquid Nails Drywall Adhesive.
- D. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- E. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."
- F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- G. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

2.06 TEXTURE FINISHES

- A. Finish: As recommended by textured finish manufacturer.
 1. Texture Finish: Water-based, job- mixed, drying-type texture finish for spray application.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) G-P Gypsum; Georgia-Pacific ToughRock Wall and Ceiling Texture.
 - 2) USG Corporation; Sheetrock Quick Spray Decorative Texture.
 2. Texture: Medium orange peel, smooth sand, light orange peel or match existing adjacent finish.
 3. Architect to approve samples prior to application.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance. Verify that all blocking, backing, strapping and framed openings as required for attachment of accessories, equipment, fixtures and cabinetry has been properly installed.
- 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.

3.02 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 of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered 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 full height with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally. Fully encapsulate interior side of insulated walls with gypsum board panels.
 - 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. 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- wide joints to install sealant.
 - 4. At fire-resistive wall and ceiling assemblies, install gypsum board panels cut tight to and around rafters, joints, blocking, beams and similar projections to provide full membrane protection to roof or floor deck above and/or to rated membrane applied to underside of roof/floor framing to achieve the fire protection required by referenced CBC UL or W-H assemblies and as indicated in drawings. Seal voids with fire resistant sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood or metal framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.
- J. 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 recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

- K. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

3.03 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Regular Type: Vertical surfaces, unless otherwise indicated.
 - 2. Type F.R.: Where required for fire-resistance-rated assembly Vertical surfaces, unless otherwise indicated.
 - 3. Ceiling Type: Ceiling surfaces.
 - 4. Moisture- and Mold-Resistant Type: At wet areas in restrooms.
- 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 vertically (parallel 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.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
 - 1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - 2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.04 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 84 in specific locations approved by Architect for visual effect and as indicated on the drawings.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. L-Bead: Use at exposed panel edges. Leave 1/4" space for caulk where abutting dissimilar materials.

3.05 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 and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for 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 2: Panels that are substrate for acoustical tile and vinyl covered tackboard.
 - 3. Level 3: Where indicated on the drawings.
 - 4. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.
 - 5. Level 5: Where wall coverings are specified or where indicated for a very smooth/level finish.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.06 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.07 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. 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 09290

SECTION 095113 - ACOUSTICAL PANEL SUSPENDED CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes acoustical panels and exposed suspension systems for ceilings including all components and accessories for support, bracing and anchorage.
- B. Related Sections include the following:
 - 1. Division 09 Section "Acoustical Tile Ceilings" for ceilings consisting of mineral-base acoustical tiles used with concealed suspension systems, stapling, or adhesive bonding.
 - 2. Division 09 Section "Acoustical Wall Panels and Ceiling Clouds" for suspended fabric wrapped fiberglass acoustical cloud ceiling panels.

1.2 DEFINITIONS

- A. CAC: Ceiling Attenuation Class.
- B. LR: Light Reflectance coefficient.
- C. NRC: Noise Reduction Coefficient.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.
- C. Research/Evaluation Reports: For each acoustical panel ceiling and components.
- D. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
 - 2. Suspension System: Obtain each type through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.
 - b. Flame Spread Index: 25 or less.
- C. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 1. T-24 CBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
 1. Required Attendees: Architect, Owners Representative, Inspector, Mechanical Consultant, Electrical Consultant, General Contractor, Mechanical Contractor, and Electrical Contractor (lighting),

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings

is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 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. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed, or one full box, whichever is lesser, as a minimum.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong World Industries, Inc.; "Minaboard Cortega" or "Fissured."
 - 2. Certainteed; Baroque.
 - 3. USG Interiors, Inc.; "Auratone", item #507.

4. Other special panels with different size, edges, textures and patterns as indicated in drawings.
- B. Classification: Provide fire-resistance-rated Class A panels complying with ASTM E 1264 for type, form, and pattern as follows:
1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
 2. Pattern: CD or CE (perforated small holes and fissured). Ceiling Type C-4 to have 1" wide linear grooves 6" on center.
 3. Color: White.
 4. LR: Not less than 0.80.
 5. NRC: Not less than 0.55.
 6. CAC: Not less than 30.
 7. Edge/Joint Detail: Square for ceiling type C-2, Tegular for ceiling types C-3 and C-4.
 8. Thickness: 5/8 inch.
 9. Modular Size: 24 by 24 inches and 24 by 48 inches, as indicated by the drawings.
 10. Flame Spread Index: 25 or less.
 11. Smoke-Developed Index: 450 or less.
- C. Refer to finish schedule, ceiling plans, sections and details for other specialty acoustical panels that may have tegular edges, scored patterns, different textures and other features as indicated.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire (12 ga.).
- E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces or as indicated in drawings.

- F. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
 - 1. "Berc Clip" as manufactured by Armstrong World Industries, or approved equal, as indicated by drawings.
- G. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees and as required to hold vertical and steep slope panels in place.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong World Industries, Inc.; Prelude XL Heavy Duty (fire guard when required).
 - 2. Certainteed; Classic Stab, heavy duty.
 - 3. USG Interiors, Inc.; Standard DXL, heavy duty.
 - 4. Chicago Metallic Corporation, heavy duty.
- B. Wide-Face, Capped, Double-Web, Fire-Rated Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch- wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Steel or aluminum cold-rolled sheet.
 - 5. Cap Finish: Painted white.

2.5 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.
 - 1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
 - 2. Shadow molding, Armstrong #7873, or approved equal, at dropped soffit walls and as otherwise indicated by the drawings.

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.
 - 1. 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, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with T-24 CBC Standard 25-5, ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested and approved 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 within 1-1/2". Wire turns made by machine where both strands have been deformed may exceed the 1 1/2" dimension, but the number of turns must be maintained, and must be as tight as possible. Connect hangers directly either to structures 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. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 6. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 7. Install compression struts with vertical hanger wire, spaced as indicated by the drawings, to inhibit vertical displacement.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns within 1-1/2". Suspend bracing from building's structural members as required for hangers.
- 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. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim, unless specifically indicated otherwise by the drawings.
- 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 a neat, precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 2. 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.
 3. Arrange directionally patterned acoustical panels with the pattern running in one direction parallel to the short axis of the space unless indicated otherwise by the drawings.
 4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
 5. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.
- G. Lateral Bracing:
1. Provide lateral and uplift bracing as required by pertinent California codes and regulations for schools. Provide 4 sets of splayed bracing wires oriented 90 degrees from each other and spaced not more than 12'-0" each way. Provide bracing wires at locations not more than 6'-0" centers above each perimeter wall and at the edge of vertical ceiling offsets.
 2. Secure lateral brace to structural members. Secure at right angles to the direction of the partition and four ways in large ceiling areas.
 3. The slope of splay wires shall not exceed 45 degrees from the plane of the ceiling and be taught.
 4. Do not splice splay wires.
 5. Fasten splay wires with not less than four tight turns within a distance of 1-1/2".
 6. Provide uplift bracing of steel studs or metal EMT tubing at each point of lateral bracing as indicated, securely attached to main runner at ceiling and to floor/roof structure above as indicated and required by Division of the State Architect.

3.4 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. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT WALL BASE AND ACCESSORIES

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. Resilient Wall Base.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size samples of each resilient product color, texture, and pattern required.
- D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.4 QUALITY ASSURANCE

- A. Installation Qualification: Contractors for floor covering installation should be experienced in managing commercial flooring projects and provide professional installers, qualified to install the various flooring materials specified. An installer is "qualified" if trained by Tarkett or a certified INSTALL (International Standards & Training Alliance) resilient floor covering installer.
- B. Mockups: Provide resilient products with mockups specified in other Sections.

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 Tarkett, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

1.6 PROJECT CONDITIONS

- A. Install resilient products after other finishing operations, including painting, have been completed.
- B. Maintain ambient temperatures within range recommended by Tarkett, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C) in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- C. Maintain the ambient relative humidity between 40% and 60% during installation.
- D. Until Substantial Completion, maintain ambient temperatures within range recommended by the manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis-of-design manufacturer: Tarkett North America, Address: 30000 Aurora Rd., Solon, Ohio 44139, web: www.tarkettna.com, info@tarkett.com
- B. Provide basis of design product, or comparable product approved by Architect prior to bid from the list of manufacturers below:
 - 1. Burke Mercer Flooring Products; Molded Rubber Wall Base (Blue Bonnet color)
 - 2. Armstrong World Industries, Inc.; Color Integrated Rubber Wall Base.
 - 3. Azrock Commercial Flooring, DOMCO; Rubber Wall Base.
 - 4. Roppe Corporation; Pinnacle Rubber Base.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Flooring products 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."

2.3 RESILIENT MILLWORK CONTOURABLE WALL BASE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Johnsonite; A Tarkett Company; Millwork Silhouette or comparable product.

- B. Product Standard: Meets performance requirements for ASTM F 1861 Standard Specification for Resilient Wall Base, Type TP, Group 1.
- C. Specify length: 8 feet (2.4 m).
- D. Colors and Patterns: As selected by Architect from full range of industry colors.
- E. Test Data:
 - 1. Resistance to light, ASTM F1515: Passes
 - 2. Resistance to chemicals, ASTM F925: Passes
 - 3. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm² or greater, Class 1.

2.4 INSTALLATION MATERIALS

- A. Adhesives: as recommended by Tarkett to meet site conditions
 - 1. Tarkett 960 Cove Base Adhesive (Porous applications)
 - 2. Tarkett 946 Premium Contact Bond Adhesive (Non-porous applications)

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.
- 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 adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to Tarkett's written instructions to ensure adhesion of resilient wall base.
- B. 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.
- C. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with Tarkett'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 practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient wall 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.

3.4 CLEANING AND PROTECTION

- A. Comply with Tarkett's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 096513

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces, as indicated on the drawings and schedules, and as specified herein.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
 - 2. Paint and finish exposed surfaces using the combination of materials listed on Painting Schedule in part 3 of this Section, as specified herein, and as needed for a complete and proper installation.

- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish except when specifically noted otherwise.
 - 2. Priming or priming and finishing of certain surfaces may be specified to be factory-performed or installer-performed under pertinent other Sections. Said provisions DO NOT negate the primers required to be applied on-site where finishing is a part of this Section.

- C. Provide labor, materials, equipment, and services needed in areas of alteration work and new construction to clean and prepare the surfaces, and to paint including, but not necessarily limited to:
 - 1. Interiors requiring painting of surfaces including gyp. board walls/ceilings, wood casework, trim, window panels/frames/sash, doors/frames and other similar items in the areas of work.
 - 2. Exterior:
 - a. Plaster building walls and misc trim where called for on the drawings. Paint the sections of the wall indicated as a part of the work from the ground to the roof deck, soffit or eave. Extend to end of wall or nearest complete panel joint. All new plaster and all patched or retextured plaster is to be painted to match existing adjacent surfaces.
 - b. Trim, window panels/frames/sash, doors/frames and other similar items in the area of work.
 - 3. Lead Based Paint: The District has retained a separate consultant to sample and test existing paint and coatings for detection of lead content in the area of work for this project. Refer to CLOVIS UNIFIED SCHOOL DISTRICT REQUIRED SPECIFICATIONS for LEAD BASED PAINT PROCEDURES and the LEAD BASED PAINT SURVEY by XRF as prepared by HMS, Inc. which are bound into this Project manual. Follow all procedures and applicable requirements of the LEAD BASED PAINT PROCEDURES for proper removal and handling of lead based paint within the areas of work for this project, based on the XRF test results scheduled in the SURVEY FOR LEAD BASED PAINT. Samples were taken randomly to determine general extent of existing lead based paint and

coatings. Other similar surfaces that correlate with those tested should be handled the same as if tested.

- D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and required labels.
1. Prefinished items include (but not necessarily limited to) the following factory-finished components:
 - a. Architectural woodwork.
 - b. Acoustical wall panels.
 - c. Metal lockers.
 - d. Finished mechanical and electrical equipment.
 - e. Light fixtures.
 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.
 - b. Ceiling plenums.
 - c. Utility tunnels.
 - d. Pipe spaces.
 - e. Duct shafts.
 3. Finished metal surfaces include (but not necessarily limited to) the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
 6. Sandblasted concrete: Do not paint unless so scheduled.
- E. Related Sections include the following:
1. Division I Section "Product Requirements".
 2. Division 32 Section "Pavement Markings" for traffic-marking paint.
 3. Division 5 Section "Structural Steel" for shop priming structural steel.
 4. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
 5. Division 6 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
 6. Division 8 Section "Hollow Metal Doors and Window Frames" for factory priming steel doors and frames.
 7. Division 9 Section "Gypsum Board" for surface preparation of gypsum board.
- F. The Finish Schedules and descriptive notes indicated on the drawings, indicates the location of interior room surfaces to be painted or finished. The Schedule indications are general and do not necessarily define the detail requirements. Include all detailed refinements and further instructions as may be given for the required complete finishing of all spaces and rooms. Interior Elevations, building Sections and Details, Room Finish

Schedules and Color Schedules are all to be used in concert to determine requirements of this Section.

1.2 REFERENCES

- A. Green Seal Standard GS-11, Paints, First Edition, May 1993.
- B. Green Seal Standard GC-03, Anti Corrosive Paints, Second Edition, January 1997.
- C. SCAQMD – South Coast Air Quality Management District
 - 1. SCAQMD-1113 – Rule 1113, Architectural Coatings
- D. SJVAPCD – San Joaquin Valley Air Pollution Control District
 - 1. SJVAPCD Regulations – Local Regulations
- E. SSPC – Steel Structures Painting Council.

1.3 DEFINITIONS

- A. General: "Paint," as used herein, means coating systems materials including primers, emulsions, epoxy, enamels, stains, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats. Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 ADMINISTRATIVE REQUIREMENTS

Not used.

1.5 SUBMITTALS

- A. Product Data: Within 25 calendar days after the Contractor has received the Owner's Notice to proceed, submit, for each paint system indicated, (include block fillers and primers) the following:
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification. Submit only those products applicable to the project scope for work indicated in the drawings.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material. Data proving compliance with the specified requirements and regulations shall be submitted for inclusion with warranty and certification information to be retained by the Owner.
- B. Samples

1. Following the selection of colors and glosses by the Architect, submit Samples for the Architect's review. If selection of colors/glosses has been scheduled, commence immediately with the sample submittal.
 - a. Provide five Samples of each color and each gloss for each material on which the finish is specified to be applied. Submittals will be reviewed for color and texture/finish only. Provide a listing of material and application for each coat of each finish sample.
 - b. Except as otherwise directed by the Architect, make Samples approximately 8" x 10" in size on materials simulating actual finished conditions.
 - c. On actual wood surfaces, provide 4" x 8" samples of natural and stained wood finish. Label and identify each as to location and application.
 - d. If so directed by the Architect, submit Samples during progress of the Work in the form of actual application of the approved materials on actual surfaces to be painted. Provide full-coat finish samples on at least 100 sq. ft. of surface as directed, until required sheen, color and texture is obtained; simulate finished lighting conditions for review of in-place work.
2. Revise and resubmit each Sample as requested until the required gloss, color, and texture is achieved. Such Samples, when approved, will become standards of color and finish for accepting or rejecting the work of this Section.
3. Do not commence finish painting until approved Samples are on file at the job site.

C. Qualification Data: For Applicator.

1.6 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Paint coordination:
 1. Provide finish coats which are compatible with the prime coats actually used. Provide priming, undercoating, coating and finishing products produced by a single manufacturer source. Use only thinners approved by the paint manufacturers, and use only within recommended limits. Insofar as practicable, use undercoat, finish coat, and thinner material as parts of a unified system of paint finish.
 2. Review other Sections of these Specifications as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.
 3. Upon request, furnish information on the characteristics of the specific finish materials to assure that compatible prime coats are used.
 4. Provide barrier coats over noncompatible primers, or remove the primer and reprime as required.
 5. Notify the Architect in writing of anticipated problems in using the specified coating systems over prime-coatings supplied under other Sections.
- C. Intent of the drawings is to have a completed product. Where work of the Contract disturbs existing finishes such that repair is required, said repair work is to be accomplished to logical architectural stopping points.

- D. Protect finished work from damage by other trades, workers and processes until work is turned over to the Owner. Provide temporary protective barriers and coverings when necessary.
- E. Protect other work/surfaces from damage, drips or overspray by using appropriate shields, tarps, masks, etc. Clean any errant paint from adjacent materials as required and in accordance with appropriate cleaning methods for both the paint and for the materials being cleaned.
- F. Regulatory Requirements:
 - 1. Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this Specification, comply with the more stringent provisions.
 - 2. Regulatory changes may affect the formulation, availability, or use of specified coatings. Confirm availability of coatings to be used prior to job going out to bid and before start of painting project.
 - 3. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).
 - 4. Conform to SJVAPCD Regulations for maximum VOC limits.
- G. Quality verification requirements: These specifications call for a per-coat dry film thickness. The Contractor shall have available upon 48 hours notice a spectrographic measuring device (or other appropriate device) able to measure total thickness should there be a question as to the number of coats or compliance with the overall film thickness requirements.
- H. Source Limitations: Obtain primers for each coating system from the same manufacturer as the finish coats.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.8 PROJECT CONDITIONS

- A. IF APPLICABLE: Do not apply solvent-thinned paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 45° F, unless otherwise permitted by the manufacturer's printed instructions.
- B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F, unless otherwise permitted by the manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to

damp or wet surfaces, unless otherwise permitted by the manufacturer's printed instructions.

- 1. Painting may continue during inclement weather only if surfaces and areas to be painted are enclosed and heated (or cooled) within temperature limits specified by manufacturer during application and drying periods.
 - 2. Applications may also continue during inclement weather only within the temperature and humidity limits specified by the paint manufacturer as being suitable for use during application and drying periods.
- D. Avoid painting surfaces when exposed to direct sunlight.

1.9 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents and location where used. Deliver extra materials to Owner.
 - 1. Quantity: Furnish Owner with an additional 4 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color and gloss applied.

PART 2 – PRODUCTS

2.1 PAINT MANUFACTURER

A. Acceptable manufacturers:

1. Subject to compliance with requirements, the following is a list of manufacturers offering products which may be incorporated in the work. Other manufacturers approved in advance by the Architect, may be substituted in accordance with provisions of the Contract. Various manufacturers have been listed in the Paint Schedule at the end of this Section to establish and identify paint systems for the numerous finishes and substrates to establish cross references. Subject to comparison with the listings shown on the Paint Schedule, products of the following manufacturers may be used in lieu of those shown. Submit the manufacturer's equivalent painting system for each substrate and for each different finish for review by the Architect that is of equal or greater quality of performance and appearances as acceptable to Architect. Replace products listed with the latest equivalent paint, products, available from the manufacturers that have been updated for compliance with environmental regulations or for improved performance.
2. Approved Manufacturers: Subject to compliance with the requirements, manufacturers which offer products that may be used in the Work include, but are not limited to the following:
 - a. Frazee
 - b. Dunn Edwards Corporation
 - c. I.C.I. Glidden Pro
 - d. The Sherwin-Williams Company
 - e. Kelly-Moore

2.2 PAINT MATERIALS

- A. Paints: Provide Ready-Mixed, except field catalyzed coatings. Pigments shall be fully ground maintaining soft paste consistency, capable of being readily and uniformly dispersed to complete homogeneous mixture. Paints shall have good flowing and brushing properties and be capable of drying or curing free of streaks and sags.
- B. Acceptable materials: Provide the best professional quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers that comply with the current EPA rules and regulations in place where the project is located. Materials not displaying manufacturer's identification as a standard, best professional line product, and not complying with the EPA rules and regulations, will not be acceptable. The quantity of titanium dioxide, the use of clays, aluminum silicate, talc and the purity of acrylic materials are a few of the criteria which will be used by the Architect in determining equivalency of materials.

- C. Accessory Materials: Linseed oil, shellac, solvents, and other materials not specified but required to achieve required finishes shall be of high quality and approved by manufacturer.
- D. Proprietary names used to designate colors, materials or finishes are not intended to imply that products of above-named manufacturers are unacceptable or excluded where equivalent products are available.
- E. Paint Pigments shall be pure, unfading, applicable types suited to the substrates and services to which they are to be applied.

2.3 COLOR SCHEDULES

- A. The Contract Documents may contain a color schedule indicating intent for colors, textures and final finishes.

2.4 APPLICATION EQUIPMENT

- A. For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint, and as allowed by the rules and regulations (i.e. EPA) in place at the project location.
- B. Prior to use of application equipment, verify that the proposed equipment is actually compatible with the material to be applied, and that integrity of the finish will not be jeopardized by use of the proposed equipment.

2.5 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.
- B. If materials are not listed for items such as patching, provide quality patching materials specifically developed for the use, applied as per the manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
 - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.
- C. Do not paint over dirt, dust, rust scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint finish.
- D. Beware of a condition known as "critical lighting". This condition causes shadows that accentuate even the slightest surface variations. A pigmented sealer will provide tooth for succeeding decorative coating, but "does not" equalize smoothness or surface texture. Any corrective action to drywall must be done by the drywall contractor prior to decorating.
- E. Follow all applicable procedures and requirements in the Lead Based Paint & Coating Removal Guidelines furnished by FUSD prior to applying new paint coatings.

3.2 PROTECTION

- A. Protect previously installed work and materials which may be affected by Work of this Section.
 - 1. Protect prefinished surfaces, lawns, shrubbery and adjacent surfaces against paint and damage.
 - 2. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or splatter from fouling surfaces to be painted.
 - 3. Protect surfaces, equipment, and fixtures from damage resulting from use of fixed, movable and hanging scaffolding, planking, and staging.

3.3 MATERIALS PREPARATION

A. General:

- 1. Mix and prepare paint materials in strict accordance with the manufacturers' recommendations.
- 2. Maintain containers used in storage, mixing, and application of paint in a clean condition, free from foreign materials and residue.

B. Stirring:

- 1. Stir materials before application, producing a mixture of uniform density.
- 2. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
- 3. Use only thinners approved by paint manufacturer and only within recommended limits.

- C. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.4 SURFACE PREPARATION

A. General:

1. Perform preparation and cleaning procedures in strict accordance with the paint manufacturers' recommendations and instructions and as herein specified, for each particular substrate condition.
 - a. Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
 - b. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface applied protection prior to surface preparation

and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting each space or area, reinstall removed items without damaging treated surfaces by using workmen who are skilled in the necessary trades.

- c. Clean each surface to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Schedule cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly painted surfaces.
- d. Follow all applicable procedures and requirements in the Lead Based Paint & Coating Removal Guidelines furnished by FUSD prior to and during all preparation work.

B. Surface Preparation of NEW materials

1. Cementitious Materials:

- a. Prepare cementitious surfaces of concrete, concrete block and cement plaster to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
- b. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
- c. Clean concrete and concrete floor surfaces scheduled to be painted with a commercial solution of muriatic acid, or other etching cleaner. flush floor with clean water to neutralize acid, and allow to dry before painting.

2. Wood surfaces:

- a. Clean wood surfaces until free from dirt, oil, and other foreign substance with scrapers, mineral spirits, and sandpaper, as required.
- b. Sandpaper smooth finished wood surfaces exposed to view, and dust off. Where so required, use varying degrees of coarseness in sandpaper to produce a uniformly smooth and unmarred wood surface. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sandpaper smooth when dried.

- c. Unless specifically approved by the Architect, do not proceed with painting of wood surfaces until the moisture content of the wood is 12% or less as measured by a moisture meter.
3. Metal surfaces:
- a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
 - d. Thoroughly clean ferrous surfaces, which are not galvanized or shop-coated, of dirt, oil, grease, loose mill scale and other foreign substances by solvent or mechanical cleaning.
 - e. On galvanized surfaces, clean surface contaminants using non-petroleum based solvent for the initial cleaning, and then treat the surface thoroughly with phosphoric acid etch. Remove etching solution completely before proceeding.
 - f. Allow to dry thoroughly before application of paint.

C. Surface preparation of existing surfaces:

- 1. Clean all surfaces scheduled to receive new paint coatings free from all dirt, dust, oxidized paint film, loose particles and unsound paint coatings, and other foreign matter.
- 2. Locate unsound plaster, gypsum board, and similar unsound areas, and patch as needed to provide a smooth substrate for application of the paint coating.
- 3. Metal: Clean free from loose and unsound paint coatings and other surface contaminants which may impair the adhesion of the new paint coating.
 - 4. Wood:
 - a. Clean free from loose and unsound paint coatings and other surface contaminants which may impair the adhesion of new paint coatings.
 - b. Sand sharp edges of paint film to a smooth feathered edge.
 - c. Fill, sand, and otherwise repair as needed to provide a smooth substrate for application of the new coating.
 - 5. Stucco:
 - a. Clean free from all dirt and other foreign matter by the hydrowash method.
 - b. Provide a clean sound surface for the new paint coatings.
 - c. Repair cracks and voids to match the texture and plane of the area in which the repair occurs.
 - d. Remove graffiti (if any) prior to application of the new paint coatings.

3.5 PAINT APPLICATION

A. General:

- 1. Apply paint in accordance with manufacturer's directions and in strict compliance with all current EPA Standards, Rules and Regulations, and other governing regulations applicable at the time of application. Use applicators and techniques best suited for the substrate and type of material being applied.

2. Paint colors, surface treatments, and finishes are indicated in "schedules" of the Contract Documents.
 3. Provide finish coats which are compatible with prime paints used.
 4. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color, and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surface areas.
 5. Paint surfaces behind moveable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.
 6. Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless indicated otherwise.
 7. Touch up shop-applied prime coats which have been damaged, and touchup bare areas prior to start of finish coats application.
 8. Slightly vary the color of succeeding coats.
 - a. Do not apply additional coats until the completed coat has been inspected and approved.
 - b. Only the inspected and approved coats of paint will be considered in determining the number of coats applied.
 9. Sand and dust between coats to remove defects visible to the unaided eye from a distance of five feet.
 10. Apply additional coats of fillers or primer to new materials such as stucco where needed to visually match the texture and sheen of adjacent existing surfaces that have been previously painted.
- B. Schedule Painting: Apply first-coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Apply prime coat on material which is required to be painted or finished, and which has not been prime coated by others. Recoat primed or sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
 2. Allow sufficient drying time between coats, modifying the period as recommended by the material manufacturer to suit adverse weather conditions.
 3. Do not apply successive coatings until dry to where the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and when the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- C. Minimum Coating Thickness: Apply each coat of materials at not less than manufacturer's recommended spreading rate, to establish a dry film thickness of not less than 1.2 mils or as recommended by the coating manufacturer.
- D. Brush applications:
1. Brush out and work the brush coats onto the surface in an even film.

2. Completely cover to provide opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will not be acceptable.
- E. Spray application:
1. Except as specifically otherwise approved by the Architect, and allowed by governing regulations, confine spray application to metal framework and similar surfaces where hand brush work would be inferior.
 2. Where spray application is used, apply each coat to provide the hiding equivalent of brush coats.
 3. Do not double back with spray equipment to build up film thickness of two coats in one pass.
- F. For completed work, match the approved Samples as to texture, color, and coverage. Remove, refinish, or repaint work not in compliance with the specified requirements.
- G. Interior: Use "stipple" finish where enamel is specified. Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.
- H. Miscellaneous surfaces and procedures:
1. Exposed mechanical/electrical items (not pre-finished):
 - a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, and items of similar nature to match the adjacent wall and ceiling surfaces, or as directed.
 - b. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
 - c. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
 - d. Paint exposed piping, conduit and fittings, vents and jacks, pipe hangers and supports, electrical trays, piping shrouds, exposed equipment supports and frames.
 2. Exposed pipe and duct insulation:
 - a. Apply one coat of latex paint on insulation which has been sized or primed under other Sections; apply two coats on such surfaces when unprepared.
 - b. Match color of adjacent surfaces.
 - c. Remove band before painting, and replace after painting.
 3. Hardware:
 - a. Paint prime coated hardware to match adjacent surfaces;
 - b. Paint metal portions of head seals, jamb seals, and astragal seals to match the color of the door frame unless otherwise directed by the Architect.
 4. Wet areas:
 - a. In toilet rooms and contiguous areas, add an approved fungicide to paints.
 - b. For oil base paints, use 1% phenolmercuric or 4% tetrachlorophenol.
 - c. For water emulsion and glue size surfaces, use 4% sodium tetrachlorophenate.

5. Equipment: Unless otherwise noted, paint the following equipment items:
 - a. Mechanical equipment and exposed roof HVAC Units and platforms.
 - b. Electrical Panels and switchgear
 - c. Accessory items
6. Application to EXISTING previously painted areas: Areas and materials that are being REPAINTED may receive two coats of paint in lieu of the three specified. Apply primer coat when there is any chance of lack of adhesion at existing previously painted walls.
7. Existing cabinets indicated to be painted, if previously painted, shall be prepared and painted inside as well as outside.

3.6 CLEAN-UP AND FINAL PROTECTION

- A. During the progress of work, remove paint splatters from window glass and other surfaces. Remove splattering paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finish surfaces.
- B. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.
 1. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for the protection of their work after completion of painting operations.
 2. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.
 3. Remove all rubbish, paint cans, and accumulated materials resulting from work in each space or room. All areas shall be left in a clean, orderly condition.

3.7 PAINT SCHEDULE

A. General:

1. Materials required to complete the painting are herein specified and listed by material number and name for each type of finish and substrate, solely to establish a standard for kind, quality and function. Unlisted manufacturers of equivalent products, upon compliance with these specifications and with the requirements of specification Section "Product Substitutions", may submit their products for approval.
2. Except for specialty items or as otherwise specified, all materials shall be by one manufacturer.

3.8 PAINTING SYSTEMS SCHEDULE

- A. Provide the following paint systems for the various substrates, as indicated. This list complied with the EPA rules and regulations at last checking. Changes in product compliance after the date listed above should be brought to the attention of the Architect.

ENVIRONMENTAL COMPLIANCE CENTER
FRESNO, CA

PAINTING
SECTION 099100 - 16

1st Coat: W709 Eff-Stop 3030 Bond Prep A24W300
Loxon

2nd Coat: W704V Acriflat 2210 Durus A6 A-100

Previously Painted Concrete Tilt-Up:

Spot Prime Where Needed:

W709 Eff-Stop 3030 Bond Prep A24W300
Loxon

One Coat: W701V Evershield 2200 Dulux Pro
B2WF51 Weathclad

c. Brick Masonry – Semi-Gloss; 100% Acrylic:

1st Coat: W709 Eff-Stop 3030 Bond Prep A24W300 Loxon

2nd Coat: W701V Evershield 2200 Dulux Pro
B2WF51 Weathclad

Previously Painted Brick Masonry:

Spot Prime Where Needed:

W709 Eff-Stop 3030 Bond Prep A24W300 Loxon

One Coat: W701V Evershield 2200 Dulux Pro
B2WF51 Weathclad

d. Concrete Block – Semi-Gloss; 100% Acrylic:

1st Coat: W305 Blocfil, Smooth 3010 Prep & Prime B25W25
Block Filler

Block Filler

2nd Coat: W701V Evershield 2200 Dulux Pro B2WF51 Weathclad

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e. Metal – Ferrous - Gloss:

1 st Coat: W75 Untra Grip	4020 Devflex	B66W1 DTM Acrylic Primer
2 nd Coat: W10 WB Syn-Lustro Gloss	4218 Devflex Gloss	B66 DTM

f. Metal – Galvanized or Aluminum - Gloss:

Pretreatment:

Galva-Etch GE 123	Jasco Prep & Primer	B71Y1 DTM Wash Primer
1 st Coat: W8 WB Syn Lustro Acrylic	4020 Devflex	B66W1 DTM Primer
2 nd Coat: W960V Permagloss Gloss	4208 Devflex	K34 Duration

g. Wood – Paint Finish – Gloss: 100% Acrylic:

1 st Coat: W708 E-Z Prime	3210 Gripper	B51W20 Prep Rite Pro Black
2 nd Coat: W960V Permagloss Duration Gloss	4208 DevFlex	K34

h. Wood – Stain Finish - Opaque:

1 st Coat: W704V Acri-Flat Mar Solid Color	Solid Stain	2600 Wood Pride	Solid Stain	A16 Pro
2 nd Coat: W704V Acri-Flat A16ProMar Solid Color	Solid Stain	2600 Wood Pride		

i. Wood – Stain Finish – Semi-Transparent:

Two Coats: WPT-3 Weather Pro WoodScapes Transparent	2610 Wood Pride Flood Latex S/T	A15T5 Semi-
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2. INTERIOR FINISH – Enamel: The following enamel paints are to be used for the final interior enamel paint application as directed on the Finish Schedule and in accordance with the base coats specified in the following Subparagraphs.

DUNN-EDWARDS

ICI GLIDDEN PRO

SHERWIN

WILLIAMS

W960V Permagloss	4208 Dev Flex	B21W51 ProClassic Gloss
W901 Permasheen	1407 Dulux Semi Gloss Eminence SG	HP D18Q

a. Gypsum Drywall:

1 st Coat: W101V Vinylastic	1000-1200 Prep & Prime Prep-Rite Primer	B28W200
2 nd & 3 rd Coat: Gloss as directed	Glass as directed	Gloss as directed

b. Plaster, Concrete:

1 st Coat: W707V Unikote Rite	3210 Gripper	B28W101 Prep Classic
2 nd & 3 rd Coat: Gloss as directed Gloss as directed		Gloss as directed

c. Concrete Block:

1 st Coat: W6329 Block Filler Filler	4000 Block Filler	B25W25 Block
2 nd & 3 rd Coat: Gloss as directed Gloss as directed		Gloss as directed

d. Wood:

1 st Coat: W707V Unikote B28W101 Prep Rite	3210 Gripper Classic
2 nd & 3 rd Coat: Gloss as directed Gloss as directed	Gloss as directed

e. Metal Ferrous:

1 st Coat: W715 Ultra Grip	4020 Devflex	B66W1 DTM Acrylic Primer
2 nd & 3 rd Coat: Gloss as directed	Gloss as directed	Gloss as directed

f. Metal – Non Ferrous/Galvanized, Aluminum:

1 st Coat: W715 Ultra Grip	4020 Devflex	B66W1 DTM Acrylic Primer
2 nd & 3 rd Coat: Gloss as directed directed	Gloss as directed	Gloss as

g. Galvanized Metal - Doors:

1st Coat: W715 Ultra Grip

4020 Devflex

B66W1 DTM Acrylic
Primer

2nd & 3rd Coat: Gloss as directed
Gloss as directed

Gloss as directed

3. Finish – Stain and Lacquer - Satin

a. Wood:

1st Coat: V109 Stainseal II
A67Fi Wood Classics

1700 Wood pride Stain

Stain

Jasco Paste Wood Filler
Minwax Wood Filler

Jasco Paste Wood Filler

2nd Coat: McCloskey 2000
Sanding Sealer

B44MJ91 Sealer

Gemini 200-0012 High Build Sealer

3rd & 4th Coat:
A68 Wood Classics

MC 80-6841 Satin

Satin

Lacquer (275 voc)

1802 Woodpride Satin

4. Epoxy Coating – Interior (Finish – Gloss):

a. Wood:

1st Coat: W 715 Ultra-Grip
B28W101 Prep Rite

3210 Gripper Primer

Classic

2nd Coat: S-60 Water Base Epoxy
Water Based

4408 Devoe Tru-Glaze

B70

(Rustoleum)
Catalyzed Epoxy

3rd Coat: S-60 Water Base Epoxy 4408 Devoe Tru-Glaze Epoxy
B70 Water Based

(Rustoleum)
Catalyzed Epoxy

b. Concrete:

1st Coat: Comex E-4000 Waterboone Epoxy Primer

2nd & 3rd Coat: S-60 Water Base Epoxy 4408 Tru-Glaze Epoxy
B70 Water Based

(Rustoleum)
Catalyzed Epoxy

c. Gypsum Drywall:

1st Coat: Comex E-4000 Waterborne Epoxy Primer

W 715 Ultra-Grip 3210 Griper Primer B51W20 ProBlock

2nd & 3rd Coat: S-60 Water Base Epoxy 4408 Devoe Tru-Glaze B70 Water
Based

(Rustoleum) Catalyzed
Epoxy

d. Metal – Ferrous and Galvanized:

1st Coat: 43-5 Corrobar (ferrous) Devoe DevRan 203 Epoxy B66W1 DTM
(ferrous)

43-7 Galv-Alum (galvanized) Primer B71Y1
(galvanized)

2nd & 3rd Coat: S-60 Water Base Epoxy Devoe 4408 Tru-Glaze Epoxy B70 Water
Based

(Rustoleum)
Epoxy

Catalyzed

5. Concrete Floor Sealers - Clear:

a. Concrete:

1st & 2nd Coats: Okon W-1 Waterproofing

Rain Guard Micro Seal Oron W-1

Concrete

Weatherproofing

END OF SECTION 099100

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes, but is not exclusive to, the following:
 - 1. Parking lot signage (verify/coordinate with site signage in Division 32).
 - 2. Accessible path of travel.
 - 3. Building and room identification.
 - 4. Restroom signage.
 - 5. Exit signage (non-illuminated).
 - 6. Occupancy signage.
 - 7. Miscellaneous signage

1.2 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, including construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for signs. Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
 - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 2. Provide message list, typestyles, and graphic elements, including tactile characters and Braille, and layout for each sign.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for each different type of sign.
- D. Samples for Verification: For each type of sign, include the following Samples to verify color selected:
 - 1. Panel Signs: Full-size Samples of each type of sign required.
 - 2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter and number) required. Show character style, material, finish, and method of attachment.
 - 3. Approved samples will be returned for installation into Project.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines, Applicable requirements of CBC Section 11B-703 and the Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- D. General: Provide signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of polymer finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image colors and sign lamination.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide standard products manufactured by Architectural Signing, Inc. 4082 Glencoe Ave Marina del Rey, CA. 90261 or a comparable product by another manufacturer, from those listed below, approved by the Architect in advance.
 - 1. ACE Sign Systems, Inc.
 - 2. Best Sign Systems Inc.
 - 3. Gemini Incorporated.
 - 4. Mohawk Sign Systems.

2.2 MATERIALS

- A. Steel:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coating, either commercial or forming steel.
 2. Steel Members Fabricated from Plate or Bar Stock: ASTM A 529/A 529M or ASTM A 572/A 572M, 42,000-psi minimum yield strength.
 3. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of 5005-H15.
- C. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
- D. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:
1. Impact Resistance: 16 ft/lbf/in. per ASTM D 256, Method A.
 2. Tensile Strength: 9000lbf/sq. in. per ASTM D 638.
 3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
 4. Heat Deflection: 265 deg. F at 264 lbf/sq. in. per ASTM D 678.
 5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.
- E. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:
1. Edge Condition: Beveled.
 2. Corner Condition: Square (1/8" radius) unless indicated otherwise.
- F. Brackets: Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit panel sign construction and mounting conditions indicated. Factory-paint brackets in color matching Architect's sample.
- G. Graphic Content and Style: Provide sign copy that complies with CBC Section 11B-703 and requirements indicated on Drawings for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage. Where copy has not been determined or is not indicated, provide copy as selected by Architect. All indicated copy is subject to change without additional cost to Owner until released for production following approval by Owner and Architect.
- H. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with CBC Section 11B-703, ADA-ABA Accessibility Guidelines and 2013 CBC. Text shall be accompanied by California contracted (Grade 2) Braille. Produce precisely formed characters with square cut edges free from burrs and cut marks in contrasting color from background.
1. Panel Material: Photopolymer and Clear acrylic sheet with opaque color coating, subsurface applied (Non-Glare Finish).
 2. Raised-Copy Thickness: Not less than 1/32 inch raised letters in Sans Serif upper case characters.
 3. Braille shall have domed or rounded dots 1/10 inch on center in each cell with 2/10 inch space between cells and raised 1/40 inch above the background.

- I. Subsurface Copy: Apply minimum 4-mil- thick vinyl copy to back face of clear acrylic sheet forming panel face to produce precisely formed opaque image. Image shall be free from rough edges.
- J. Applied Copy: Die-cut characters from vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing. Apply copy to glass and wall surfaces where indicated.
- K. Anchors and Inserts: Provide nonferrous-metal or stainless steel anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use epoxy set toothed steel or expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into stucco, concrete or masonry work.

2.3 DIMENSIONAL CHARACTERS

- A. Cast Characters: Form individual letters and numbers by casting. Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.
 - 1. Material: Formed-acrylic sheet or metal as indicated.
- B. Fabricated Characters: Fabricate letters and numbers to required sizes and styles, using metals and thicknesses indicated. Form exposed faces and sides of characters to produce surfaces free from warp and distortion. Include internal bracing for stability and attachment of mounting accessories. Comply with requirements indicated for finish, style, and size.
 - 1. Acrylic: 3/4" inch thick.
 - 2. Character Height: As indicated.
 - 3. Character Style: As selected.

2.4 PANEL SIGNS/SYMBOLS

- A. Exterior and Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with CBC Section 11B-703 and the following requirements:
 - 1. Acrylic Sheet: 0.125 inch thick (Non-Glare Finish).
 - 2. Aluminum sheet: 0.080 inch thick (Non-Glare Finish).
 - 3. Edge Condition: Bullnose.
 - 4. Corner Condition: 1/4" radius.
 - 5. Mounting: Unframed.
 - a. Wall mounted.
 - b. Manufacturer's standard non-corroding anchors for substrates encountered.
 - 6. Color: As selected by Architect from manufacturer's full range.
- B. Colored Coatings for Acrylic Sheet: For copy colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are Non-Glare UV and water resistant for three years for application intended.
 - 1. Color: As selected by Architect from manufacturer's full range.

- C. Toilet Room Door Geometric Symbols: Refer to drawings for graphic layout. Provide door sign plaques with the following attributes:
1. Material: Cast-acrylic sheet (Non-Glare).
 2. Plaque color: As approved by Architect to contrast with door background color.
 3. Perimeter: Unframed with eased edge, 1/8" radius corners.
 4. Size: Men's door shall have an equilateral triangle with 12" sides, 1/4" thick with a vertex pointing upward.
 5. Size: Women's door shall have a 12" diameter circle, 1/4" thick.
 6. Size: A unisex door shall have a 12" diameter circle, 1/4" thick, and a 1/4" thick contrasting color triangle inscribed and superimposed on the circle.
 7. Colors: As selected by Architect, subject to jurisdictional approval.
- D. Toilet Room Wall Signs: Refer to drawings for graphic layout. Provide door sign plaques with the following attributes:
1. Material: Cast-acrylic sheet (Non-Glare Finish), 3/16" thick.
 2. Plaque color: Blue (or other approved contrasting color).
 3. Type color: White (or other approved contrasting color).
 4. Perimeter: Unframed with 1/4" radiused corners.
 5. Size: 8" minimum width x 9" minimum height with a minimum 6" high field for raised wheelchair logo and adjacent man/woman 5" to 6" high pictogram.
 6. Margins: As indicated on drawings.
 7. Copy: 3/4" high (minimum) Sans Serif Bold raised (1/32") letters stating gender with California contracted (Grade 2) Braille below repeating gender (or reading "RESTROOM" or "STAFF") at Unisex toilets.
 8. Text color: White (or other approved contrasting color).
- F. Exit Signs: Accessible exit and exit route sign text and locations shall be as indicated by the drawings.
1. Material: 1/8 inch thick x 4 inch minimum high non-glare acrylic plate.
 2. Plaque color: As selected by Architect from manufacturer's full range.
 3. Perimeter: Unframed with 1/4" radiused corners.
 4. Size: As indicated by the drawings and as required for length of text.
 5. General: Sub-surfaces Process, with 1/32 inch raised letters with integral contracted (Grade 2) Braille centered below letters.
 6. Text: 3/4 inch high Sans Serif Bold lettering.
- G. Room Identification Signs (Exterior and Interior): Sign locations shall be as indicated by the drawings.
1. Material: 1/8 inch thick x 4 inch minimum high (8" at classrooms) non-glare acrylic plate.
 2. Plaque color: As selected by Architect from manufacturer's full range.
 3. Perimeter: Unframed with 1/4" radiused corners.
 4. Size: As indicated by the drawings and as required for length of

text.

5. General: Sub-surfaces Process, with 1/32 inch raised border with California Contracted integral Grade 2 braille copy.
 6. Text: 3/4 inch high Sans Serif Bold lettering.
 7. Locations: Provide one sign at each main room entry door plus additional signs as required to comply with ADA-ABA and CBC standards and as indicated by drawings.
 8. Copy allowance: Allow fifteen (15) letters and three (3) numerals for each sign. Classrooms shall be identified by a N or S letter, hyphen and room number only (6" high copy) with braille below.
- H. Occupancy Signs: Sign text and locations shall be as indicated by the drawings.
1. Material: 1/8 inch thick x 6 inch high non-glare acrylic plate.
 2. Plaque color: As selected by Architect from manufacturer's full range.
 3. Perimeter: Unframed with 1/4" radiused corner.
 4. Size: As indicated by the drawings and as required for length of text.
 5. General: Sub-surfaces Process, with 1/32 inch raised letters.
 6. Text: 1/2 inch high (48 point). Sans Serif lettering.
 7. Copy for Sign at Assembly Rooms: As indicated by the drawings.
- I. International Symbol of Accessibility Signs: As indicated by drawings.
1. Figure Symbols: Building Entrance Sign; Size: 6" x 6", typical.
 2. Assistive Listening Systems: At assembly room with public address systems provide symbol of Access for Hearing Loss in accordance with CBC Figure 11B-14C. Along with specific location for pick-up indicated by drawings.
- J. Metal Signs: General
1. Materials: Reflectorized sign shall be porcelain on steel with beaded text; galvanized steel post and concrete footing. See drawings for text.
 2. Type Imagery:
 - a. Type Style: Helvetica Medium, all upper case.
 - b. Arrangement: Use standard spacing between letters, words, numbers and lines; centered typically.
- K. Accessible Parking Signs: As indicated by drawings.
1. Material: 0.080-inch aluminum or other noncorrosive material.

2. Background Color: Blue.
3. Copy Material: Reflective vinyl.
4. Mounting: Post mounted. Wall/fence mounted where applicable and indicated by drawings.

- L. Symbols of Accessibility: Provide 6-inch- high symbol fabricated from opaque nonreflective vinyl film, 0.0035-inch nominal thickness, with pressure-sensitive adhesive backing suitable for both exterior and interior applications.

2.5 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.
1. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.6 FINISHES, GENERAL

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not

acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ACRYLIC SHEET FINISHES

- A. Colored Coatings for Acrylic Sheet: For copy colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for three years for application intended.

2.8 ACCESSORIES

- A. Applied Vinyl Film: Provide opaque non-reflective die cut vinyl film, 0.0035-inch minimum thickness, with pressure-sensitive adhesive backing suitable for both exterior and interior applications.
- B. Mounting Methods: Use concealed fasteners, double-sided vinyl tape or silicone adhesive as indicated and approved by Architect fabricated from materials that are not corrosive to sign material and mounting surface.
- C. Anchors and Inserts: Provide nonferrous-metal or stainless steel anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.9 FINISHES, GENERAL

- 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 strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within 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, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- C. Verify that items are sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent wall, preferably on right side. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door (centered 9" minimum from face of jamb on latch side of door).
- B. Wall-Mounted Exterior Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
 - 1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes located 1/4" to 1/2" in from edges at all 4 corners as approved by Architect. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
- C. Wall-Mounted Interior Signs: Attach panel signs to wall surfaces using methods indicated below:
 - 1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

2. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
 3. Where panel signs are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.
- D. Bracket-Mounted Units: Provide manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings
- with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.
- E. Dimensional Characters: Mount characters using standard fastening methods recommended in writing by manufacturer for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
1. Projected Mounting: Mount characters at projection distance from wall surface indicated.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 101400

SECTION 102623 - DECORATIVE PROTECTION PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Decorative protection panels.

1.2 REFERENCES

A. Reference Standards: In addition to requirements, comply with applicable provisions of following for design, materials, fabrication, and installation of component parts:

1. ANSI / NEMA LD-3: High Pressure Decorative Laminates.
2. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
3. GreenGuard Gold Indoor Air Quality Certified®
4. Class 1/A Fire-rated (UL723/ASTM E-84).
5. SEFA 8.1 approved.
6. ASTM G 22 Bacterial Growth Resistance.
7. ASTM E 162: Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
8. IMO FTP: International Code for Application of Fire Test Procedures.
9. IMO FTP Code Part 2: Smoke and Density Test.
10. IMO FTP Code Part 5: Test for Surface Flammability.
11. ISO: International Organization for Standardization.
12. ISO 9001: Quality Management Systems.
13. NFPA 101: Life Safety Code.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Product data for each specified product. Include manufacturer's technical

data sheets and published instructions.

- B. Shop Drawings: Each installation.
 - 1. Anchorages to other construction, including requirements for concealed supports.
 - 2. Use same unit designations used on Drawings.
- C. Color Chart: Provide actual color samples. Electronic color samples will not be accepted.
- D. Verification Samples: Not less than 5 by 7 inches (127 by 177.8 mm), for each type, color, pattern, and surface finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator and installer.
- B. Product Certificates: For the following:
 - 1. Decorative protection panels.
- C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Manufacturer's written maintenance instructions.
- B. Manufacturer warranties transferrable to Owner.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in fabricating and installing decorative plastic laminate finished work with a minimum 3 years experience.
- B. Fabricator Qualifications: Shop that 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 with a minimum 3 years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Package and ready materials according to manufacturer's instructions.
- B. Do not deliver components until Project is fully enclosed.
- C. Store products inside building protected from light, heat and moisture and never store in contact with floor or outside wall surfaces. Do not expose to continuous direct sunlight.
 - 1. Store horizontally.
 - 2. Sheets must be handled by two people.
 - 3. Stored at a temperature per Formica Corporation technical guide requirements.
- D. Provide protective coverings of suitable material. Take special precautions at corners.

1.8 PROJECT CONDITIONS

- A. Coordinate sizes and locations of cut-outs and other related Work specified in other Sections to ensure that interior laminate construction can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide decorative protection panels with the following surface burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Source Limitations: Obtain decorative protection panels materials through one source from a single manufacturer.

2.2 MANUFACTURER

- A. Manufacturer:
 - 1. Basis of Design: Formica Corporation; HardStop Decorative Protection Panels.
 - a. Contact: <http://www.formica.com/en/us>

B. Decorative Protection Panels

1. Description: Decorative protection panels.
 - a. Impact resistant panels.
2. Panel Core Material: Treated fiberglass core. Class A Fire-rated.
3. Laminate Grade:
 - a. Grade H1, 0.0677 Inches - 0.0827 Inches (1.72mm-2.1mm).
4. Laminate Color(s):
 - a. As selected by Architect from manufacturer's line of available colors.
5. Laminate Finish:
 - a. -58 Matte.
 - b. -43 Artisan.
6. Laminate Application(s):
 - a. Wainscots.

2.3 ACCESSORY MATERIALS

- a. Aluminum Trim Profiles for Seam Treatments:
 - 1) Thicknesses:
 - a) All trims 0.055-inch.
 - b) Corner guard trim 0.065-inch.
 - 2) Profile Types:
 - a) End caps.
 - 3) Colors, Finish and Patterns:
 - a) [Clear anodized.]
- b. Adhesives:
 - 1) Bonding Laminate: Franklin Advanced Polymer adhesive recommended. See Formica technical guide for recommended adhesive by substrate type.
- c. Sealant:
 - 1) Color Coordinated Sealant: 100% silicone caulk material by Color-Rite Incorporated as recommended by Formica Corporation.

2.4 FABRICATION

- A. Conform to Formica Corporation standard practices, procedures, conditions including preconditioning, material recommendations, machining, equipment and workmanship.
- B. Router base should be clean and free of burrs and debris. Table saws should be clean, flat, and free of burrs.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install decorative protection panels in accordance with manufacturer's installation instructions, approved submittals.
- B. Provide templates and rough-in measurements.
- C. Accessory Materials: Install in accordance with manufacturer's written installation instructions.

3.2 CLEANING AND PROTECTING

- A. Cleaning:
 - 1. Clean decorative protection panels and aluminum trims in accordance with manufacturer's instructions.
- B. Protection:
 - 1. Do not permit construction near unprotected surfaces.

END OF SECTION 102623

SECTION 102800 - TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Toilet accessories in new construction.
- B. Related Sections include the following:
 - 1. Division 06 Section "Miscellaneous Carpentry" for framed openings and backing/blocking to accommodate and support accessories.
 - 2. Division 09 "Finishes" for various adjacent finishes.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, finishes for each type of accessory specified and manufacturer's warranty.
- B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Schedules and room designations indicated on Drawings in the product schedule.
- D. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.
- E. Shop drawings including floor plans and/or interior elevations at min. 1/4" per foot scale to indicate mounting locations and heights for all accessories and required backing.

1.3 QUALITY ASSURANCE

- A. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Schedules.
 - 1. Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Architect, may be provided.
 - 2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Schedule at the end of this Section.
- B. Available Manufacturers:
 - 1. Provide all individual items from a single manufacturer, unless specifically indicated otherwise.
 - 2. Where indicated on the Drawings or otherwise required, provide the following items or equal products of another manufacturer approved in advance by the Architect. Use of Bobrick numbers and descriptions below are intended to represent the desired level of quality of workmanship, materials, gages, etc., and are not intended to limit the suppliers of these products. With Architects and Owners approval, other products may be used as an equal from those listed below:
 - a. American Dispenser Company.
 - b. Bradley Corporation.
 - c. Accessory Specialties.
 - d. Parker
 - e. Waltrous.
 - f. Fort James.
 - g. Bay West.
 - h. World Dryer.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, G60.
- D. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- E. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.
 - 1. Anchors and fasteners shall be capable of developing a retaining force commensurate with the strength of the accessory to be mounted, and well suited for use with the supporting structure.
 - 2. Where exposed fasteners are permitted, provide oval head fasteners with finish matching the accessory.

2.3 FABRICATION

- A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- B. All finishes shall be stainless steel, with satin finish, for all items of this Section unless specifically indicated otherwise
- C. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- D. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
- E. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
 - 1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
- F. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper and theft-resistant installation, as follows:
 - 1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

PART 3 - EXECUTION

3.1 GENERAL

- A. Refer to Drawing Plans, Details, Notes and Interior Elevations for locations and mounting heights of all accessories. Verify all accessories can be mounted to comply with disabled access requirements per CBC Section 1115B and notify Architect of any conflicts prior to installing blocking/backing, cutting-in of openings and ordering of any related materials. Provide alternative units of equal or better quality and capacity to suite the specific accessory location. Paper towel dispensers, hair dryers, napkin dispensers

and similar accessories located in accessible path of travel within toilet rooms shall not protrude more than 4" from the face of the wall along the accessible route to fixtures.

- B. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
- C. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.3 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.4 SCHEDULE: In addition to accessories indicated in the Drawings, provide the following Product Items:

- A. Paper Towel Dispenser and Waste Receptacle Combo:
 - 1. Bobrick B-3942 Semi-Recessed Convertible Paper Towel Dispenser and Waste Receptacle
- B. Toilet Seat Cover Dispenser, Waste Disposal, and Toilet Tissue Dispenser Combo:
 - 1. Bobrick B-3091, Recessed Toilet Seat Cover Dispenser, Waste Disposal, and Toilet Tissue Dispenser
- C. Soap Dispensers:
 - a. Soap Dispenser: F & E by Owner
- D. Grab Bars:
 - 1. Grab bars: Bobrick Series, sizes and locations per Architect's drawings.
 - a. Grab bar (W/C side wall) B-5806.99 x 48" (1 1/4" diameter)
 - b. Grab bar (W/C rear wall) B-5806.99 x 36" (1 1/4" diameter)
 - c. Provide 258 series anchor plate at toilet partitions and/or backing in wall to support a minimum 250 pound point load on grab bars.
 - d. Provide grab bars in length and at locations shown for accessible shower as indicated in drawings.

- E. Mirrors:
 - 1. Tilt Mirror with Stainless Steel Frame, Model # Bobrick B-293 Series, 24" x 36":

END OF SECTION 102800

SECTION 104413 - FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and cabinets for fire extinguishers.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and cabinets.
 - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
- D. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- C. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

1.5 SEQUENCING

- A. Apply decals on field-painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - b. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 - c. Larsen's Manufacturing Company.
 - d. Potter Roemer LLC.
 2. Valves: Manufacturer's standard.
 3. Handles and Levers: Manufacturer's standard.
 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.2 FIRE PROTECTION CABINET

- A. Basis-of-Design Product: J. L. Industries Ambassador model 1015 W10 or 1017 W10 With SAF-T-LOCK, factory painted, with vertical "FIRE EXTINGUISHER" decal; or a comparable product by one of the following:
1. Kidde Fyrnetics.
 2. Larsen's Manufacturing Company.
 3. Potter Roemer; Div. of Smith Industries, Inc.
 4. Watrous; Div. of American Specialties, Inc.
- B. Cabinet Construction: Non-rated or rated as required by wall type as indicated on Drawings.
1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Steel sheet.
- D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
1. Rolled-Edge Trim: 2-1/2-inch

- E. Door Material: Steel sheet.
- F. Door Style: Center glass panel with frame.
- G. Door Glazing: Tempered break glass.
- H. Door Hardware: Manufacturer's standard door-operating hardware (that does not require grasping by persons with disabilities) of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide manufacturer's standard.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- I. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
 - 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet glazing.
 - 2) Application Process: Decals.
 - 3) Lettering Color: White.
 - 4) Orientation: Vertical.
 - 4. Alarm: Manufacturer's standard alarm that actuates when fire protection cabinet door is opened and that is powered by batteries.
- J. Finishes:
 - 1. Manufacturer's standard baked-enamel paint for the following:
 - a. Exterior of cabinet, door and trim except for those surfaces indicated to receive another finish.
 - b. Interior of cabinet and door.
 - 2. Steel: Factory baked enamel or powder coat.

2.3 MOUNTING BRACKETS FOR PORTABLE EXTINGUISHERS

- A. Available Manufacturers:
 - 1. Provide mounting brackets from same manufacturer as extinguishers.
- B. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 1. Color: Red.
- C. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

2.4 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material.
 - 3. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 - 2. Fabricate door frames of one-piece construction with edges flanged.
 - 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 FINISHES, GENERAL

- 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.

3.2 PREPARATION

- A. Prepare recesses for recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
 - 1. Fire Protection Cabinets: 54 inches maximum above finished floor to top of cabinet or as indicated.

- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
- C. Identification: Apply decals at locations indicated.
- D. Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 133419 - METAL BUILDING SYSTEMS

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 framing.
 - 2. Metal roof panels.
 - 3. Metal wall panels.
 - 4. Accessories.

1.3 DEFINITIONS

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.4 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .
 - 1. Review methods and procedures related to metal building systems including, but not limited to, the following:
 - a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural load limitations.

- c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Required tests, inspections, and certifications.
 - e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.
2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
 - b. Structural limitations of purlins and rafters during and after roofing.
 - c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - d. Temporary protection requirements for metal roof panel assembly during and after installation.
 - e. Roof observation and repair after metal roof panel installation.
 3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
 - b. Structural limitations of girts and columns during and after wall panel installation.
 - c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 - d. Temporary protection requirements for metal wall panel assembly during and after installation.
 - e. Wall observation and repair after metal wall panel installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Metal roof panels.
 - b. Metal wall panels.
 - c. Foamed-insulation-core metal panels.
 - d. Roof ventilators.
- B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:
 1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
 2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.

3. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
 - a. Show roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
 4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches :
 - a. Flashing and trim.
 - b. Gutters.
 - c. Downspouts.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Samples for Verification: For the following products:
1. Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
 2. Flashing and Trim: Nominal 12 inches long. Include fasteners and other exposed accessories.
 3. Accessories: Nominal 12-inch- long Samples for each type of accessory.
- E. Delegated-Design Submittal: For metal building systems.
1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer licensed by the State of California in responsible charge for their preparation.
- 1.7 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For erector manufacturer .
- B. Welding certificates.
- C. Letter of Design Certification: Signed and sealed by the qualified professional engineer in responsible charge. Include the following:
1. Name and location of Project.
 2. Order number.
 3. Name of manufacturer.
 4. Name of Contractor.
 5. Building dimensions including width, length, height, and roof slope.
 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 7. Governing building code and year of edition.
 8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective

peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).

9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

D. Material Test Reports: For each of the following products:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.
5. Nonshrink grout.

E. Field quality-control reports.

F. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located (State of California).

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

1.11 FIELD CONDITIONS

- A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

1.12 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Buildings Company; a Nucor Company.
 - 2. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
 - 3. Nucor Building Systems.
 - 4. Star Building Systems; a division of NCI Building Systems, Inc.
 - 5. Varco-Pruden Buildings; a division of BlueScope Buildings North America, Inc.

- B. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

2.2 SYSTEM DESCRIPTION

- A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
- B. Primary-Frame Type:
 - 1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
 - 2. Rigid Modular: Solid-member, structural-framing system with interior columns.
- C. End-Wall Framing: Engineer end walls to be expandable. Provide primary frame, capable of supporting full-bay design loads, and end-wall columns.
- D. Secondary-Frame Type: Manufacturer's standard purlins and joists and exterior-framed (bypass) girts.
- E. Eave Height: As indicated on Drawings.
- F. Bay Spacing: As indicated on Drawings .
- G. Roof Slope: As Indicated on Drawings.
- H. Roof System:
- I. Exterior Wall System: Manufacturer's standard exposed-fastener, tapered-rib, metal wall panels.

2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
 - 1. Design Loads: As indicated on Drawings .
 - 2. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
 - 3. Deflection and Drift Limits: No greater than the following:

- a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
 - b. Girts: Horizontal deflection of 1/180 of the span.
 - c. Metal Roof Panels: Vertical deflection of 1/240 of the span.
 - d. Metal Wall Panels: Horizontal deflection of 1/180 of the span.
 - e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
 - f. Lateral Drift: Maximum of 1/200 of the building height.
- C. Seismic Performance: Metal building system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 .
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing 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 , ambient; 180 deg F , material surfaces .
- E. Fire-Resistance Ratings: Where assemblies are indicated to have a fire-resistance rating, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 or ASTM E 108 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory," FM Global's "Approval Guide," or from the listings of another qualified testing agency.
- F. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
1. Wind Loads: As indicated on Drawings.
- G. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 2.86 lbf/sq. ft. .
- H. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
1. Uplift Rating: UL 60
- I. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A- 60

2.4 STRUCTURAL-STEEL FRAMING

- A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."
- B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
 - 1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.
 - 2. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.
 - 3. Frame Configuration: Single gable
 - 4. Exterior Column: Tapered.
 - 5. Rafter: Tapered.
- E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
 - 1. End-Wall Rafters: I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
- F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:
 - 1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch- wide flanges.
 - a. Depth: As needed to comply with system performance requirements .
 - 2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch- wide flanges.
 - a. Depth: As required to comply with system performance requirements
 - 3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.

4. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch-diameter, cold-formed structural tubing to stiffen primary-frame flanges.
 5. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
 6. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- G. Bracing: Provide adjustable bracing perpendicular to main frames as follows:
1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 ; or ASTM A 529/A 529M, Grade 50 ; minimum 1/2-inch- diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
 2. Cable: ASTM A 475, minimum 1/4-inch- diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
 3. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
- H. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.
- I. Materials:
1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55 ; or ASTM A 529/A 529M, Grade 50 or 55
 2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 ; or ASTM A 529/A 529M, Grade 50 or 55
 3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 ; or ASTM A 529/A 529M, Grade 50 or 55
 4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
 5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
 6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55 , or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70 ; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80 , or HSLAS, Grades 45 through 70
 7. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80 , or HSLAS or HSLAS-F, Grades 50 through 80 ; with G60 coating designation; mill phosphatized.
 8. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80 , or HSLAS or HSLAS-F, Grades 50 through 80 ; with G90 coating designation.
 - b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, SS, Grade 50 or 80 ; with Class AZ50 coating.

9. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A, carbon-steel, hex-head bolts; ASTM A 563 carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
 - a. Finish: Hot-dip zinc coating, ASTM F 2329, Class C .
 10. High-Strength Bolts, Nuts, and Washers: ASTM F 3125/F 3125M, Grade A325 , Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436/F 436M, Type 1, hardened carbon-steel washers.
 - a. Finish: Hot-dip zinc coating, ASTM F 2329, Class C .
 11. High-Strength Bolts, Nuts, and Washers: ASTM F 3125/F 3125M, Grade A490 Type 1, heavy-hex steel structural bolts or Grade F2280 tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436/F 436M, Type 1, hardened carbon-steel washers; all with plain finish.
 12. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 3125/F 3125M, Grade F1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436/F 436M, Type 1 hardened carbon-steel washers.
 - a. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50 .
 13. Unheaded Anchor Rods: ASTM F 1554, Grade 36 .
 - a. Configuration: Straight.
 - b. Nuts: ASTM A 563 hex carbon steel.
 - c. Plate Washers: ASTM A 36/A 36M carbon steel.
 - d. Washers: ASTM F 436 hardened carbon steel.
 - e. Finish: Hot-dip zinc coating, ASTM F 2329, Class C .
 14. Threaded Rods: ASTM A 36/A 36M .
 - a. Nuts: ASTM A 563 hex carbon steel.
 - b. Washers: ASTM A 36/A 36M carbon steel.
 - c. Finish: Hot-dip zinc coating, ASTM F 2329, Class C .
- J. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
1. Clean and prepare in accordance with SSPC-SP2.
 2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil .
 - a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.

2.5 METAL ROOF PANELS

- A. Standing-Seam, Vertical-Rib, Metal Roof Panels : Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.030-inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

- a. Exterior Finish: Three-coat fluoropolymer .
- b. Color: As selected by the District to match surrounding buildings on site.
2. Clips: Two-piece floating to accommodate thermal movement.
3. Joint Type: Mechanically seamed.
4. Panel Coverage: 16 inches .
5. Panel Height: 2 inches .

B. Finishes:

1. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil

2.6 METAL WALL PANELS

- A. Exposed-Fastener, Tapered-Rib, Metal Wall Panels : Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.030-inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Exterior Finish: Three-coat fluoropolymer .
 - b. Color: As selected by the District to match surrounding Buildings on site.
2. Major-Rib Spacing: 6 inches o.c.
3. Panel Coverage: 36 inches .
4. Panel Height: 1.25 inches .

B. Finishes:

1. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil .

2.7 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent

possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
 3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
 4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch standoff; fabricated from extruded polystyrene.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.
1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
 2. Opening Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating.

Trim head and jamb of door openings, and head, jamb, and sill of other openings.

- E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
 - 1. Gutter Supports: Fabricated from same material and finish as gutters.
 - 2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.

- F. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- long sections, complete with formed elbows and offsets.
 - 1. Mounting Straps: Fabricated from same material and finish as gutters.

- G. Materials:
 - 1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
 - a. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
 - b. Fasteners for Metal Roof Panels: Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.
 - c. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws , with EPDM sealing washers bearing on weather side of metal panels.
 - d. Fasteners for Metal Wall Panels: Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head , with EPDM sealing washers bearing on weather side of metal panels.
 - e. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 - f. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
 - 2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
 - 3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
 - 4. Metal Panel Sealants:
 - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing.

Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.

- b. Joint Sealant: ASTM C 920; one part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.8 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
 1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
 1. Make shop connections by welding or by using high-strength bolts.
 2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
 3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
 5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
 1. Make shop connections by welding or by using non-high-strength bolts.
 2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.
- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
 1. Engage land surveyor to perform surveying.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written instructions and drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. 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 will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pretensioned as required by manufacturer.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 2. Locate and space wall girts to suit openings such as doors and windows.
 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
1. Tighten rod and cable bracing to avoid sag.
 2. Locate interior end-bay bracing only where indicated.
- I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
 - 1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- D. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
 - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
 - 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
 - 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Locate metal panel splices over structural supports with end laps in alignment.
 - 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- E. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
 - 1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
- F. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

- G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
 - 1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.

3.5 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
 - 1. Install ridge caps as metal roof panel work proceeds.
 - 2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
 - 1. Install clips to supports with self-drilling or self-tapping fasteners.
 - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 - 4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
 - 5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.
 - 6. Provide metal closures at peaks rake edges rake walls and each side of ridge caps.
- C. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by manufacturer.
 - 1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
 - 2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
 - 3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.
 - 4. At metal panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

- D. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- E. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
 - 2. Shim or otherwise plumb substrates receiving metal wall panels.
 - 3. When two rows of metal panels are required, lap panels 4 inches minimum.
 - 4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
 - 5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
 - 6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 - 7. Install screw fasteners in predrilled holes.
 - 8. Install flashing and trim as metal wall panel work proceeds.
 - 9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
 - 10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
 - 11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.
- C. Insulated Metal Wall Panels: Install insulated metal wall panels on exterior side of girts. Attach panels to supports at each panel joint using concealed clip and fasteners at maximum 42 inches o.c., spaced not more than manufacturer's recommendation. Fully engage tongue and groove of adjacent insulated metal wall panels.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels as weather seal.

- D. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet , noncumulative; level, plumb, and on location lines; and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
 - 1. Provide elbows at base of downspouts to direct water away from building.
 - 2. Tie downspouts to underground drainage system indicated.

3.8 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.
- B. Product will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.
- B. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing , bearing plates, and accessories.
 - 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 133419

SECTION 200100 – GENERAL MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The preceding General Conditions shall form a part of this Section with the same force and effect as though repeated here. The provisions of this Section shall also apply to the following Divisions 21, 22, 23 and 25 of these Specifications and shall be considered a part of those Divisions.

1.2 CODES AND REGULATIONS

- A. All work and materials shall be in accordance with current rules and regulations of applicable codes. Nothing in these Drawings or Specifications is to be construed to permit work not conforming to these codes. Should the Drawings or Specifications call for material or methods of construction of a higher quality or standard than required by these codes, the Drawings and Specifications shall govern. Applicable codes and regulations include, but are not necessarily limited to, the following:

California Building Code	CCR Title 24, Part 2
California Electrical Code	CCR Title 24, Part 3
California Mechanical Code	CCR Title 24, Part 4
California Plumbing Code	CCR Title 24, Part 5
California Energy Code	CCR Title 24, Part 6
California Fire Code	CCR Title 24, Part 9
Local Codes	

1.3 DEFINITIONS

- A. Provide: The term "provide" as used in these specifications or on the drawings shall mean furnish and install.
- B. Piping: The term "piping" as used in these specifications or on the drawings shall mean all pipe, fittings, valves, hangers, insulation, etc. as may be required for a complete and functional system.
- C. Ductwork: The terms "duct" or "ductwork" as used in these specifications or on the drawings shall mean all ducts, fittings, joints, dampers, hangers, insulation, etc. as may be required for a complete and functional system.
- D. Wiring: The term "wiring" as used in these specifications or on the drawings shall mean all wiring, conduit, boxes, connections, transformers, relays, switches etc. as may be required for a complete and functional system.

1.4 PERMITS AND FEES

- A. The Contractor shall take out all permits and arrange for all tests in connection with his work as required. All charges are to be included in the work.

1.5 COORDINATION OF WORK

- A. Examination: Before starting work, thoroughly examine existing and newly completed underlying and adjoining work and conditions on which the installation of this work depends. Report to the Engineer in writing all conditions which might adversely affect this work.
- B. Layout: Layout of materials, equipment and systems is generally diagrammatic unless specifically dimensioned. Some work may be shown offset for clarity. The actual locations of all materials, piping, ductwork, fixtures, equipment, supports, etc. shall be carefully planned prior to installation of any work in order to avoid all interference with each other, or with structural, electrical, architectural or other elements.
- C. Verification: If discrepancies are discovered between drawing and specification requirements, the more stringent requirement shall apply. All conflicts shall be called to the attention of the Engineer prior to the installation of any work or the ordering of any equipment. No work shall be prefabricated or installed prior to this coordination. No costs will be allowed to the Contractor for any prefabrication or installation performed prior to this coordination. Verify the proper voltage and phase of all equipment with the electrical plans.
- D. Location of Utilities Prior to Trenching or Earthwork: The Contractor shall notify the Owner a minimum of two business days prior to beginning trenching or earthwork. Prior to this notification, the Contractor shall have marked all proposed trenches with paint and shall have contacted a utility locating company and have had this company mark all found underground utilities with paint. The Contractor shall then coordinate and arrange for a site visit with the Owner to review the proposed trenching and/or earthwork areas. Trenching and/or earthwork shall not begin until the Owner agrees. Repair and/or compensation for repair of marked utilities is the responsibility of the Contractor. The Owner retains the right to either self-perform the repair or require the Contractor to complete the repair, as directed by the Owner. If while performing the work, the Contractor discovers utilities that have not been marked, the Contractor shall immediately notify the Owner verbally and in writing.

1.6 GUARANTEE

- A. Guarantee shall be in accordance with the General Conditions. The Contractor shall repair any defects due to faulty materials or workmanship and pay for any resulting damage to other work which appears within the guarantee period. These Specifications may extend the period of the guarantee for certain items. Where such extensions are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the certificate of guarantee shall be furnished to the Owner through the Engineer.

1.7 QUIETNESS

- A. Piping, ductwork and equipment shall be arranged and supported so that vibration is a minimum and is not transmitted to the structure.

1.8 DAMAGES BY LEAKS

- A. The Contractor shall be responsible for damages caused by leaks in the temporary or permanent piping systems prior to completion of work and during the period of the guarantee, and for damages caused by disconnected pipes or fittings, and the overflow of equipment prior to completion of the work.

1.9 EXAMINATION OF SITE

- A. The Contractor shall examine the site, compare it with Plans and Specifications, and shall have satisfied himself as to the conditions under which the work is to be performed. No allowance shall subsequently be made in his behalf for any extra expense to which he may be put due to failure or neglect on his part to make such an examination.

1.10 COMPATIBILITY WITH EXISTING SYSTEMS

- A. Any work which is done as an addition, expansion or remodel of an existing system shall be compatible with that system.

1.11 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be new unless otherwise noted. Materials and equipment of a given type shall be by the same manufacturer. Materials and equipment shall be free of dents, scratches, marks, shipping tags and all defacing features at time of project acceptance. Materials and equipment shall be covered or otherwise protected during construction as required to maintain the material and equipment in new factory condition until project acceptance. All HVAC equipment and ductwork shall be covered, sealed and protected per CGBSC Section 5.504.3 from delivery on site until final start-up.

1.12 SUBMITTALS

- A. Shop Drawings: Within 30 days of contract award, the Contractor shall submit six copies of shop drawings for all materials, equipment, etc. proposed for use on this project. Material or equipment shall not be ordered or installed until written review is processed by the Engineer.

All shop drawings must comply with the following:

1. Shop drawings are required for all material and equipment items and shall include manufacturer's name and catalog numbers, dimensions, capacities, performance curves, and all other characteristics and accessories as listed in the specifications or on the drawings. Descriptive literature shall be current factory brochures and submittal sheets. Capacities shall be certified by the factory. FAX submittals are not acceptable.
2. All shop drawings shall be submitted at one time in a neat and orderly fashion in a suitable binder with title sheet including Project, Engineer and Contractor, table of contents, and indexed tabs dividing each group of materials or item of equipment. All items shall be identified by the specification paragraph number for which they are proposed. All equipment shall also be identified by the mark number as indicated on drawings.

3. All capacities, characteristics, and accessories called for in the specifications or on the drawings shall be high-lighted, circled or underlined on the shop drawings. Calculations and other detailed data indicating how the item was selected shall be included for items that are not scheduled. Data must be complete enough to permit detailed comparison of every significant characteristic which is specified, scheduled or detailed.
4. Electronic Submittals: Where allowed by Division 01, electronic submittals are acceptable providing the following requirements are met. Electronic submittals which do not comply with these requirements will be rejected.
 - a. Submittal shall be a single file in PDF format, with bookmarks for table of contents and each tab, and sub-bookmarks for each item.
 - b. All text shall be searchable (except text that is part of a graphic).
 - c. Submittal shall include all items noted in 1 through 3 above, except a binder is not required.
 - d. Electronic submittals shall be processed through normal channels. Do not submit directly to the Engineer unless the Engineer is the prime consultant for the project.
 - e. Contractor shall provide Owner and Owner's Representative with hard copies of the final submittal. Coordinate exact number required with Owner through Architect/Engineer.
- B. Substitutions: Manufacturers and model numbers listed in the specifications or on the drawings represent the standard of quality and features desired. Proposed substitutions shall comply with the Owner's General Requirements. Calculations and other detailed data indicating how the item was selected shall be included. The Contractor shall assume full responsibility that substituted items or procedures will meet the specifications and job requirements and shall be responsible for the cost of redesign and modifications to the work caused by these items. At the Engineer's request, furnish locations where equipment similar to the substituted equipment is installed and operating along with the user's phone numbers and contact person. Satisfactory operation and service history will be considered in the acceptance or rejection of the proposed substitution.
- C. Review: Submittals will be reviewed for general conformance with the design concept, but this review does not guarantee quantity shown, nor does it supersede the responsibility of the Contractor to provide all materials, equipment and installation in accordance with the drawings and specifications. The Contractor shall agree that shop drawing submittals processed by the Engineer are not Change Orders; that the purpose of shop drawing submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use. The Contractor shall agree that if deviations, discrepancies or conflicts between shop drawings and design drawings and specifications are discovered either prior to or after shop drawing submittals are processed by the Engineer, the design drawings and specifications shall control and

shall be followed. If a resubmittal is required, submit a complete copy of the Engineer's review letter requiring such with the resubmittal.

1.13 MANUFACTURER'S RECOMMENDATIONS

- A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site through the construction of the project.

1.14 SCHEDULING OF WORK

- A. All work shall be scheduled subject to the review of the Engineer and the Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site. The Contractor shall have at all times, as conditions permit, a sufficient force of workmen and quantity of materials to install the work contracted for as rapidly as possible consistent with good work, and shall cause no delay to other Contractors engaged upon this project or to the Owner. HVAC equipment and functions, whether existing or new, shall be maintained in operating condition whenever the facility is occupied, unless otherwise approved by the Owner.

1.15 DEMOLITION

- A. Existing equipment, ducts, piping, etc. noted for removal shall be removed and delivered to the Owner at a location to be determined by the Owner. Those items determined by the Owner to be of no value shall become the property of the Contractor and shall be removed from the job site by the Contractor at the Contractor's expense. Existing piping, ducts, services, etc. requiring capping shall be capped below floors, behind walls, above ceilings or above roof unless otherwise noted. Where items are removed, patch the surfaces to match the existing surfaces.

1.16 HAZARDOUS MATERIAL REMOVAL

- A. All hazardous material removal will be by the Owner. Hazardous material is to be removed before the work is started. If the Contractor discovers hazardous material which has not been removed, the Contractor shall immediately cease work in that area and promptly notify the Owner.

1.17 OPENINGS, CUTTING AND PATCHING

- A. The locations and dimensions for openings through walls, floors, ceilings, foundations, footings, etc. required to accomplish the work under this Specification Division shall be provided under this Division. Except as noted below, the actual openings and the required cutting and patching shall be provided by other Divisions. Coring through existing concrete or masonry walls, floors, ceilings, foundations, footings, etc., and saw cutting of concrete floors or asphaltic concrete required to accomplish the work under this Specification Division shall be provided under this Division. Patching of these surfaces shall be provided by other Divisions. Cutting or coring shall not impair the strength of the structure. Any damage resulting from this

work shall be repaired at the Contractor's expense to the satisfaction of the Engineer.

1.18 EXCAVATION AND BACKFILL

- A. General: Barrel of pipe shall have uniform support on sand bed. Sand shall be free from clay or organic material, suitable for the purpose intended and shall be of such size that 90 percent to 100 percent will pass a No. 4 sieve and not more than 5 percent will pass a No. 200 sieve. Unless otherwise noted, minimum earth cover above top of pipe or tubing outside building walls shall be 24", not including base and paving in paved areas.
- B. Excavation: Width of trench at top of pipe shall be minimum of 16", plus the outside diameter of the pipe. Provide all shoring required by site conditions. Where over excavation occurs, provide compacted sand backfill to pipe bottom. Where groundwater is encountered, remove to keep excavation dry, using well points and pumps as required.
- C. Backfill:
 - 1. 6" Below, Around, and to 12" Above Pipe: Material shall be sand. Place carefully around and on top of pipe, taking care not to disturb piping, consolidate with vibrator.
 - 2. One Foot Above Pipe to Grade: Material shall be sandy or silty loam, free of lumps, laid in 6" layers, uniformly mixed to proper moisture and compacted to required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6" layers may be used, subject to review by Engineer.
- D. Compaction: Compact to density of 95% within building and under walkways, driveways, traffic areas, paved areas, etc. and to 90% elsewhere. Demonstrate proper compaction by testing at top, bottom and one-half of the trench depth. Perform these tests at three locations per 100' of trench.

1.19 CONTINUITY OF SERVICES

- A. Existing services and systems shall be maintained except for short intervals when connections are made. The Contractor shall be responsible for interruptions of services and shall repair damage done to any existing service caused by the work. If utilities not indicated on the drawings are uncovered during excavation, the Contractor shall notify the Engineer immediately.

1.20 PROTECTIVE COATING FOR UNDERGROUND PIPING

- A. All ferrous pipe below grade (except cast iron) shall have a factory applied protective coating of extruded high density polyethylene, 35 to 70 mils total thickness, X-Tru-Coat, Scotchkote. All fittings and areas of damaged coating shall be covered with two layer double wrap of 10 mil polyvinyl tape to total thickness of 40 mils. John-Mansville. Protective coating shall be extended 6" above surrounding grade.

1.21 ACCESS DOORS

- A. Provide access doors as required where equipment, piping, valves, ductwork, etc. are not otherwise accessible. Access doors shall match the wall or ceiling finish and fire rating as indicated on the Architectural drawings. 16-gage steel frame and 14-gage steel door with paintable finish, except in ceramic tile, where door shall be 16-gage stainless steel with satin finish. Continuous hinge. Deliver doors to the General Contractor for installation. Milcor. Unless otherwise noted, the minimum sizes shall be as follows:

1 valve up to 1-1/2"	12" x 12"
1 valve up to 3"	16" x 16"

1.22 HOUSEKEEPING PAD

- A. Housekeeping pads shall be 6" high concrete, 3000 PSI strength, unless otherwise noted. Pad shall extend 6" beyond the largest dimensions of the equipment, unless otherwise noted. The top edge of the pad shall have a 3/4" chamfer. Unless otherwise noted, the pad shall have #4 reinforcing bars at 12" on center, each way, located at mid-depth of the pad. If not poured at the same time as the slab with pad rebar tied to slab rebar, the pad shall be anchored as follows: Drill 5/8" diameter, 3" deep hole in slab. Install 7" long, #4 rebar with Simpson Set epoxy system. Provide a minimum of 4 of these anchors per pad, but no more than 4 feet apart in either direction. Anchor points shall be 12" from the edge of the pad.

1.23 CONCRETE ANCHORS

- A. Steel bolt with expansion anchor requiring a drilled hole - powder driven anchors, adhesive anchors and concrete screws are not acceptable. Re-use of screw anchor holes shall not be permitted. Minimum concrete embedment shall be 4-1/2 diameters. Minimum spacing shall be 12 diameters center to center and 6 diameters center to edge of concrete. Post-installed anchors in concrete used for component anchorage shall be pre-qualified for seismic application in accordance with ACI 355.2 and ICC-ES AC193. Post-installed anchors in masonry used for component anchorage shall be pre-qualified for seismic applications in accordance with ICC-ES AC01. Maximum allowable loads for tension and shear shall be as determined by Calculation in compliance with ACI 318-14, Chapter 17, and the anchor's ICC or IAPMO evaluation report. Hilti, Powers, Red Head.

1.24 EQUIPMENT ANCHORING AND OTHER SUPPORTS

- A. Mechanical systems (equipment, ductwork, piping, conduit, etc.) shall be anchored in accordance with the CBC. All systems mounted on concrete shall be secured with a concrete anchor at each mounting point. All air handlers shall be mounted on spring isolators. Secure base plate as indicated above. Attachment of equipment, ductwork, piping, conduit, etc. supported on curbs or platforms shall be made to the side of curbs and platforms, where possible. Where screws or lag bolts must be installed through the top of a sheet metal cap, the installation shall be as follows. Pre-drill pilot hole. Fill pilot hole with polyurethane sealant. Install screw or lag bolt with a flat washer and an EPDM washer adjacent to the sheet metal.

1.25 SUPPORTS AND SEISMIC RESTRAINTS

- A. Any structural element required to hang or support piping, ducts or equipment provided under this Division and not shown on other drawings shall be provided under this Division.
- B. Mechanical systems (equipment, ductwork, piping, etc.) shall be provided with supports and seismic restraints in accordance with the CBC. Submit anchorage calculations and details stamped and signed by a structural engineer registered in the State of California. Submit shop drawings showing location, type and detail of restraints. Submit manufacturer's data for restraints. Restraint system shall be Mason West, Inc. (OSHPD OPM 0043-13).

1.26 PAINTING

- A. Paint all black iron supports, hangers, anchors, etc. with two coats of rust resisting primer. Also paint all uninsulated black iron piping exposed to weather with two coats of rust resisting primer.

1.27 ROOF PENETRATIONS AND PATCHING

- A. Whenever any part of the mechanical systems penetrates the roof or exterior wall, the openings shall be flashed and counter-flashed water tight with minimum 22 gauge galvanized sheet metal. Flashing shall extend not less than eight inches from the duct, pipe, or supporting member in all directions unless detailed otherwise. All roof penetrations and patching shall be in accordance with the recommendations of the National Roofing Contractor's Association and the Owner's roofing standards.

1.28 SYSTEM IDENTIFICATION

- A. Above Grade Piping: Provide markers on piping which is either exposed or concealed in accessible spaces. For piping systems, other than drain and vent lines, indicate the fluid conveyed or its abbreviation, either by pre-printed markers or stenciled marking, and include arrows to show direction of flow. Pre-printed markers shall be the type that wrap completely around the pipe, requiring no other means of fastening such as tape, adhesive, etc. Comply with ANSI A13.1 for colors. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 50' maximum intervals along exposed portions of lines. Marking of short branches and repetitive branches for equipment connections is not required.
- B. Below Grade Piping: Bury a continuous, pre-printed, bright-colored, metallic ribbon marker capable of being located with a metal detector with each underground pipe. Locate directly over buried pipe, 6" to 8" below finished grade.
- C. Equipment: All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. AC-4) and identifies the area or space served by the equipment. Provide 1/2" high lettering - white on black background. Nameplates shall be permanently secured to the exterior of the unit.
- D. Valves: Provide stamped brass valve tags with brass hooks or chains on all valves of each piping system, excluding check valves, valves within equipment, faucets, stops

and shut-off valves at fixtures and other repetitive terminal units. Prepare and submit a tagged-valve schedule, listing each valve by tag number, location and piping service.

1.29 CLEANING

- A. Progressively and at completion of the job, the Contractor shall thoroughly clean all of his work, removing all debris, stain and marks resulting from his work. This includes but is not limited to building surfaces, piping, equipment and ductwork, inside and out. Surfaces shall be free of dirt, grease, labels, tags, tape, rust, and all foreign material.

1.30 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Printed: Three copies of Operation and Maintenance Instructions and Wiring Diagrams for all equipment and parts list for all faucets, trim, valves, etc. shall be submitted to the Engineer. All instructions shall be clearly identified by marking them with the same designation as the equipment item to which they apply (e.g. AC-3). All Wiring Diagrams shall agree with reviewed Shop Drawings and indicate the exact field installation. All instructions shall be submitted at the same time and shall be bound in a suitable binder with tabs dividing each type of equipment (e.g. Pumps, Fans, Motors, etc.). Each binder shall be labeled indicating "Operating and Maintenance Instructions, Project Title, Contractor, Date" and shall have a Table of Contents listing all items included.
- B. Verbal: The Contractor shall verbally instruct the Owner's maintenance staff in the operation and maintenance of all equipment and systems. The controls contractor shall present that portion of the instructions that apply to the control system. The Engineer's office shall be notified 48 hours prior to this meeting.
- C. Acknowledgment: The Contractor shall prepare a letter indicating that all operation and maintenance instructions (printed and verbal) have been given to the Owner, to the Owner's satisfaction. This letter shall be acknowledged (signed) by the Owner and submitted to the Engineer.

1.31 RECORD DRAWINGS

- A. The Contractor shall obtain one set of prints for the project, upon which a record of all construction changes shall be made. As the work progresses, the Contractor shall maintain a record of all deviations in the work from that indicated on the drawings. Final location of all underground work shall be recorded by depth from finished grade and by offset distance from permanent surface structures, i.e. building, curbs, walks. In addition, the water, gas, sewer, under floor duct, etc. within the building shall be recorded by offset distances from building walls. An electronic copy of the original drawings will be made available to the Contractor. The Contractor shall transfer the changes, notations, etc. from the marked-up prints to the electronic copy. The record drawings (marked-up prints, electronic drawings disc and a hard copy) shall be submitted to the Engineer for review.

1.32 ACCEPTANCE TESTING

- A. The Contractor shall perform, document and submit all acceptance testing as required by California Code of Regulations, Title 24, Part 6.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

END OF SECTION 200100

SECTION 210500 - FIRE SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS

- A. The preceding General Mechanical Provisions shall form a part of this Section with the same force and effect as though repeated here.

1.2 SCOPE

- A. General: Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The entire facility shall be fire sprinklered.
- B. Design/Calculations: The sprinkler system shall be designed and sized by hydraulic calculations in accordance with NFPA No. 13 and fire authority requirements. Calculations shall be included in submittals.
- C. Preparation of Drawings and Material Data Sheets: Before starting work, complete shop drawings showing locations and sizes of all sprinkler heads, piping, valves, etc., shall be prepared. Shop drawings shall also include material data sheets giving manufacturer's name and catalog numbers, equipment descriptions giving dimensions, capacities, performance curves, and complete layouts. Piping shall be concealed in walls, above the ceilings or below grade unless otherwise noted. Exposed piping must be approved by the Architect and Engineer. Exposed piping shall be specifically noted on shop drawings.

1.3 WORK SPECIFIED ELSEWHERE

- A. Fire alarm system.

1.4 SUBMITTAL REVIEW PROCESS

- A. Submit shop drawings, calculations and material data sheets to fire authority for approval.
- B. Submit approved shop drawings, calculations and material data sheets to Engineer for review.
- C. Material or equipment shall not be ordered, nor work proceed until Engineer processes written review.

PART 2 - PRODUCTS

2.1 STANDARDS

- A. All materials shall be in accordance with NFPA No.13 "Standard for the Installation of Sprinkler Systems". Underground mains shall be in accordance with NFPA No. 24

"Standard for the Installation of Private Fire Service Mains and Their Appurtenances".

2.2 PIPING MATERIALS

- A. General: The pressure rating of all piping, valves, flanges and other piping accessories shall be in accordance with code and fire authority requirements. Pressure ratings shall exceed the highest possible working pressure.
- B. Piping:
 - 1. Underground: Polyvinyl chloride, Class 200, AWWA C900, with rubber ring joints, ASTM D1869. Cast or ductile iron fittings, AWWA C110 or C153, Class 250 or higher, with rubber ring joints, ASTM D1869.
 - 2. Above Grade:
 - a. 2" and Smaller: Threaded black steel pipe, ASTM A53, minimum wall thickness per NFPA 13. 300 psi WOG black malleable iron threaded fittings, UL listed.
 - b. 2-1/2" and Larger: Welded black steel pipe, ASTM A53, minimum wall thickness per NFPA 13. Carbon steel welding fittings, ANSI B16.9. Roll grooved, listed pipe couplings may be used for assembling welded sections.
- C. Gate Valve:
 - 1. 2" and Smaller: All bronze, rising stem. UL listed.
 - 2. 2-1/2" and Larger: Iron body, bronze mounted, outside screw and yoke. UL listed. (UL listed butterfly valves may be substituted for 4" and larger gate valves above grade.)
- D. Check Valve:
 - 1. 2" and Smaller: All bronze swing check. UL listed.
 - 2. 2-1/2" and Larger: Iron body, bronze mounted swing check. UL listed.
- E. Drain Valve: All bronze angle globe valve. UL listed.
- F. Anchors and Hangers: Shall comply with NFPA No. 13.

2.3 SPRINKLER HEAD

- A. Automatic sprinkler head, concealed type in areas with finished ceilings and recessed or suspended lighting, semi-recessed in areas with finished ceilings and surface lighting, upright or pendent heads elsewhere (as allowed by NFPA 13). Heads in finished areas shall be Victaulic FireLock V38 quick response concealed, Tyco RFII quick response concealed, or Globe Fire Sprinkler Corp., Quick Response GL Series Concealed Pendent, with chrome-finish metal cover plate. Heads

elsewhere shall be quick response, Victaulic FireLock V27, Tyco, Model TY-FRB or Globe Fire Sprinkler Corp., Model GL Quick Response, with standard finish. UL listed. Temperature ratings shall be in accordance with NFPA No. 13. Provide extra heads (of each type installed) in accordance with code requirements. Exposed heads installed with deflector lower than 7' 6" above floor shall have wire guards.

2.4 ALARM VALVE ASSEMBLY

- A. Standard wet type alarm valve assembly and electric bell complete with trim as required by the authority having jurisdiction. Provide flow switch for connection to alarm system. Provide tamper switch. UL listed. Coordinate with Division 28.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. General: Piping shall be concealed in walls, above the ceilings or below grade unless otherwise noted. Exposed piping must be approved by the Architect and Engineer. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. Depth of cover in traffic areas shall be 36 inches (minimum).
 - 1. Installer Certification: Installation shall be performed by certified fire sprinkler fitter(s) as required by CCR, Title 19, Divisions 1, Chapter 5.5. See CAL FIRE – Office of the State Fire Marshall Information Bulletin 17-002 for more information. The Bulletin can be downloaded from the following:
http://osfm.fire.ca.gov/informationbulletin/pdf/2017/IB_AESCert_final_05_25_17.pdf
- B. Standards: All piping shall be installed in accordance with NFPA No. 13 "Standard for the Installation of Sprinkler Systems". Underground mains shall be installed in accordance with NFPA No. 24 "Standard for the Installation of Private Fire Service Mains and Their Appurtenances".
- C. Miscellaneous:
 - 1. Escutcheons: Provide chrome plated metal escutcheons where piping penetrates walls, ceilings or floors in finished areas.
 - 2. Pattern: Sprinklers shall be installed in a symmetrical pattern with lighting fixtures and with ceiling pattern. Heads located in lay-in ceilings shall be centered in panel.
 - 3. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" annular clearance between sleeve and pipe for piping 3" and smaller and 2" annular clearance for piping 4" and larger.
 - 4. Access: Provide access doors as required for all valves, devices, etc.
 - 5. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space

surrounding the pipe, or pipe insulation sealed with fire rated materials in accordance with the requirements of the fire authority having jurisdiction.

6. Concrete Thrust Blocks: Shall be constructed at all valves, tees, elbows, bends, crosses, reducers and dead ends in loose-joint pipe. Blocks shall cure a minimum of 7 days before pressure is applied. Concrete shall be 3000 psi mix.
7. Electrical Equipment: Piping shall not be run over electrical panels, motor control centers or switchboards.

3.2 IDENTIFICATION

- A. All controls, piping, valves and equipment shall be labeled for function and service in accordance with NFPA No.13.

3.3 TESTS AND ADJUSTMENTS

- A. Unless otherwise directed, tests shall be witnessed by a representative of the Engineer and an inspector of the authority having jurisdiction. Contractor shall notify fire authority at least 48 hours prior to testing. At various stages and upon completion, the system must be tested in the presence of the enforcing agency. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and the entire work retested. Test all systems in accordance with fire authority requirements and NFPA No.13 and No.24.

3.4 CERTIFICATION

- A. At completion of the project, a certificate of inspection from authority having jurisdiction indicating installation and testing in accordance with referenced standards shall be delivered to the Owner through the Engineer.

END OF SECTION 210500

SECTION 220400 – PLUMBING

PART 1 - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS

- A. The General Mechanical Provisions, Section 20 01, 00, shall form a part of this Section with the same force and effect as though repeated here.

1.2 SCOPE:

- A. Included: Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The work includes, but is not necessarily limited to, the following:

1. Sanitary sewer system.
2. Domestic water system.
3. Drain system (including condensate drain).
4. All equipment as shown or noted on the drawings or as specified.
5. Demolition as indicated on drawings. Where demolition is called for, remove all equipment, piping, braces, housekeeping pads, supports and related items no longer required.
6. Lead Free: All equipment, fixtures, valves and fixture stops providing water for human consumption installed after January 1, 2010, must meet the "Lead Free" requirements for the State of California.

- B. Work Specified Elsewhere:

1. Line voltage power wiring, disconnect switches and installation of all starters are included in the Electrical Section unless otherwise noted.
2. Access doors.
3. Concrete and reinforcing steel unless specifically called for on the drawings or specifications.
4. Painting unless specifically called for in the drawings or specifications.
5. Carpentry.
6. Control of circulating pumps, etc.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS:

A. Sanitary Sewer:

1. Soil, Waste and Vent Piping (Non-Pressurized):

- a. Inside Building and Within Five Feet of Building Walls: Standard weight coated cast iron pipe and fittings. Plain end, CISPI 301, ASTM A888, or hub end with rubber gaskets, ASTM A74, ASTM C564. ABI, Tyler, Charlotte. Couplings shall be heavy-duty shielded couplings. Type 304 stainless steel, with neoprene gasket, ASTM C1540. Husky HD 2000, Clamp-All 80, Mission HeavyWeight. MG Couplings are also acceptable. 2" and smaller exposed to view shall be galvanized steel, ASTM A53, with coated cast iron recessed drainage fittings, ANSI B16.12.

Where required by soil conditions, as determined by the method described in ASTM A74-09, Appendix X2, below grade cast iron pipe and fittings shall have 8 mil (minimum) Polyethylene Encasement (Poly Wrap), Per ANSI/AWWA C105/A21.5.

2. Cleanouts: Comparable models of Josam, Wade, Mifab or Zurn are acceptable. Grease plug prior to installation. Floor Cleanouts: Smith 4023 with nickel bronze top in finished areas; Smith 4223 in utility areas. Wall Cleanouts: Smith 4532 with stainless steel cover and screw. Pipe Cleanouts: Iron body with threaded brass plug. Site cleanouts more than 5' outside building may be PVC with PVC plug.
3. Cleanout Box: Precast reinforced concrete. Cast iron lid marked for service. Christy F8 in foot traffic areas; G5 in roadways. Provide with PVC pipe extension down to top of pipe.

B. Water:

1. Hot and Cold Water Piping: Materials used in the water system, except valves and similar devices, shall be of like material, except where otherwise approved by Engineer and Authority Having Jurisdiction, prior to start of work. For existing water systems of galvanized steel or copper, materials shall match existing.

- a. Inside Building, Within Five Feet of Building Walls, and All Above Grade:

(1) Schedule 40 galvanized steel pipe, ASTM A53. 150 psi galvanized malleable iron screwed fittings, ANSI B16.3.

- or- (2) Hard temper seamless copper, ASTM B88. Wrought copper fittings, ANSI B16.22. Type L with brazed joints (1100F, min.). 1-1/2" and smaller above grade may be soldered, 95-5 tin-antimony solder. All nipples shall be lead-free red brass (85% copper). Above grade fittings may be copper press fittings, ASME B16.18 or ASME B16.22. EPDM O-rings. Installation shall be in accordance with the manufacturer's installation instructions. ProPress.

2. Valves and Specialties:

a. Valves:

- (1) General: Manufacturer's model numbers are listed to complete description. Equivalent models of Crane, Kitz, Milwaukee, Nibco, Stockham, Walworth or Watts are acceptable. All valves of a particular type or for a particular service shall be by the same manufacturer.
- (2) Gate Valve: 2" and Smaller: All bronze. Non-rising stem. Threaded bonnet. Wedge disk. Malleable iron handwheel. 200 psi CWP. Nibco T-113-LF.
- (3) Check Valve: Lead-free bronze swing check, regrinding. 200 psi CWP. Nibco T-413-Y-LF. For vertical applications use lead-free bronze, spring-loaded, lift-type. Nibco T-480-Y-LF.
- (4) Ball Valve: Full port. Lead free brass body, cap, stem, disk and ball. Screwed connection. Lever handle. PTFE seat and stem packing. Min. 400 psi CWP. CSA-US and UL listed. Nibco T-FP-600A-LF.
- (5) Valve Box: Precast reinforced concrete. Cast iron lid marked for service. Christy F8 in foot traffic areas; G5 in roadways. Provide with PVC pipe extension down to top of pipe.

b. Instruments:

- (1) Thermometer: 3" dial. Stainless steel case. Back or bottom connected as required. 1/2" NPT. 20F-240F, 2F divisions for hot water. 25F-125F, 2F divisions for chilled water. 2" insertion length. Allowance to be made for insulation thickness. For installations over 7 feet above finish floor, provide digital thermometer with remote reader. Marshalltown, Moeller, Taylor, Tel Tru, Winters.
- (2) Thermometer Well: Brass well. Suitable for thermometer above. Provide 2" extension at insulated pipes.

c. Miscellaneous Specialties:

- (1) Temperature and Pressure Relief Valve: ASME rated fully automatic, reseating combination temperature and pressure relief valve sized in accordance with energy input. Sensing element immersed within upper 6" of tank. Watts.
- (2) Union: 2" and Smaller: AAR malleable iron, bronze to iron ground seat. 300 psi. Unions for copper piping shall be copper or lead free cast bronze. Anvil. Size 2-1/2" and Larger:

Grooved pipe, synthetic gasket, malleable iron housing.
EPDM gasket, NSF 61 rated. Victaulic Style 77, Gruvlok.

- (3) Dielectric Coupling: Insulating union or flange rated for 250 psig. Wilkins DUXL Series.
- (4) Shock Absorber: Multiple bellows. All stainless steel construction. Designed and applied in accordance with PDI WH201. Amtrol, Smith, Wade, Zurn.

C. Drain Piping (including Condensate): Same as inside building cold water piping.

D. Miscellaneous Piping Items:

1. Pipe Support:

- a. Pipe Hanger: Steel "J" hanger with side bolt for piping 4" and smaller; steel clevis hanger for piping 5" and larger. Load and jam nuts. Size and maximum load per manufacturer's recommendation. Felt liner for copper piping. Hanger and rod shall have galvanized finish. B-Line, Anvil, Unistrut.
- b. Isolating Shield: Galvanized steel shell and reinforcing ribs. 1/4" non-conducting hair felt pad. Pipe hanger in accordance with paragraph above. Increase hanger size per manufacturer's recommendation. B-Line, Semco, Superstrut.
- c. Construction Channel: 12-gage, 1-5/8" x 1-5/8" galvanized steel channel. Single or multiple section. Self-locking nuts and fittings. B-Line, Anvil, Unistrut.

2. Flashing: Vent flashing shall be 4 lb/ft² lead, 16" sq. flange, length sufficient to be turned down 2" into vent. Oatey. Flashing for other piping through roof shall be prefabricated galvanized steel roof jacks with 16" sq. flange. Provide clamp-on storm collar and seal water tight with mastic. For cold process built-up roof, material shall be 4 lb/ft² lead instead of galvanized steel. For single-ply roofing, use the roofing manufacturer's recommended flashing material.

2.2 PIPING INSULATION MATERIALS:

- A. General: All piping insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.
- B. Pre-Molded Fiberglass: Heavy density sectional pre-molded fiberglass with vapor barrier laminated all service jacket and pressure sealing vapor barrier lap. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft²-F at a mean temperature of 50F. Perm rating 0.02, ASTM E96. Puncture rating 50 Beach units, ASTM D781. Provide 3" (min.) wide tape of same material as lap for butt joints. For hot water piping to 140°F, thickness shall be 1" for pipe sizes less than 1"; 1-1/2" thickness for pipe sizes 1" and 1-1/2"; 2" thickness for 2" and larger. See Title 24, Part 6 "California

Energy Code" for temperatures above 140°F. Knauf, Johns-Manville, Owens-Corning.

- C. Fiberglass Blanket: Unfaced. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft²-F at a mean temperature of 50F. 1-1/2" thickness. Knauf, Johns-Manville, Owens-Corning.
- D. PVC Jacket (for pipe, fittings and valves): Pre-molded polyvinyl chloride (PVC) jackets, 0.020" thickness. Size to match application. Provide solvent weld adhesive and PVC vapor barrier pressure sealing tape by same manufacturer. Zeston.
- E. Stretchable Glass Fabric: Reinforcing mesh. 10 X 20 continuous filament glass yarns per inch. Johns-Manville.
- F. Vapor Barrier Coating: Childers CP-30, Foster 30-25.
- G. Lagging Adhesive: Childers CP-50A, Foster 30-36.
- H. Insulating Tape: Ground virgin cork and synthetic elastomeric. Black, odorless, and non-toxic. K factor 0.43 Btu-in/hr-ft²-F or less. Non-shrinking. For outdoor use, provide protective finish by same manufacturer. Halstead.

2.3 FIXTURES:

- A. General: Provide rough-in for and install all plumbing fixtures shown on drawings. Except in equipment rooms, all trim, valves and piping not concealed in wall structure, above ceiling or below floors, shall be brass with polished chrome plate finish, unless noted otherwise. All enameled fixtures shall be acid resisting. Standard color is white unless otherwise noted.
- B. Schedule: Refer to Plumbing Fixture Schedule on the drawings for list of fixtures and trim. Manufacturer's model numbers are listed to complete description. Equivalent models of American Standard, Eljer, Elkay, Haws, Just, Kohler, Moen, T&S Brass, Willoughby or Zurn are acceptable. For drainage fixtures, equivalent models of Josam, Mifab, Smith, Wade or Zurn are acceptable.
- C. Stops and P-Traps: All fixtures shall be provided with stops and P-Traps as applicable. Wall mounted faucets, valves, etc. shall have integral stops or wall mounted stops.
 - 1. Stops: All hot and cold water supplies shall be 1/2" I.P.S. inlet angle stops with stuffing box, loose key lock shield, and brass riser (3/8" for 2-1/2 gpm and less, otherwise 1/2"). McGuire, Speedway.
 - 2. P-Traps: Semi-cast brass, ground joint. 17-gage. Clean-out plug. Unobstructed waterway. California Tubular, McGuire.
- D. Caulking: Caulk fixtures with white G.E. "Sanitary SCS1700", mildew resistant silicone sealant with EPA listed anti-microbial.

2.4 EQUIPMENT:

A. General Requirements:

1. Capacity: Capacities shall be in accordance with schedules shown on drawings. Capacities are to be considered minimum.
2. Dimensions: Equipment must conform to space requirements and limitations as indicated on drawings and as required for operation and maintenance. Equipment will not be accepted that does not readily conform to space conditions. Prepare and submit layout drawings for all proposed equipment (different than scheduled units) showing actual job conditions, required clearances for proper operation, maintenance, etc.
3. Ratings -Electrical: Electrical equipment shall be in accordance with NEMA standards and UL or ETL listed where applicable standards have been established.
4. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.
5. Electrical:
 - a. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories and controls required by equipment shall be furnished. Provide terminal blocks for controls and interlocks not included in equipment package. Manual and magnetic starters shall have ambient compensating running overcurrent protection in all ungrounded conductors. Magnetic starters shall be manual reset, and shall have H-O-A switches and auxiliary contacts. Controllers and other devices shall be in NEMA 1 or 3R enclosures as applicable.
 - b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts and other devices shall be in ungrounded conductors.
 - c. Motors: Shall be rated, constructed and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Motors exposed to weather shall be TEFC. Vertical motors with exposed fans shall have rain caps.
 - d. Starters: Motor starters shall be furnished for all equipment except where starter is in a motor control center as designated on the electrical drawings. Deliver starter to Electrical Contractor for installation and wiring.

- e. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt control circuit from integral protected transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.
 - f. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.
- B. Instantaneous Electric Water Heater: Electric. See Equipment Schedule on Plumbing Drawings. UL listed. Chronomite.
- C. Tankless Water Heater: Electric. See Equipment Schedule on Plumbing Drawings. UL listed. Eemax.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION:

A. General:

1. Piping Layout: Piping shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location to be approved by Architect. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. All piping shall be installed in a manner to ensure unrestricted flow, eliminate air pockets, prevent any unusual noise, and permit complete drainage of the system. All piping shall be installed to permit expansion and contraction without strain on piping or equipment. Vertical lines shall be installed to allow for building settlement without damage to piping. Pipe sizes indicated on the drawings are nominal sizes unless otherwise noted.
2. Joints:
 - a. Threaded: Pipe shall be cut square and reamed to full size. Threads shall be in accordance with ANSI B2.1. Joint compound or tape suitable for conveyed fluid shall be applied to male thread only. Joints shall be made with three threads exposed.
 - b. Brazed: Filler rod shall be of suitable or the same alloy as pipe. Brazing filler metal shall have a minimum melting point of 1100F. Brazing shall be performed by a Certified Brazer as certified by an organization/institution that uses standards recognized by the American Welding Society (AWS) and meets the requirements of the ASME Boiler and Pressure Vessels Code, Section 9.
 - c. Open Ends: Open ends of piping shall be capped during progress of work to preclude foreign matter.

- d. Electrical Equipment: Piping shall not be run over electrical panels, motor control centers or switchboards.
3. Fittings and Valves:
- a. Standard Fittings: All joints and changes in direction shall be made with standard fittings. Close nipples shall not be used.
 - b. Reducers: Pipe size reduction shall be made with bell reducer fittings. Bushings shall not be used.
 - c. Unions: A union shall be installed on the leaving side of each valve, at all sides of automatic valves, at equipment connections, and elsewhere as necessary for assembly or disassembly of piping.
 - d. Valves: All valves shall be full line size. Provide shut-off valve for each building and each equipment connection. Provide shut-off valve at each point of connection to existing piping. At equipment connections, valves shall be full size of upstream piping, except that gas valves within 18" of the point of connection to the equipment may be the same size as the equipment connection.
 - e. Valve Accessibility: All valves shall be located so that they are easily accessible. Valves located above ceilings shall be installed within 24" of the ceiling. For situations where this is not practical or where valves are greater than 10' above the floor, chain wheel operators shall be provided. Chain shall extend down to 7' above the floor. All such installations must have prior review by the Engineer.

4. Pipe Support:

- a. General: Hangers shall be placed to support piping without strain on joints or fittings. Maximum spacing between supports shall be as specified below. Actual spacing requirements will depend on structural system. Side beam clamps shall be provided with retaining straps to secure the clamp to the opposite side of the beam. Vertical piping shall be supported with riser clamp at 20' on center (maximum). Support pipe within 12" of all changes in direction. Support individual pipes with pipe hanger. Copper piping systems which protrude through a surface for connection to a fixture stop or other outlet shall be secured with a drop ell, Nibco 707-3-5, to a Holdrite Model #SB1 bracket; nipple through surface shall be threaded brass.

(1) Pressure Pipe:

Pipe Size (Inches)	Maximum Spacing* Between Supports (ft.)	
	Copper	Sch. 40 steel
1/2	6	6
3/4	6	8
1	6	8

1-1/4	6	10
1-1/2	6	10
2	10	10
2-1/2	10	10
3	10	10
4	10	10
6	10	10

*Based on straight lengths of pipe with couplings only. Provide additional supports for equipment, valves or other fittings. Seismic requirements may reduce maximum spacing.

- (2) Gravity Drain Pipe: Piping shall be supported at each length of pipe or fitting, but in no case at greater spacing than indicated above for pressure pipe.
 - b. Hot and Cold Water Piping: All hot and cold water piping shall have isolating shield; no portion of this piping shall touch the structure without an isolating shield except at anchor points for fixture rough-in.
 - c. Trapeze: Trapeze hangers of construction channel and pipe clamps may be used. Submit design to Engineer for review.
5. Miscellaneous:
- a. Escutcheons: Provide chrome plated metal escutcheons where piping penetrates walls, ceilings, or floors in finished areas.
 - b. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" annular clearance between sleeve and pipe for piping 3" and smaller, otherwise 2" annular clearance. Piping through walls below grade shall be sealed with Link-Seal.
 - c. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space surrounding the pipe or pipe insulation sealed with fire rated materials in accordance with the requirements of 2019 CBC Section 714.
 - d. Thermometer Gage Tap: Provide tee for instrument well. Minimum size of pipe surrounding well shall be 1-1/2". Mount on side of pipe.
 - e. Dielectric Couplings: Dielectric couplings shall be installed wherever piping of dissimilar metals are joined, except that bronze valves may be installed in ferrous piping without dielectric couplings.

B. Sanitary Sewer Piping:

- 1. General: Where inverts are not indicated, sanitary sewer piping shall be installed at 1/4" per foot pitch. Piping 4" and larger may be installed at 1/8" per foot pitch where structural or other limitations prevent installation at a

greater pitch. Bell and spigot piping shall be installed with barrel on sand bed; excavate hole for bell.

2. Cleanouts: Install cleanouts at ends of lines, at changes of direction greater than 45 degrees, and at not greater than 100 foot intervals. Locate interior cleanouts in accessible locations and bring flush to finished surface.
 3. Vents: Vents shall terminate not less than 6" above the roof nor less than 12" from any vertical surface nor within 10' of any outside air intake. Install horizontal vent lines at 1/4" per foot pitch. Offset vents 2' minimum from gutters, parapets, ridges and roof flashing.
- C. Water Piping: Connections to branches and risers shall be made from top of main. Supply header in fixture battery shall be full size to last fixture, reducing in size only on individual connections to each fixture in battery. Minimum pipe size shall be 1/2", unless otherwise noted. Exposed fixture stops and flush valves shall be installed with brass nipples for copper piping and galvanized nipples for galvanized piping. Nipples are to extend from outside of wall to fitting at header or drop behind finish wall surfaces. Pipe nipples shall be same size as stop or flush valve. Provide shut off for each building and each connection to equipment. Shock absorbers shall be installed in a vertical position as indicated on drawings. Only equipment mounted on vibration isolators shall be connected with flexible connections. Underground hot water and cold water piping which run parallel to each other shall be installed a minimum of 3 feet apart.
- D. Drain Piping (Including Condensate): Install with constant pitch to receptacle, 1/4" per foot where possible, otherwise 1/8" per foot minimum. Provide TEE with clean-out plug at all changes of direction. Provide trap at each air handling unit to prevent air leakage. Only equipment mounted on vibration isolators shall be connected with flexible connection. Piping not concealed in wall structure, above ceilings or below floors shall be chrome plated brass, except in equipment rooms, piping shall be galvanized steel. P&T relief and water heater drain piping shall be galvanized steel. Provide secondary drain piping where required.

3.2 PIPING INSULATION INSTALLATION:

- A. Domestic Hot Water:
1. General: All domestic hot water piping, fittings and accessories shall be insulated.
 2. Pipe: Apply pre-molded fiberglass sections to pipe using integral pressure sealing lap adhesive in accordance with manufacturer's recommendations. Stagger longitudinal joints. Seal butt joints with factory supplied pressure sealing tape.
 3. Fittings and Valves:
 - a. Wrap all fittings and valves with pre-cut fiberglass blanket to thickness matching adjoining insulation. Cover blanket with PVC jacket in accordance with manufacturer's recommendations. Solvent weld. Seal all joints with factory supplied pressure sealing vapor

barrier tape with 1-1/2" (min.) overlap on both sides of joint. Insulate valves to stem. Do not insulate unions, flanges or valves unless water temperature exceeds 140F or the piping is exposed to weather.

- b. For miscellaneous fittings and accessories for which PVC jackets are not available or where proximity of fittings precludes a neat-appearing installation, the Contractor may cover the fiberglass blanket with stretchable glass fabric, one coat of lagging adhesive and a final coat of vapor barrier coating. All exposed ends of insulation shall be adequately sealed.
4. Additional Finish for Exposed Piping and Equipment: All piping and equipment exposed to view but protected from the weather shall be given an additional finish of PVC jackets.
- B. Cold Water Piping-Freeze Protection: All cold water piping exposed to weather or other areas subject to freezing (i.e. ventilated attics, uninsulated exterior soffits, etc.) shall be insulated same as hot water piping. Cover with aluminum jacketing where exposed to weather. Short lengths of pipe and valves may be wrapped with insulating tape, 50% overlap. Cover valves to stem. Apply at least two coats of protective finish where exposed to weather.
 - C. Piping Insulation Under Lavatories and Sinks: Exposed water piping, water stops and drain piping under lavatories and sinks shall be insulated with 1/8" thick molded closed cell vinyl. Installation shall be in accordance with manufacturer's instructions.

3.3 FIXTURE INSTALLATION:

- A. Fixture Height: Shall be as indicated on Architectural drawings.
- B. Floor Drains or Floor Sinks: Shall be placed parallel to room surfaces, set level, flush with floor, and adjusted to proper height to drain. Cover openings during construction to keep all foreign matter out of drain line.
- C. Wall Hung Fixtures: Shall be provided with proper backing and hanger plates secured to wall. Fixtures mounted on carriers shall bear against stop nuts, clear of wall surface. Caulk fixtures against walls with white G.E. "Sanitary SCS1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).
- D. Floor Mounted Fixtures: Shall be provided with proper support plates. Caulk floor mounted fixtures with white G.E. "Sanitary SCS1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).
- E. Other Connections: Rough-in and connection for trim or fixtures supplied by others shall be included in this specification section.

3.4 EQUIPMENT INSTALLATION:

- A. General: It shall be the responsibility of the equipment installer to insure that no work done under other specification sections shall in any way block, or otherwise hinder the equipment. All equipment shall be securely anchored in place.

- B. Connections to Equipment: Where size changes are required for connections to equipment, they shall be made immediately adjacent to the equipment and, if possible, inside the equipment cabinet.

3.5 TESTS AND ADJUSTMENTS:

- A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Architect. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and entire work retested. Tests may be made in sections, however, all connections between sections previously tested and new section shall be included in the new test.
- B. Gravity Systems:
 - 1. Sanitary Sewer: All ends of the sanitary sewer system shall be capped and lines filled with water to the top of the highest vent, 10' above grade minimum. This test shall be made before any fixtures are installed. Test shall be maintained until all joints have been inspected, but no less than 2 hours.
 - 2. Drains (Including Condensate): Similar to Sanitary Sewer.
- C. Pressure Systems:
 - 1. General: There shall be no drop in pressure during test except that due to ambient temperature changes. All components of system not rated for test pressure shall be isolated from system before test is made.
 - 2. Domestic Hot and Cold Water Piping: Maintain 100 psig water pressure for 4 hours.
- D. Fixtures: Provide torque testing of water closet carrier anchor bolts in presence of Inspector. If Inspector is not available, a testing agency shall handle the inspection.

3.6 DISINFECTION:

- A. Disinfect all domestic water piping in accordance with 2019 CPC Section 609.9, and in accordance with administrative authority. Disinfection process shall be performed in cooperation with health department having jurisdiction and witnessed by a representative of the Architect. During procedure signs shall be posted at each water outlet stating, "Chlorination - Do Not Drink". After disinfection, one set of water samples shall be collected by Contractor for bacteriological analysis in presence of Inspector. If the water fails the bacteriological test, Contractor shall disinfect the piping again and pay for any retesting required, at no additional cost to owner. Bacteriological testing results shall be obtained by Contractor and delivered to the Owner through the Architect before project completion. Contractor shall include copy of Bacteriological Test Results at closeout with operation and maintenance manuals.

END OF SECTION 220400

SECTION 230800 - HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS

- A. The General Mechanical Provisions, Section 20 01 00, shall form a part of this Section with the same force and effect as though repeated here.

1.2 SCOPE

- A. Included: Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The work includes, but is not necessarily limited to, the following:

1. Air distribution system.
2. All equipment as shown or noted on the drawings or as specified.
3. Refrigeration system.
4. System energy balance.
5. Coordinate with Section 25 09 00 (Direct Digital Control System) regarding location and installation of system sensors, valves, actuators, etc. and to provide simultaneous start-up.
6. Demolition as indicated on drawings. Where demolition is called for, remove all equipment, piping, ductwork, braces, supports, housekeeping pads, temperature controls and related items no longer required.

- B. Work Specified Elsewhere:

1. Line voltage power wiring to equipment, disconnect switches and installation of all starters are included in the Electrical Sections, unless otherwise noted.
2. Connection of condensate drains to equipment.
3. Concrete and reinforcing steel unless specifically called for in the drawings or specifications.
4. Painting unless specifically called for in the drawings or specifications.
5. Carpentry.
6. Direct Digital Control System.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Hard drawn Type ACR copper, dried and capped, ASTM B280. Wrought copper fittings, silver alloy brazed, 1100°F, Silfos.

- B. Miscellaneous Piping Items:

1. Pipe Support:

- a. Pipe Hanger: Steel "J" hanger with side bolt for piping 4" and smaller; steel clevis hanger for piping 5" and larger. Load and jam nuts. Size and maximum load per manufacturer's recommendations. Felt liner for copper piping. Hanger and rod shall have galvanized finish. B-Line, Unistrut.
 - b. Isolating Shield: Galvanized steel shell and reinforcing ribs. 1/4" non-conducting hair felt pad. Pipe hanger in accordance with paragraph above. Increase hanger size per manufacturer's recommendation. B-Line, Semco.
 - c. Construction Channel: 12-gage, 1-5/8" x 1-5/8" galvanized steel channel. Single or multiple section. Self-locking nuts and fittings. B-Line, Unistrut.
2. Flashing: Flashing for piping through roof shall be prefabricated galvanized steel roof jacks with 16" square flange around pipe. Provide clamp-on storm collar and seal water tight with mastic. Maintain dielectric separation between copper and galvanized materials. For cold process built-up roof, material shall be 4 lb/ft² lead instead of galvanized steel.

2.2 PIPING INSULATION MATERIALS

- A. General: All piping insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.
- B. PVC Jacket (for pipe, fittings and valves): Pre-molded polyvinyl chloride (PVC) jackets, 0.020" thickness. Size to match application. Provide solvent weld adhesive and PVC vapor barrier pressure sealing tape by same manufacturer. Zeston.
- C. Stretchable Glass Fabric: Reinforcing mesh. 10 x 20 continuous filament glass yarns per inch. Johns-Manville.
- D. Vapor Barrier Coating: Childers CP-30 LO.
- E. Lagging Adhesive: Childers CP-50A.
- F. Aluminum Jacketing: Aluminum pipe and fitting jacketing, 0.016" thickness for straight pipe. 0.024" thickness for fittings. Integral moisture barrier. Stucco-Embossed finish. Provide pre-fabricated aluminum strapping and seals by same manufacturer. ITW or RPR.
- G. Metal Jacketing Sealant: Childers CP-76, Foster 95-44.
- H. Flexible Elastomeric: Closed cell flexible elastomeric preformed pipe insulation. Thermal conductivity shall not exceed 0.27 Btu-in/hr-ft²-°F at a mean temperature of 70°F. 1/2" thick. Provide #520 adhesive and Armaflex insulation pipe hangers by same manufacturer. Armacell Armaflex.

2.3 DUCTWORK MATERIALS:

- A. General: All ductwork materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50. Shall comply with 2019 CMC.
- B. Metal Ductwork: Metal ductwork shall be galvanized sheet steel, lock forming quality, ASTM A-653, with gage and construction to match SMACNA Standard for pressure required (26 gage minimum).
- C. Flexible Ductwork: Insulated flexible ductwork. One pound per cubic foot glass fiber insulation, 1-1/2" thick (R-6), 2" thick (R-8) where ductwork is outside the building thermal insulation envelope. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft²-°F at a mean temperature of 75°F. Seamless metalized reinforced polyester vapor barrier jacket. Duct shall comply with NFPA 90A. Continuous internal liner bonded to galvanized steel wire helix. Duct shall be capable of continuous operation at 1-1/2" of positive water static pressure and 4,000 ft/min air velocity. JP Lamborn.
- D. Duct Sealants: All Joints Exposed to Weather: Sealant shall be water based, Foster 32-19/32-17, Childers CP-146/148, United Duct Sealer WB or G.E. "SilPruf" SCS2000 silicone sealant. Joints Not Exposed to Weather: Fiber reinforced. White in color. Foster 32-17, Childers CP-148, Design Polymerics DP1030, Hardcast Versa-Grip 181, Hardcast CCWI-181.

2.4 AIR TERMINALS AND DUCT FITTINGS:

- A. Grilles: (Grilles, Registers, Diffusers and Louvers)
 - 1. Information on Drawings: Refer to Grille Schedule on the drawings for the list of grilles. Manufacturer's model numbers are listed to complete the description Titus. Equivalent models of Anemostat or Krueger are acceptable. Refer to the floor plans for neck size, CFM, air diffusion pattern and fire damper, if required.
 - 2. Performance: Submit complete performance data (throw, pressure drop, noise level, etc.) for all grilles proposed, other than those scheduled. Testing shall be in accordance with ANSI/ASHRAE 70-1991. If, according to the certified data of the manufacturer of the proposed units, the sizes indicated on the drawings will not perform satisfactorily, the units shall be reselected by the Contractor for the proper diffusion, spread, pressure drop, throw and noise level.
 - 3. Frame and Accessories: Supply, return, and exhaust grilles shall not have an opposed blade volume control damper unless otherwise noted. All surface mounted grilles shall have a perimeter gasket and flanged edge. All grilles shall have frames suitable for mounting in the surfaces designated by the architectural drawings. Key or screwdriver operated, no slide bars.
 - 4. Finish: All ceiling and wall grilles and all louvers shall have a paintable white finish unless otherwise noted. Interior components (everything behind

the face plate) shall be flat black. Floor grilles shall have an anodized aluminum finish unless otherwise noted.

- B. Branch Duct Volume Damper: Volume control damper (VCD) in rectangular ducts shall be as follows: Opposed blade, 6" maximum blade width, 16-gage blade, 48" maximum length, nylon or oil impregnated bronze bearings, 1/2" diameter pin shaft, 16-gage channel frame, actuating rod and linkage out of air stream. VCD in round duct shall be as follows: Damper blade full height of branch and 1" less than branch width. All branch dampers shall have regulator with stamped steel handle, spring loaded shaft nut, cast body and serrated self-locking die cast core. Regulator for horizontal ducts overhead shall be mounted on sides or bottom of ducts. Secure a 12" length of brightly colored plastic ribbon to handle for ease of location. Where rectangular or round ductwork is insulated, slit insulation to allow handle to protrude. Ventlok 641 (with 607 end bearing for round ducts).
- C. Extractor: Curved blade turns in adjustable position rigid frame. Tuttle and Bailey Deflectrol.
- D. Turning Vanes: Double wall, hollow metal, air foil shape. Spacing in accordance with manufacturer's recommendations. Aero Dyne HEP.
- E. Flexible Connection: UL listed neoprene coated 30 ounce fiberglass cloth. 3" metal, 3" fabric, 3" metal. Ventglas.

2.5 DUCTWORK INSULATION MATERIALS:

- A. General: All ductwork insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.
- B. Fiberglass Blanket: **Installed** thermal resistance at a mean temperature of 75°F shall meet or exceed indicated value. 3/4 lb/ft³ or 1 lb/ft³, **R-6** where ductwork is within the building thermal insulation envelope. 3/4 lb/ft³ **R-8** where ductwork is outside the building thermal insulation envelope and/or above the roof. Faced with glass reinforced foil laminated to Kraft paper. Certainteed, Knauf, Johns-Manville, Owens-Corning.
- C. Acoustic Lining: Glass fiber. **Installed** thermal resistance at a mean temperature of 75°F shall meet or exceed indicated value. One side coated to prevent fiber erosion up to 6000 ft/min. Average noise reduction coefficient of 0.80. 1.5 lb/ft³ density. 1" thick (**R-4.2**) where ductwork is within the building thermal insulation envelope. 2" thick (**R-8**) where ductwork is outside the building thermal insulation envelope and/or above the roof. Certainteed, Knauf, Johns-Manville, Owens-Corning.
- D. Bonding Adhesive: Design Polymerics DP2501, Foster 85-60.

2.6 EQUIPMENT

- A. General Requirements:

1. Start-up: All equipment shall be started and tested in accordance with the manufacturer's written instructions. Start-up procedure shall be performed by a factory trained service technician – not the installing contractor. Provide the inspector of record with factory start-up literature for each mechanical equipment item. Demonstrate to inspector that the start-up procedure has been completed. Start-up sheets shall be completed and submitted with O&M manuals. Start-up sheets shall be submitted, certifying that start-up has been completed per manufacturer's written instructions.
2. Capacity: Capacities shall be in accordance with schedules shown on drawings. Capacities are to be considered minimum.
3. Dimensions: Equipment must conform to space requirements and limitations as indicated on drawings and as required for operation and maintenance. Where Architectural screening is indicated, equipment shall not extend above or beyond screening. Equipment will not be accepted that does not readily conform to space conditions. Prepare and submit layout drawings for all proposed equipment (different than scheduled units) showing actual job conditions, required clearances for proper operation, maintenance, etc.
4. Ratings:
 - a. Electrical: Electrical equipment shall be in accordance with NEMA Standards and UL or ETL listed where applicable standards have been established.
5. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. For equipment mounted on springs, provide flex connections. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.
6. Electrical:
 - a. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories required by equipment shall be furnished. Provide terminal blocks for controls and interlocks not included in equipment package. Manual and magnetic starters shall have ambient compensating running overcurrent protection in all ungrounded conductors. Magnetic starters shall be NEMA rated, manual reset, shall have H-O-A switches and auxiliary contacts. Controllers and other devices shall be in NEMA 1 or 3R enclosures as applicable.
 - b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on

operating side of equipment. Switches, contacts and other devices shall be in ungrounded conductors.

- c. Motors: Shall be rated, constructed and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Three-phase motors shall be NEMA B design on pumps and fans, NEMA C on reciprocating equipment, sealed ball bearing, three-phase induction unless otherwise noted. Motors 1 HP and above shall be NEMA premium efficiency, Class F insulation. Motors in a fan air stream shall be TEFC or TEO. Vertical motors exposed to weather shall be TEFC and shall have rain caps. Horizontal motors exposed to weather shall be TEFC. Motors for use with VFD's shall be inverter ready.
 - d. Starters: Motor starters shall be furnished for all equipment except where starter is in a motor control center as designated on the electrical drawings. Deliver starter to Electrical Contractor for installation and wiring.
 - e. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt control circuit from integral protected transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.
 - f. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.
7. Fan Selection:
- a. Fan Curves: Performance curves shall be submitted for all units of 3000 CFM or greater. Operating point for forward curved fans shall be from point of maximum efficiency toward increased CFM limited by horsepower scheduled. Operating point for backward inclined fans shall be selected near point of maximum efficiency. Curves shall plot CFM versus static pressure with constant brake horsepower, RPM and efficiency lines.
 - b. Static Pressure: Unless otherwise noted, pressure scheduled as external static pressure (ESP) includes all ductwork and accessory losses external to the unit housing. Unless otherwise noted, pressure scheduled as total static pressure includes all ductwork, filter, coil, cabinet, damper and other accessory losses. Unless otherwise noted, pressure scheduled as duct static pressure includes all supply and return ductwork and accessory losses external to the unit housing and plenum (as applicable). The allowance for filter losses is 0.3" WC, unless otherwise noted. Submit itemized static pressure losses for all components.
8. Filters:

- a. General: Tested and rated in accordance with ASHRAE Standard 52.2 and Title 24, C.C.R. Furnish and install one complete change of all filters after air balance is completed and prior to acceptance. Provide pressure differential gage across all filter banks.
 - b. Filter Media: 2" media. MERV-13. Clean filter resistance 0.41" water at 500 fpm. Throw-away frame. Class 2. Camfil AP-Thirteen.
 - c.
9. Screens: All duct or louver openings to the outside shall be covered with 1/2", 16-gage, galvanized wire mesh screen.
10. Mixing Dampers: Opposed blade, 16 gage. Six inch maximum blade width, 48" maximum length. Nylon or oil impregnated bronze bearings. One half inch diameter pin shaft. 16 gage channel frame. One percent maximum leakage at 4" WC in accordance with AMCA 500 for outside air dampers. Actuating rod out of air stream. Arrow.
11. Sound Ratings: Shall be in accordance with ASHRAE 36 - 72. Sound ratings shall not exceed scheduled values.
- B. Split System Heat Pump:
1. General: Refer to Paragraph 2.6A for General Requirements. Completely assembled and factory tested. Provide all starters and relays required for operation. All components by same manufacturer. Carrier.
 2. Outdoor Unit:
 - a. Compressor: Sealed hermetic rotary compressor with vibration isolator mountings. Crankcase heater, suction line accumulator, recycling timer. High and low head pressure/temperature protection. Motor overload protection, low ambient feature to 20F cooling mode. High and low side service valves. Recycling timer. Single phase start assist kit. 5-year extended warranty.
 - b. Fan and Coil: Finned tube non-ferrous coil. Propeller type fan, 1200 RPM maximum, direct drive. Totally enclosed motor, overload protected, permanently lubricated, resiliently mounted.
 - c. Cabinet: Weatherproof, factory paint.
 3. Indoor Unit:
 - a. Supply Fan: Direct drive, multi-speed forward curve, centrifugal fan, resiliently mounted. Thermally protected motor.
 - b. Indoor Coil: Copper tube, aluminum fin, DX coil.
 - c. Electric Heaters: Integral part of unit, complete with all operational and safety controls, single point wiring terminal, 5-year factory warranty, UL listed as a complete unit.

- d. Condensate Pan: Install under complete coil area with drain connections.
 - e. Filter: Washable media. Class 2 or better.
4. Controls: Microprocessor control containing temperature selection, room temperature indication, automatic cooling/heating changeover, malfunction alarm, power failure automatic restart safety, and emergency operation function.
- C. Exhaust Fan:
- 1. General: All exhaust fans shall be tested and rated in accordance with AMCA Standard 210. Fans exposed to weather shall have ventilated weatherproof housing over motor and drive assembly. Refer to Paragraph 2.6A for general requirements. All direct drive fans shall be provided with unit mounted speed controllers. All exhaust fans shall have a disconnect switch. All motors 1 horsepower and larger shall be the premium efficiency type.
 - 2. Wall Fan: Spun aluminum, wall mounted, direct driven, horizontal centrifugal exhaust ventilator. Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners and stainless steel fasteners on cap. Spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. Spun aluminum wall flange shall have prepunched keyslot holes and a mounting template with wall opening location for ease of installation. Windband shall have a rolled bead for added strength. An integral conduit chase shall be provided into the motor compartment to facilitate wiring connections. Motor shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Unit shall bear an engraved aluminum nameplate. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. An aerodynamic aluminum inlet cone shall be provided for maximum performance and efficiency. Motor shall be heavy duty type with permanently lubricated sealed bearings and furnished at the specified voltage, phase and enclosure. Backdraft damper. Greenheck.
 - 3. Ceiling Fan: Direct driven, centrifugal exhaust fan. Fan wheel housing and integral outlet duct shall be galvanized steel or injection molded from a specially engineered resin exceeding UL requirements for smoke and heat generation. Outlet duct shall have an aluminum backdraft damper with continuous aluminum hinge rod. Inlet box shall be minimum 22 gauge galvanized steel. Motor shall be isolation mounted to a one piece galvanized stamped steel integral motor mount/inlet. Provide a field wiring compartment with disconnect receptacle. Provide an adjustable prepunched mounting bracket to accommodate different ceiling thickness. Provide a powder painted white aluminum egg-crate grille. Unit shall be designed with provision for field conversion from ceiling to in-line. Wheel shall be centrifugal forward curved type, galvanized steel or injection

molded of polypropylene resin. Motor shall be open drip proof type with permanently lubricated sealed bearings and include impedance or thermal overload protection and disconnect plug. Greenheck.

PART 2 - EXECUTION

3.1 PIPING INSTALLATION

A. General:

1. Piping Layout: Piping shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location to be approved by Engineer. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. All piping shall be installed in a manner to ensure unrestricted flow, eliminate air pockets, prevent any unusual noise, and permit complete drainage of the system. All piping shall be installed to permit expansion and contraction without strain on piping or equipment. Vertical lines shall be installed to allow for building settlement without damage to piping. Lines shall be adequately braced against vertical and lateral movement. For piping connected to equipment mounted on springs, provide flex connections. Pipe sizes indicated on the drawings are nominal sizes unless otherwise noted. Pipe sizes shall not decrease in direction of flow, unless otherwise noted.
2. Joints:
 - a. Threaded: Pipe shall be cut square, and reamed to full size. Threads shall be in accordance with ANSI B2.1. Joint compound or tape suitable for conveyed fluid shall be applied to male thread only. Joints shall be made with three threads exposed.
 - b. Brazed: Brazing shall conform to American Welding Society (AWS) standards. Filler rod shall be of suitable or the same alloy as pipe. Brazing filler metal shall have a minimum melting point of 1100°F. Brazing shall be performed by a Certified Brazer as certified by an organization/institution that uses standards recognized by the AWS and meets the requirements of the ASME Boiler and Pressure Vessels Code, Section 9. The Contractor shall submit welding procedures per AWS for project welds for testing lab review.
 - c. Open Ends: Open ends of piping shall be capped during progress of work to preclude foreign matter.
 - d. Electrical Equipment: Piping shall not be run over electrical panels, motor control centers or switchboards.
3. Fittings and Valves:

- a. Standard Fittings: All joints and changes in direction shall be made with standard fittings. Close nipples shall not be used.
 - b. Reducers: Pipe size reduction shall be made with bell reducer fittings. Bushings shall not be used.
 - c. Unions: A union shall be installed on the leaving side of each valve, at all sides of automatic valves, at equipment connections, and elsewhere as necessary for assembly or disassembly of piping.
 - d. Valves: All valves shall be full line size. At equipment connections, valves shall be full size of upstream piping. Provide a shut-off valve at each point of connection to existing piping.
 - e. Valve Accessibility: All valves shall be located so that they are easily accessible. Valves located above ceilings shall be installed within 24" of the ceiling. For situations where this is not practical or where valves are greater than 10' above floor, chain wheel operators shall be provided. Chain shall extend down to 7' above the floor. All such installations must have prior review by the Engineer.
4. Pipe Support:
- a. General: Hangers shall be placed to support piping without strain on joints or fittings. Maximum spacing between supports shall be as specified below (based on straight lengths of pipe with couplings only). Provide additional supports for equipment, valves or other fittings. Seismic requirements may reduce maximum spacing. Actual spacing requirements will depend on structural system. Refer to drawings for additional requirements and attachment to structure. Side beam clamps shall be provided with retaining straps to secure the clamp to the opposite side of the beam. Vertical piping shall be supported with riser clamp at 20' on center (maximum). Support pipe within 12" of all changes in direction.
 - b. Refrigerant Piping: Support insulated refrigerant line with construction channel and sheet metal support saddle or Cooper B-Line Armafix clamps. 5' spacing. Use isolation shield for uninsulated pipe. When using pre-charged tubing, all changes of direction shall be made with bending tools producing neat uniform bends. Free hand bends will not be accepted.
 - c. Trapeze: Trapeze hangers of construction channel and pipe clamps may be used. Submit design to Engineer for review.
5. Miscellaneous:
- a. Escutcheons: Provide chrome plated metal escutcheons where piping penetrates walls, ceilings, or floors in finished areas.

- b. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" (nominal) clearance between sleeve and pipe or pipe insulation. Piping through walls below grade shall be sealed with Link-Seal.
 - c. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space surrounding the pipe or pipe insulation sealed with fire rated materials in accordance with the requirements of 2019 CBC Section 714.
 - d. Dielectric Couplings: Dielectric couplings shall be installed wherever piping of dissimilar metals are joined, with the following exceptions: Bronze valves may be installed in ferrous piping without dielectric couplings. Do not install dielectric couplings at coil connections; provide red brass union in place of dielectric coupling.
- B. Refrigerant Piping: Pipe shall be cut square. Joint surfaces shall be thoroughly cleaned, fitted and erected before brazing. After installation, evacuate to 29 inches of mercury, ambient temperature during evacuation shall not be less than 70°F. After evacuation, fill with dry nitrogen to 250 psi and maintain for two hour period without additional charge. After nitrogen test, purge with refrigerant charged through dryer and maintain holding charge in system and equipment. Refrigerant piping below grade shall be run in 4" (min.) PVC conduit with long radius ells. Seal ends of conduit watertight.

3.2 PIPING INSULATION INSTALLATION

- A. Refrigerant Piping: Cover piping with foamed plastic insulation. Longitudinal and end seams shall be thoroughly cemented with adhesive in accordance with manufacturer's recommendations. Cover all fittings, unions, valves and connections. Piping exposed to view shall be covered with PVC jacketing. Piping exposed to weather shall be covered with aluminum jacketing, install all joints and seams to prevent water entry, seal with 1/8" bead of gray metal jacketing sealant.

3.3 DUCTWORK INSTALLATION:

- A. General:
- 1. Standards: Unless otherwise noted, all ductwork shall be constructed and installed in accordance with current SMACNA Standards. Ductwork shall be built to a pressure classification equal to or greater than the maximum operating pressure at that point in the ductwork. A copy of these standards shall be maintained at the job site at all times. Duct work and accessories shall be installed in a manner to prevent vibration and rattling.
 - 2. Access: Provide duct access doors as required to adjust equipment and dampers. Provide wall or ceiling access panels, or remote actuators as required where equipment and dampers are not otherwise accessible. Ventlok 666 concealed remote actuator with zinc finish on cover.

3. Flexible Connections: Connection of ductwork to any vibrating equipment shall be with 3" (min.) flexible connection. Install with ample slack and uniform gap. There shall be no metal to metal contact across flexible connection. Flexible connections exposed to weather shall have a protective sheet metal cover.
 4. Flanges and Escutcheon: Where ductwork penetrates walls, ceilings, or floors, furnish and install flange or escutcheon of same material as duct.
- B. Low Velocity-Low Pressure (up to 2,000 ft/min and up to 2.0 in water):
1. Sheet Metal Ductwork:
 - a. Ells: Ells with less than standard radius and square ell shall be fitted with turning vanes.
 - b. Tees: Tees in supply ductwork shall be straight tap-in with extractor or 45 degree take-off as shown on drawings. Grilles or branches in supply ductwork shall be a minimum of 8 duct diameters downstream of tees.
 - c. Duct Joints and Seams: All joints and seams which are not exposed to weather shall be sealed airtight with duct sealant. All joints and seams exposed to weather shall be sealed air and water tight with silicone sealant. (See Part 2 of this Specification).
 - d. Dampers: Install volume control damper and damper regulator in all branch ducts.
 2. Flexible Glass Fiber Ductwork: The use of flexible duct is limited to the last 5 feet of each branch duct (i.e. one 5 foot section of flexible duct may be used to connect the grille to the sheet metal branch duct). No joints are permitted in this 5' length. Hangers shall be 4" wide metal straps spaced to prevent sagging, 42" spacing maximum. Insert 6" wide fiberglass pad between duct and hanging strap. Joints shall be installed with stainless steel or nylon draw bands, Duro Dyne Dyn-O-Tie. Minimum turn radius shall be in accordance with SMACNA Standards (turn radius of duct centerline not less than 1.5 times the duct diameter).
- 3.4 AIR TERMINALS AND DUCT FITTINGS INSTALLATION:
- A. General: Unless otherwise noted, all air terminals and duct fittings shall be installed in accordance with current SMACNA Standards. Terminals and fittings shall be installed in a manner to prevent vibration and rattling. Metal surfaces exposed to view behind grilles and registers shall be painted flat black.
- 3.5 DUCTWORK INSULATION INSTALLATION:
- A. General: Insulate all sheet metal supply, return and outside air intake ductwork except as noted below. Insulation shall be continuous through walls and floors except at fire dampers.

- B. Where Insulation Is Not Required: Do not insulate factory-insulated ducts or casings, acoustic lined ducts, fibrous glass ducts, underground ductwork, supply or return ductwork exposed to view in the space that it serves, or exhaust ductwork.
- C. Concealed Ductwork: Wrap concealed ductwork including outside air intakes with fiberglass blanket lapped 2" minimum. Secure with staples 4" on centers maximum on straight runs and 3" maximum at elbows and fittings. Insulation on bottom of ducts wider than 36" shall also be secured with mechanical fasteners at 24" on center.
- D. Acoustic Lining: Unless otherwise indicated, all supply and return ductwork in equipment rooms, all ductwork exposed to weather and other ducts as indicated on drawings, shall have acoustic lining. Do not acoustic line outside air intakes, evaporative cooling ductwork or ductwork downstream of high efficiency filters. Where acoustic lining is installed, increase each sheet metal dimension to accommodate lining and maintain clear inside duct dimensions shown on drawings. Apply lining with bonding adhesive in accordance with manufacturer's recommendations and also secure with mechanical fasteners in accordance with SMACNA Standards. Seal exposed edges of lining with bonding adhesive.

3.6 EQUIPMENT INSTALLATION

- A. General: The equipment installer shall ensure that no work done under other specification sections will in any way block or hinder the equipment. All equipment shall be securely anchored in place.
- B. Connections to Equipment: Where size changes are required for connections to equipment, they shall be made immediately adjacent to the equipment and, if possible, inside the equipment cabinet.

3.7 TESTS AND ADJUSTMENTS

- A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Engineer. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and entire work retested.

3.8 SYSTEM ENERGY BALANCE

- A. Scope: Provide the services of an independent test and balance agency to test, adjust and balance, retest and record performance of the system to obtain design quantities as specified. The agency must prove that they have no affiliation with any equipment manufacturer, design engineer, installing contractor, or any other party which might lead to a conflict of interest, in order to provide an unbiased, third party system balance and report.
- B. Qualifications: Prior to commencing work, the agency shall be reviewed by the Engineer and shall be certified by the Associated Air Balance Council or National Environmental Balancing Bureau. The agency shall provide documentation of

having successfully completed at least five projects of similar size and scope. The Contractor must have sufficient personnel to respond to a trouble call at the site within two hours.

- C. Instruments: All instruments shall be accurately calibrated; calibration histories shall be available for examination. Application of instrumentation shall be in accordance with AABC or NEBB standards.
- D. Submittals: Include in shop drawings copies of forms to be used for testing and balancing showing all data which is to be recorded. Three copies of completed balance report shall be submitted for review.
- E. Procedure - General: Procedure shall be in accordance with Associated Air Balance Council's "National Standards for Field Measurements and Instrumentation - Total System Balance", Volume Two, No. 12173, or equivalent NEBB standards. System shall be in full, continuous operation during test. Balanced quantities shall be plus 10%, minus 0% of design quantities. All nameplate data, manufacturer, model and serial numbers shall be recorded for each item tested.
- F. Extended Warranty: The test and balance agency shall include an extended warranty of 90 days after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck or resetting of any item or items in test report. The agency shall provide technicians to assist the Engineer in making any tests he may require during this period of time.
- G. Air Balance Procedure (For Each Air Handling System):
 - 1. All air filters shall be clean when air balance is performed.
 - 2. Provide a sketch of the equipment showing exactly where all pressure readings were taken.
 - 3. Adjust blower RPM to design requirements.
 - 4. Record motor full load amperes.
 - 5. Make pitot tube traverse of main supply and return ducts and obtain design CFM at fans.
 - 6. Record system static pressures, inlet and discharge.
 - 7. Record filter quantity, size(s) and pressure drop across filter(s) at each filter bank.
 - 8. Adjust system for design CFM recirculated air.
 - 9. Adjust system for design CFM outside air.
 - 10. Record entering air temperatures. (DB heating, DB and WB cooling.)

11. Record leaving air temperatures. (DB heating, DB and WB cooling.)
12. Adjust all main supply and return air ducts to design CFM.
13. Adjust all zones to design CFM, supply and return.
14. Adjust all diffusers, grilles and registers to plus 10%, minus 0% of design requirements.
15. Adjust CFM at all exhaust fans, make-up units, etc. (high and low speed, where applicable). Record applicable data from items 1 through 11 above.
16. Each grille, diffuser and register shall be identified as to location.
17. Verify proper diffusion pattern for all ceiling grilles and that all sidewall grilles are set for 5 degrees upward deflection unless otherwise noted. Make a notation of any that are not set properly.
18. Size, type and manufacturer of diffusers, grilles, registers and all tested items shall be identified and listed. Manufacturer's ratings shall be used to make required calculations on all items.
19. Readings and tests of diffusers, grilles, and registers shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.
20. In cooperation with the control manufacturer's representative, set adjustments of automatically operated dampers to operate as specified. Testing agency shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.
21. All diffusers, grilles and registers shall be adjusted for required air patterns and to minimize drafts.
22. As a part of the work of this contract, THE AIR CONDITIONING CONTRACTOR shall make any changes in pulleys, belts and dampers or the addition of dampers required for correct balance as recommended by air balance agency, at no additional cost to Owner.
23. Set, test and adjust packaged heating/cooling unit economizer operation in cooperation with controls contractor. Record minimum and maximum outside and exhaust airflows.

END OF SECTION 230800

SECTION 250900 – DIRECT DIGITAL CONTROL SYSTEM

PART 1 - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS

- A. The General Mechanical Provisions, Section 20 01 00, shall form a part of this Section with the same force and effect as though repeated here.

1.2 SCOPE

- A. Included: Provide all labor, materials and services necessary for a complete, lawful and operating direct digital control (DDC) system as shown or noted on the drawings or as specified here. The work includes, but is not necessarily limited to, the following:

1. Control panels, control devices, line and low voltage wiring, conduit and related equipment as required for proper operation of all controlled systems.
2. Power wiring required for control devices such as actuators, controllers, sensors and power supplies. Power wiring for these devices shall be fed from circuits dedicated to the DDC system.

- B. Work Specified Elsewhere:

1. Line voltage dedicated power circuits for stand-alone building controllers are included in the Electrical Divisions unless otherwise noted.

1.3 CONTRACTOR QUALIFICATIONS

- A. All controls shall be furnished and installed by a Contractor who is licensed, certified or contracted by the controls for design, installation, start-up and service of their product. The Contractor must have factory supplied training and support. The Contractor shall have sufficient personnel to respond to a trouble call at the site within four hours. The Contractor's local manager shall have a minimum of five years' experience in the design, installation, start-up and service of similar systems. The Contractor shall submit a list of at least five projects which are similar in size, scope and contract value to this project. This list shall include the Owner's contact person, phone number and controls contract value.

- B. Quality Assurance

1. General

- i. The Building Management System (BMS) Contractor shall be Authorized Building Controls Specialist contractor that is regularly engaged in the engineering, programming, installation and service of total integrated Building Management Systems. Bids from wholesalers, distributors or contractors who do not purchase directly from Johnson Controls are not allowed.

- ii. The BMS Contractor shall have a branch facility within a 25-mile radius of the job site supplying complete maintenance and support services on a 24 hour, 7-day-a-week basis. The BMS Contractor shall have at this facility at least eight (8) factory trained, directly employed and full time technical staff, spare parts inventory, and all necessary test and diagnostic equipment.
- iii. As evidence and assurance of the BMS contractor's ability to support the Owner's system with service and parts, the BMS contractor must have been in the BMS business for at least the last ten (10) years and have successfully completed total projects of at least 10 times the value of this contract in each of the preceding five years.
- iv. The BMS architecture shall consist of the products of a manufacturer regularly engaged in the production of Building Management Systems, and shall be the manufacturer's latest standard of design at the time of bid.

2. Workplace Safety and Hazardous Materials

- a. Provide a safety program in compliance with the Contract Documents.
- b. The BMS Contractor shall have a corporately certified comprehensive Safety Certification Manual and a designated Safety Supervisor for the Project.
- c. The BMS Contractor and its employees and subtrades shall comply with federal, state and local safety regulations.
- d. The BMS Contractor shall ensure that all subcontractors and employees have written safety programs in place that covers their scope of work, and that their employees receive the training required by the OSHA rules that have jurisdiction for at least each topic listed in the Safety Certification Manual.
- e. Hazards created by the BMS Contractor or its subcontractors shall be eliminated before any further work proceeds.
- f. Hazards observed but not created by the BMS Contractor or its subcontractors shall be reported to either the General Contractor or the Owner within the same day. The BMS Contractor shall be required to avoid the hazard area until the hazard has been eliminated.
- g. The BMS Contractor shall sign and date a safety certification form prior to any work being performed, stating that the Contractors' company is in full compliance with the Project safety requirements.
- h. The BMS Contractor's safety program shall include written policy and arrangements for the handling, storage and management of all hazardous materials to be used in the work in compliance with the requirements of the AHJ at the Project site.

- i. The BMS Contractor's employees and subcontractor's staff shall have received training as applicable in the use of hazardous materials and shall govern their actions accordingly.

3. Quality Management Program

- a. Designate a competent and experienced employee to provide BMS Project Management. The designated Project Manager shall be empowered to make technical, scheduling and related decisions on behalf of the BMS Contractor. At minimum, the Project Manager shall:
 - ◇ Manage the scheduling of the work to ensure that adequate materials, labor and other resources are available as needed.
 - ◇ Manage the financial aspects of the BMS Contract.
 - ◇ Coordinate as necessary with other trades.
 - ◇ Be responsible for the work and actions of the BMS workforce on site.

1.4 BASIS OF DESIGN

- A. The system shall be Johnson Metasys Building Systems, without substitution.

1.5 SUBMITTALS AND OPERATION AND MAINTENANCE MANUALS

- A. Submittals shall be in accordance with Section 20 01 00 and shall include the following:
 1. Contractor qualifications. Manufacturer licenses, contracts or certifications for the installer shall be submitted on manufacturer's letterhead.
 2. Manufacturer's data for all devices.
 3. Manufacturer's data for all software.
 4. Diagrams showing control schematics. Diagrams shall include all sensors, terminal strips, panels and control devices. Locations of all devices shall be indicated.
 5. Sequence of operation.
 6. Site plan showing conduit trench and pullbox locations. This plan shall also show the conduit termination points inside the buildings.
- B. Operation and Maintenance Manuals: Furnish Operation and Maintenance Manuals for all components. These manuals shall contain full documentation which shall include, without being limited to, the following:
 1. General description and specifications.

2. Installation and initial checkout procedures.
3. Complete trouble-shooting procedures and diagrams.
4. Complete alignment and calibration procedures for all components.
5. Preventative maintenance requirements.
6. Detailed schematics and assembly drawings.

1.6 SYSTEM ARCHITECTURE

- A. The direct digital control system shall employ a multi-level distributed processing architecture. A web based front end controller shall act as the host and shall communicate with both the system operator and the stand-alone controllers. The stand-alone controllers shall be microprocessor based and perform the specified data acquisition and control functions. They shall connect to and supervise multiple application specific controllers (ASC). The stand-alone controllers shall perform stand-alone control functions whether in communications with the web based front end controller or not. All independent control loops shall be processed and controlled by the stand-alone controllers. Each stand-alone controller shall store historical data for all connected points for a minimum of 24 hours. Historical data shall include total run-time for each digital point. For analog data, periodic samples shall be stored at the frequency of once per minute. The physical connection and interface with the actual field points shall be accomplished through the ASC's. The ASC's shall be located throughout the data environment, communicate with, and be controlled by the stand-alone controllers. The stand-alone controllers shall be accessible by laptop computer with proper software via cable connection. Access to the system shall also be available through connection at selected space sensors.

PART 2 - PRODUCTS

2.1 SENSORS

- A. Space Temperature Sensor: Room sensor with occupant adjustable set point. Occupant adjustable set point shall be limited by software. Wall mounted temperature sensors shall be mounted with bottom of sensor at 48" above finish floor.
- B. Outside Air Temperature Sensor: Provide one outside air sensor per stand-alone building controller. Install on north wall of building.
- C. Duct Sensor: Averaging sensor shall be used at ducts with greater than 9 square feet of cross sectional area. Sensor shall extend across 75% of the duct. Sensor shall be housed in a NEMA 3R enclosure with proper extension at insulated ducts. Provide access door.
- D. Photocell: Wattstopper EM-24 A 2.
- E. Status Sensor: Current sensing status sensor with sensitivity adjustment.

- F. Smoke Detector: Photoelectric type, 115 VAC. The detector shall operate at air velocities from 300 FPM to 4000 FPM. The detector head shall not require additional filters or screens. Mounted in a sheet metal housing with a removable cover. A visual indication of alarm and power shall be provided on detector front. Manual test and reset switch on front of detector. Power supervisory relay. Minimum of two sets of alarm contacts. UL listed. California State Fire Marshal listed. Air Products and Controls, SM-501 Series.

2.2 SYSTEM COMPONENTS

- A. Electric Actuators:
 - 1. General: Fully modulating, UL listed. Visual position indicator, manual override, spring return. Factory weatherproof enclosure where exposed to weather. Belimo.
 - 2. Valve Actuators: Provide with factory mounting brackets and linkage to the control valve. Capable of shutting off against a 50 psi differential.
 - 3. Damper Actuators: Actuators shall be direct mounted onto the damper control shaft without linkage. Damper actuators shall be sized to provide a minimum of 5 inch-pounds of torque per square foot of damper face area.
- B. Lighting Contactors: Contactor with metal enclosure. Square D. Provide low voltage relays to complete the lighting control. For low voltage (120 volt) outside lighting, provide status relay for lighting status. For 277 volt outside lighting, provide current sensor for lighting status.
- C. Web Based Front End Controller with Graphical Interface: Provide color graphics accessible through the Owner's system (with security protocol) which will allow the user to override on/off and temperature set points directly. Real time data shall be continuously updated. The minimum graphic screens shall include the following:
 - 1. Site lay-out locations of all equipment being controlled, control component locations and spaces served. Provide multiple screens – minimum of one screen per building, plus site and others as needed for clarity. By selecting the desired equipment item, a flow diagram shall be displayed for the related equipment (as described below). By selecting a conditioned space, a graphic display of the zone conditions shall be displayed (as described below).
 - 2. Flow diagrams shall be provided for each HVAC system, such as air-handling system, chilled water system, hot water system, condenser water system, package unit system with all inputs and outputs dynamically displayed.
 - 3. Each temperature control zone shall have a screen providing set points, temperatures, and related HVAC system status data.
 - 4. Scheduling screens allowing on/off times shall be set for all the following:

- a. Pre-determined individual days
 - b. Pre-determined blocks of days (from/to)
 - c. Schedules for "Routine" days
 - d. Schedules for "Special" days
- D. Enclosures: Hinged, lockable front panel. The panel shall be identified with a label as specified. No conduit or other penetration of any kind shall be made on top of the enclosure. If any such entry is made, a plug is not acceptable; replace the enclosure. Hoffman with metal back panel. NEMA 1 for indoor; NEMA 3R for outdoor, NEMA 12 for hazardous locations.
- E. Wiring: Sensor and communication cable shall be shielded cable, wire gage and number of wires as recommended by the system manufacturer. Install per manufacturer's recommendations. No splices will be allowed. Identify both ends at terminal blocks. All wiring that is routed below grade shall have a PVC jacket, CL2-0552. All other wiring shall be plenum-rated, CL3P-0552.
- F. Conduit: Size conduit per the California Electrical Code and then increase by one size, except that the minimum conduit size for low voltage shall be 1" and the minimum conduit size for 120 volt power shall be ¾". For underground conduit, provide 100% spare capacity by installing a second conduit (empty) along all conduit routes.
- G. Labels: All labels, signs, etc. shall be engraved, laminated plastic, white on black background, 1/8" high lettering, minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: A dedicated ASC shall be provided for every item of new equipment and for every item of existing equipment. All electrical work shall be in accordance with the California Electrical Code and the Electrical Specification Sections. Wiring shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed wiring shall run in conduit parallel to room surfaces; location shall be approved by the Engineer. Wiring in walls or in mechanical rooms, janitor rooms, or storage rooms shall be in conduit. Conduit above roofs shall be rigid conduit. Low voltage wiring in accessible attics may be run without conduit. This wiring shall be strapped to structure at 48" on center, and shall not lay on the ceiling. No structural member shall be weakened by cutting, notching, boring or otherwise. Provide power wiring for each device requiring external power. Dedicated circuits shall be provided for devices as required by the manufacturer. Devices or wiring exposed to the weather shall be protected in NEMA 3R enclosures and weatherproof conduit. All conduit shall include a pull wire. Set, test, and adjust the system for proper operation. Provide connection to the Owner's network for web-based access to stand-alone controllers.

- B. Programming: The Contractor shall be responsible for programming the system and shall coordinate the scheduling (on/off times) with the Owner. All point lists and programming blocks shall be provided by the Contractor. For upgrades or additions to existing systems, all existing programming and existing sequences of operation shall be incorporated into the new system and equipment. The project will not be considered complete until all programming and graphics have been completed and all systems are operational from the location of the web based front end controller.
- C. Control Panels/Enclosures:
 - 1. ASC's, transformers, relays, etc. shall be housed in enclosures. Enclosures shall be installed as shown on plans. Wherever practical, do not locate enclosures above ceilings. Maintain access to enclosures that are located above ceilings (e.g. at VAV boxes).
 - 2. For all enclosures, provide a disconnect switch and an in-line fuse. All wiring shall be terminated at terminal strips – no wire nuts. Provide a plastic covered wiring diagram in each enclosure. All wiring (field and inside enclosures) shall be labeled at both ends with machine printed markers – black on white tape. At packaged equipment, locate the enclosure on the side of the unit without obstructing access or service clearance.
 - 3. Separate 120 volt circuits from low voltage circuits horizontally. A physical barrier is not required. Enclose wiring within the enclosure in 2"x2" Panduit.

3.2 TRAINING

- A. Prior to final acceptance, the Contractor shall provide operational training to the Owner's personnel. The training sessions shall include a complete demonstration of the system. Dates and times of the training sessions shall be coordinated through the Owner not less than one week prior to session. A total of 40 hours of instruction shall be provided - 20 hours initially, and 20 hours to be spread throughout the first year of operation. The Contractor shall maintain a log of training sessions including dates, times and names/titles of those attending. The Contractor shall submit a copy of this log on request.

3.3 TESTING AND ACCEPTANCE

- A. The Contractor shall verify, in the presence of the Owner, the system accuracy and proper function of each controlled device and sensor. The following items shall be successfully demonstrated prior to acceptance by the Owner:
 - 1. All system outputs including controllers, relays, and other control devices shall be addressed and start/stop functions demonstrated.
 - 2. All inputs shall be displayed and all event-initiated functions shall be demonstrated.
 - 3. Demonstrate program integrity and power restore sequence during and after a power failure and restoration.

4. Deliver all record drawings, wiring diagrams, equipment specifications, operation and maintenance manuals and other documentation as required to describe the system.
5. Complete operator training in the use, programming, and operation of the system.

3.4 SERVICE WORK

- A. Service work shall be performed by service personnel in the direct employ of the controls contractor. The service technicians shall be factory trained and certified by the manufacturer to be competent in all aspects of the installed system. The technician shall have a working knowledge of calibration techniques, preventive maintenance, troubleshooting, software diagnostics and microprocessor repair. Precaution shall be taken to minimize disruption of facility operations by service work.

3.5 SEQUENCE OF OPERATION

- A. Indoor/Outdoor Units (IDU/ODU): Units shall be controlled by integral factory controls to maintain 68°F (heating, adj.) or 78°F (cooling, adj.). DDC shall monitor space temperature with room sensor. DDC shall monitor unit status with current sensor, one each IDU and ODU.
- B. Exhaust Fan: Fan shall start/stop by signal from DDC. DDC shall monitor fan status with current sensor.

END OF SECTION 250900

SECTION 260000 - ELECTRICAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Contact requirements of the foregoing GENERAL CONDITIONS, SPECIAL CONDITIONS and supplements thereto and all requirements of Division 1 of these Specifications shall form a part of this Section with the same force and effect as though repeated herein. The provisions of this Section shall apply to all of the following Sections of Division 26, 27 and 28 of these Specifications. All applicable portions of the work under Division 26, 27 and 28 shall conform fully to all provisions of all other Division Sections along with other Sections of these Specifications.

1.2 SUMMARY OF WORK

The Contractor shall provide all materials, tools, equipment, labor and services necessary to furnish and install complete working electrical systems as shown on the plans and described within these Specification. All systems, at project completion and before final acceptance, shall be demonstrated to have a complete and working functional operation. The work includes but is not specifically limited to items indicated on Drawings and specified herein.

1.3 DESCRIPTION AND INSTALLATION OF SYSTEMS

- A. The electrical drawings are diagrammatic and do not necessarily show all raceway, wiring, number or types of fittings, offsets, bends or exact locations of items required by the electrical systems. Items not shown or indicated which are clearly necessary for proper operation, payment or installation of systems shown shall be provided at no-increase in contract price.
- B. The exact routing of systems and location of devices and equipment shall be governed by coordination with other trades, structural and architectural conditions. The Architect or Electrical Engineer reserves the right, at no increase in contract price, to make reasonable changes in location of electrical equipment or wiring systems; so as to coordinate with other systems, group them into orderly relationships, or to increase their utility. Contractor shall verify requirements in this regard prior to roughing in.
- C. Install electrical work in cooperation with other trades and make proper provisions to avoid interferences and coordinate with structural and architectural features, in a manner approved by the Architect or Electrical Engineer. All changes caused by neglect to make such provisions shall be at Contractor's expense. Provide offsets and special fittings, as required to facilitate installation of the work.
- D. When a particular product or type of product is specified with a manufacturer's designation, the latest published specifications, installation, and construction information of the manufacturer shall constitute the minimum acceptable standard. Any substitutions shall be made in accordance with Section 1.09

SUBSTITUTIONS.

1.4 RELATED DOCUMENTS

A. Codes and Regulations: All electrical equipment and material and its installation shall conform to the current requirements of the following authorities and Section 01-080 CODES AND STANDARDS:

1. Occupational Safety and Health Act (OSHA).
2. California Electric Code (CEC), 2019 Edition.
3. California Administrative Code (CAC).
 - a. Title 8, Safety Orders.
 - b. Title 19, Fire and Panic Safety Standard.
 - c. Title 24, Building Standard.
4. California Fire Code.
5. California Building Code.
6. California Mechanical Code.
7. California Plumbing Code.
8. Local Codes, if applicable.

NOTE: Where two or more codes conflict, the most restrictive shall apply. Nothing in these Plans and Specifications shall be construed to permit work not conforming to applicable codes.

B. Tests and Standards: The tests, standards, or recommended procedures of the following agencies shall relate to all parts of these Specifications and shall be considered a minimum:

1. American National Standards Institute (ANSI).
2. Underwriters Laboratories, Inc. (UL).
3. National Electric Manufacturers Association (NEMA).
4. Electrical Testing Laboratories (ETL).
5. National Fire Protection Association (NFPA).
6. Insulated Power Cable Engineers Association (IPCEA).
7. Institute of Electrical and Electronic Engineers (IEEE).

8. Illumination Engineering Society (IES).

1.5 EXAMINATION OF DOCUMENTS AND SITE

Before submitting a proposal, each bidder shall carefully examine the electrical, mechanical, architectural, and structural drawings and specifications. He shall also visit the site and fully inform himself as to all existing conditions and limitations applying to the work. If, after such examination and study, it appears that any change from the drawings and specifications should be allowed, the bidder shall so state in writing together with any change in cost involved.

By the act of submitting a proposal, each bidder shall be deemed to have made such examinations of the drawings and specifications and premises, and it will be assumed that he is therefore familiar with the entire scope of the project and has based his proposal upon the work described in the Plans and Specifications and upon all existing conditions and limitations applying to his work.

1.6 EXECUTION

- A. Workmanship: The work shall be performed by competent workmen, skilled in the particular phase of the work entailed. The work shall be first class throughout, neat, accurate and in full accordance with the intent of these Specifications and the satisfaction of the Architect or Electrical Engineer.
- B. Safety: All standard safety procedures as set forth by OSHA, CCR, and California Division of Industrial Safety shall be strictly adhered to.
- C. Coordination: The Contractor shall familiarize himself with the work of other crafts so as to be able to provide electrical service of correct size and voltage and other requirements to any equipment to be installed. The installations shall be coordinated as to location and time, and interference causing delays and non-acceptable construction shall be avoided.
Prior to commencing construction the Electrical Contractor shall arrange a conference with the Mechanical and Plumbing Contractors and sub-contractors as well as equipment suppliers and shall verify types, sizes, locations, requirements, controls, and diagrams of all equipment furnished by them. Prior to roughing in, he shall, in writing, inform the Architect or Electrical Engineer that all phases of coordination of this equipment have been covered.
Exact equipment rough-in locations shall be verified from shop drawings.
- D. Cutting and Repairing: The Electrical Contractor shall do all cutting necessary for the proper installation of his work, repair any damage done by himself or his workmen, and coordinate his work with that of others. Do no cutting or patching without approval of the Architect or Electrical Engineer. Round holes through concrete slabs or walls shall be core drilled with a diamond drill, rectangular openings shall be cut with a diamond saw. In no case shall any concrete beam or column be cut.
- E. Sleeves and Openings: Electrical Contractor shall be responsible for all sleeves and openings through walls and floors required by electrical work. All openings

around conduits in sleeves shall be sealed with a material of equal fire rating as the surface penetrated. Openings not utilized shall be temporarily sealed in a similar manner. All required sleeves shall be furnished to and coordinated with the General Contractor.

- F. Cleaning and Painting: All exposed work shall be thoroughly cleaned upon completion of work. All panelboards and equipment not located in electrical or mechanical rooms or closets shall be field painted per painting specifications, finish M2, color as selected by Architect. Panelboard enclosures, fixtures, and equipment, where finish has been marred in shipment or installation, shall be completely refinished. Minor finish damage shall be rectified as indicated by the Architect or Electrical Engineer. Contractor shall remove all waste and rubbish resulting from his work from the site.

1.7 QUALITY CONTROL

- A. Supervision: The Contractor shall personally, or through a competent representative, constantly supervise the work from beginning to completion and final acceptance. He shall cooperate fully with the inspection authorities in the provision of information and access to the work. He shall, to the best of his ability, maintain the same job foreman throughout the life of the project unless a replacement is requested or authorized by the Architect or Electrical Engineer.
- B. Inspection and Tests: The Contractor shall furnish all labor and test equipment required to fully test and adjust the equipment installed under this specification and demonstrate its proper operation.
1. Arrange for all tests and inspections and provide minimum 48 hours' notice to the Architect or Electrical Engineer.
 2. A test must demonstrate that each piece of equipment, outlet, fixture, device, and appurtenance is in sound operating condition and in proper cooperative relation to associated equipment.
 3. All tests shall be conducted under supervision of the Architect or Electrical Engineer, and any defects of any nature which are apparent as a result of such test shall be made correct to the satisfaction of the Architect or Electrical Engineer before final acceptance is made.
 4. No equipment shall be tested, or operated for any other purpose, such as checking motor rotation, until it has been fully checked in accordance with the manufacturer's instructions.
1. Check and tighten nuts, bolts, lugs, and similar elements of equipment; switchboards, motor control centers, busways, panels, etc.
 2. Submit complete test reports with maintenance manual submission.
- C. Guarantee: The Contractor agrees to replace or repair, to the satisfaction of the Owner, any part of the installation which may fail due to defective material and/or workmanship or failure to follow Plans and Specifications, for a period of one year

after final acceptance. Any damage to other work resulting from such failure or the correction thereof shall be remedied at the Contractor's expense. The Contractor shall, further, secure from the manufacturers of special equipment, such as signal systems, their respective guarantees and deliver same to Owner. Guarantees between Contractor and his suppliers shall not affect guarantees between Contractor and Owner.

1.8 GROUNDING

- A. The conduit system supports, cabinets, switchboards, etc., and neutral conductors must be permanently and effectively grounded by means of approved ground clamp, in accordance with the electrical safety orders of the Department of Industrial Relations of the State of California.
- B. This Contractor shall exercise every precaution to obtain good contacts at all panel boxes, pull boxes, etc. Where it is not possible to obtain good contacts, the conduit shall be bonded around the boxes with a #6B&S gauge, rubber covered, double braided wire with ground clamps.
- C. Equipment and raceway bonding procedures shall be rigidly maintained and meet all jurisdictional requirements of codes and regulations.
- D. A separate grounding conductor shall be run in all pvc conduit runs.

1.9 SUBSTITUTIONS

- A. The Specifications or Plans are in no way to be construed as being proprietary toward one product. Those products, or types of products, listed are intended to set the standard for quality, design, and installation procedure. However, no right is implied upon the part of the Contractor to substitute other materials, products or systems without the written approval of the Architect or Engineer.
- B. All requests for substitution shall be made in accordance with the General requirements - SUBSTITUTIONS.
- C. All requests for substitutions shall be in writing, received at least 7 days prior to bid date, and shall indicate all information required thereon including differences from the specified item. The request for substitution shall be accompanied by cuts, product literature, performance data, specifications, drawings, samples or other means as may be required for proper evaluation by the Architect or Electrical Engineer.
- D. All proposed substitutions shall be standard product of the firm under current manufacture and be a catalog item at time of bid.
- E. Acceptance of substitution shall not relieve the Contractor from responsibility for complying with requirements of the Contract Documents. The Contractor shall be responsible for changes in other parts of the work occasioned by his substitutions and shall bear their expense.
- F. Representative samples may be required for determination of equality.

1.10 SUBMITTAL

- A. Make submittal for all material to be used on the project, whether as specified or substitutions, within thirty-five (35) days after award of Contract by the Owner, in accordance with the SUBMITTALS section, and the following:
1. All submittal shall be neat and bound in a suitable folder or binder.
 2. Identify each item by manufacturer, brand, trade, name, number, size, rating, and whatever other data is necessary to properly identify and check materials and equipment. Words "as specified" are not sufficient identification.
 3. Identify each submittal item by reference to specifications section paragraph in which item is specified, or Drawings and Detail Number.
 4. All submittal shall be submitted in coherent groups, e.g. all light fixtures at one time. No partial, or incomplete submittal will be accepted.
 5. Organize submittal in same sequence as they appear in specification sections, articles or paragraphs.
- B. Product Data: Submit eight copies, in groups, as follows:
1. Lighting, Fixtures, and Controls
 2. Switchboards, Panels, Disconnects, and Transformers
 3. Fire Alarm and Special System Equipment
 4. Wiring devices
 5. Conduits and raceway types required, including fittings
 6. Electric Wire, cable, connectors, medium voltage cable, junctions, splices.
 7. Each type of support, anchor, sleeve and seal
- C. Shop Drawings: Shop drawings shall show physical arrangement, wiring diagram, construction details, finishes, materials used in fabrication, provisions for conduit entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, weight, power sources, circuit numbers, and shall be compatible with the Contract Drawings and Specifications.
- D. Show wiring as actually installed, connected, and identified for this specific project. Include identification of cables and cable conductors.
- E. Shop and instruction drawings shall cover the equipment or device to be installed and not merely the general class of such equipment or device.

1.11 DOCUMENTATION

- A. Construction Record Drawings: The Contractor shall furnish to the Architect or Engineer, in accordance with the GENERAL REQUIREMENTS, a complete set of "as constructed" drawings which clearly indicate all deviations from the basic contract drawings, including exact dimension locations and depths for all stubbed conduits, location and size of spare conduits, & conductors, all new and uncovered existing work outside the buildings, power feeder runs, and communications "primary" conduit runs. Corrections and changes shall be kept up to date at all times.
- B. All submittal and shop drawings will be resubmitted with record drawings showing all revisions and changes made, clearly marked with field termination wire so as to reflect actual construction record conditions. Revisions and changes will be enumerated, and new dates of drawings shown.

1.12 EARTHWORK

- A. Scope: Do all earthwork required for installation of the underground electrical work in accordance with EARTHWORK Specifications and the following.
- B. Existing Utilities: Prior to performing any excavation, Contractor shall establish all existing utilities in area.
- C. Patching and Paving: General Contractor to patch and pave all surfaces involved with underground utilities after fill compacted by Contractor to specified values.
- D. After Excavation: Raceways shall be installed as quickly as possible and the excavation backfilled in order to reduce hazards. Barricades, construction signs, battery operated flashing lights and guards, as required, shall be placed and maintained during the progress of the construction to protect persons from injury and to avoid property damage as per General Conditions.

1.13 EXISTING SUB-SURFACE STRUCTURES

- A. The civil plans indicate all known electrical and major sewer and water systems on the site, underground. No exact recorded information is available on any and/or all buried systems on the site. Responsibility for absolute accuracy of site data indicated on electrical plans is not assumed by the Architect or Electrical Engineer.
- B. It shall be the Contractor's responsibility to protect all underground systems and structures while excavating and installing the electrical distribution system. Any damage done to the existing system during the course of electrical work shall be repaired to the satisfaction of the Owner and the utility or agency involved, at the expense of the Contractor.

1.14 PORTABLE OR DETACHABLE PARTS

The Contractor shall retain in his possession and shall be responsible for all portable and

detachable parts or portions of the installation such as fuses, keys, locks, adapters, locking clips, and inserts until final completion of his work. These parts shall be itemized and delivered to the Owner at Project Closeout.

1.15 OPERATION AND SERVICE MANUALS

- A. Contractor shall prepare manuals describing the operations, servicing, and maintenance requirements of all electrical equipment provided and complete parts lists, in accordance with the SUBMITTALS section.
- B. Equipment: Equipment described in the manual shall include all equipment listed under "Submittal", and on all other auxiliary miscellaneous systems.
- C. Information contained in the manual shall consist of 8-1/2" x 11" size catalog data on each item, together with parts lists, description of operation, maintenance information, shop drawings, wiring and riser diagrams and test reports as installed. Catalogs and data in the manuals shall be neat, clean copies. Drawings shall be accordion folded to letter size and installed in an envelope within the manual. An index shall be provided, which shall list all contents in an orderly manner with the respective equipment supplier's name, address and telephone number, and the manufacturer's recommended servicing instructions. Diagrams shall be complete for each system installed. Provide divider sheets with identifying tabs between each category.

END OF SECTION 260000

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

1.1 SCOPE

Furnish and install material and equipment as indicated on the drawings and as specified.

1.2 MATERIALS AND EQUIPMENT

Shall be new and of the best quality used for the purpose in good commercial practice.

1.3 UL APPROVAL

All material and equipment within the scope of the UL re-examination service shall be approved by the Underwriters' Laboratories for the purpose for which they are used and shall bear their label.

1.4 STORAGE

All material and equipment shall be stored in a manner to prevent damage or corrosion. Equipment with components which can be damaged due to moisture shall be placed in special heated storage facilities.

1.5 DRAWINGS

Drawings for all equipment are intended to be diagrammatic only. Any location not actual dimension is not to be considered as necessarily final or accurate. Exact locations must be determined in the field from the requirements of the equipment that is to be installed.

1.6 COORDINATION

Before rough-in of any utility lines, services, and feeders, or of any equipment, this Contractor must coordinate his work with that of other crafts and trades so that these services shall be installed in their proper locations and without interference to the equipment or building structure. This will require cooperation among all crafts and trades, the inspector, and General Contractor, along with study of shop drawings and the building plans.

1.7 ELECTRICAL WORK EXPOSED TO MOISTURE

- A. All electrical devices and equipment installed in outdoor exposed locations shall be protected by suitable NEMA type 3R enclosures, cast boxes with gasketed covers, or other Engineer approved methods.
- B. All electrical devices and equipment installed in exposed locations of PVC coated cast boxes with gasketed covers, or other Engineer approved methods.
- C. All ferrous metal portions of electrical work exposed to weather including conduits,

clamps, supports, etc. shall be hot-dip galvanized.

1.8 SEISMIC ANCHORAGE

- A. Provide complete seismic anchorage and bracing for the lateral and vertical support of conduit and electrical equipment, as required by the California Building Code, and the following.
- B. Anchorage of Equipment: All mechanical and electrical equipment shall be braced or anchored to resist a horizontal force acting in any direction.
- C. Conduit that crosses structural separation between buildings or building units shall be installed with flexible connections, suitable to accommodate longitudinal and transverse displacements.

1.9 SUBMITTAL

- A. Product Data: Submit manufacturer's data including specifications, installation instruction and general recommendations for each item submitted under Submittal, Section 260000, 1.10.

PART 2 – PRODUCTS

2.1 CONDUIT MATERIALS AND COMPONENTS

- A. Galvanized Rigid Steel: Exposed exterior damp locations, in concrete walls and slabs, in concrete block walls, or elsewhere shown on plans. Rigid metal conduit shall be new galvanized thickwall threaded, furnished in 10-foot lengths.
- B. PVC Coated Rigid Steel: Exposed interior damp locations, threaded, furnished in 10-foot lengths, with PCV coated Couplings.
- C. Flexible Liquidtight Metallic Conduit: Connections to machinery. Conduit shall be flexible interlocking single strip steel conduit with liquidtight exterior cover, with all connections made with plastic bushed fittings and with copper ground wire. Maximum length 36".
- D. Plastic P.V.C., Schedule 40: Underground locations and below vapor barrier of slabs, and in solid grouted masonry walls where wall entry and exit points are made with rigid galvanized steel. P.V.C. conduit shall be Type 40 heavy thickwall polyvinyl chloride conduit, minimum 3/4" size, Underwriters' Laboratories tested, furnished in 10-foot lengths.
- E. Thin Wall E.M.T.: Interior dry, concealed locations, exposed only at 8 feet above finished floor and in non-finished areas. E.M.T. shall be new galvanized, furnished in 10-foot lengths. E.M.T. shall be coupled with steel screw type connectors in concealed locations, and plastic bushed sealing type couplings in exposed locations. Crimp and die cast type connectors are not acceptable. E.M.T. shall be

factory colored as follows:

- Natural – 120/208V wiring
- Yellow – 277/480V wiring
- Red – Fire Alarm Systems
- Blue – Data and other Low Voltage Systems
- Orange – Fiber Optic Cable

- F. Flexible Metallic Conduit: Connections from junction boxes to lay-in light fixtures to 6 feet or less in accessible ceilings. Conduits shall be flexible interlocking single strip zinc coated, or steel with copper ground wire.

2.2 OUTLET AND SWITCH BOXES

- A. Boxes shall be one-piece die formed galvanized steel of shape and with fittings necessary to suit location and use. Boxes shall be of sufficient size to contain all wires, devices, and connection fittings required without crowding. Ceiling and surface mounted boxes shall be minimum 4" square or octagonal. Plaster rings shall be provided where required.
- B. Exposed exterior boxes shall be cast type with gasketed weatherproof cover.

2.3 WIRING DEVICES

- A. Wall Switches:
 - 1. 120-277 Volt Switches: Quiet slow make, slow break design, Decora handle, with totally enclosed case, rated 20 ampere, specification grade. Provide matching two pole, 3-way, and 4-way switches.
 - 2. Color: Verify exact device colors with Architect prior to purchase and installation.
- B. Receptacles:
 - 1. Standard Duplex Receptacles: Full gang size, polarized duplex, parallel blade, U-grounding slot, specification grade, nylon face, Decora rated at 20 amperes, 125 volts, designed for split feed service.

Acceptable types are decora, heavy-duty, industrial specification grade:

	<u>Standard</u>	<u>GFI type</u>
Normal power, Uncontrolled	Leviton 16352-W	Leviton G5263-TW
Normal power, Controlled	Leviton 16352-1PW	Leviton G5362-2TW

Isolated Ground Leviton
 16352-IGW

2. Nameplates: Provide engraved or embossed plastic for receptacles other than standard duplex receptacles, indicating voltage, phase and amperes.
3. Verify colors of all devices with Architect and Fresno County IT department prior to purchase and installation.

2.4 WALL PLATES

- A. Scope: Provide plate for each wiring device and for each signal or communication outlet.
- B. Interior Flush: All locations unless noted otherwise; smooth stainless steel.
- C. Weatherproof Plates: Cast metal, gasketed; for receptacles, provide spring loaded gasketed doors. Provide at all weatherproof locations.
- D. Where two gang boxes are required for single gang devices, provide special plates with devices opening in one gang and second gang blank.
- E. Plates with Engraving: Provide black paint filled engraving for the following.
 1. Switch plates for all outlets not within sight of switch. Engrave with function and location of outlet.
 2. Lighting controls; engraved area identification of each switch where 3 or more switches are ganged together.
- F. Blank bushed or special outlet plates shall be provided for all signal and communications systems outlets as required.

2.5 WIRE

- A. Low Voltage - (Under 600 Volt):

Branch circuit wire shall be copper type THWN/THHN-2, 90°C, 600 volt, from new fresh stock, bearing U.L. label, delivered to site in unbroken packages; minimum power size 12 AWG. All 20/1 home runs over 125 feet from panel shall be increased to next larger size. Conductors #8 or larger, shall be stranded copper, #10 AWG and smaller shall be solid copper or as shown on plans. All control wires shall be stranded.

PART 3 – EXECUTION

3.1 INSTALLATION OF CONDUIT RACEWAYS

- A. General: Install conduits in a neat manner, concealed except as noted. Mount conduits directly to building structure with clamps or one-hole straps where possible. Secure straps with cadmium plated wood screws into wood, and machine screws into metal or inserts preset in concrete. Where impractical to secure directly to structure, suspend on conduit hangers. Wherever possible, group and rack multiple conduit runs.
- B. Installation and Cleaning: Install free from dents, kinks and bruises. Red lead all threaded conduit joints before coupling. Plug ends at time of installation to prevent entry of dirt or moisture. Thoroughly clean out conduits before installing conductors. Thoroughly clean all exposed conduit exteriors.
- C. Provide tagged pullwire in all empty conduits. Pullwire shall be 1/8" stranded nylon, leave 36" free coiled each end.
- D. Plastic conduit shall be installed in accordance with manufacturer's recommendations and accepted trade practice. Plastic conduit shall be encased in 3" concrete envelope. Where plastic conduit rises above ground in exposed locations, the riser bend and riser shall be of rigid metal conduit installed according to rigid metal portion of this specification item.
- E. All plastic, flexible, feeder and receptacle branch conduits shall carry a grounding bond wire with the size as shown, or where not shown, as determined by applicable codes for the ampacity of the circuit being carried.
- F. Protective Coating: All metallic conduits installed in contact with earth or in concrete on contact with earth shall be coated with a minimum 40 mil P.V.C. coating on all conduit lengths and fittings. The coating shall correspond to ATSM D638-68, D1706, D140-64, and D746-64T specifications and Federal test standard 141, method 615z. Coating shall be continuous without flaws showing exposed metal. Coating shall extend to the device conduit is terminated to in exposed locations and 12" above grade in unexposed locations.
- G. Conduits which stub-up through floor shall be installed so that none of the curved portions of the elbow is exposed. Conduit bends and risers terminating below-grade runs shall be 40 mil PVC coated galvanized rigid steel.
- H. Conduit Routing: Route exposed conduits parallel or perpendicular to walls or floors. Install conduits in masonry walls at time of wall construction. NO conduits will run under heavy equipment, footing or other structural elements. Where runs must cross footings, install in sleeves per structural details.
- I. Conduit Runs in Ceiling Areas: Conduits run above accessible ceiling shall be routed parallel or perpendicular to ceiling system and structural members. All conduit runs shall be coordinated to avoid conflicts with mechanical and structural systems, lighting fixtures and ceiling support system. Conduits shall be installed as close to the above structure as possible to avoid conflict with removal of ceiling panels.

- J. Conduits Penetrating Membranes: Where conduits penetrate wall or slab membrane moisture barriers, penetration shall be sealed in accordance with the requirements of applicable sections of these Specifications for "Thermal and Moisture Protection".
- K. Conduits Penetrating Roof: Provide flashing and counter flashing making watertight joints where conduits pass through roof or waterproofing membranes, in accordance with existing roofing manufacturer's warranty requirements.
- L. Escutcheons: Conduits penetrating wall, floors, or ceiling in exposed locations shall be installed with appropriate escutcheon plates.
- M. Separations: Coordinate with all other crafts to allow minimum of 12" running and 6 inches crossing clearance at flues, hot water pipes, steam pipes, and heat sources. Keep electrical conduits free from contact with all other piping runs of other systems or of dissimilar metals.
- N. Conduits Crossing Building Joints: Conduits shall not be run in concrete slab or wall construction where passing through an earthquake or expansion joint. At such condition, conduit shall be run exposed or in furred ceiling space with 24" length of flexible conduit crossing joints.
- O. Conduits Penetrating Floors and Walls: Provide grouting around raceways where penetrating floor slabs, concrete or masonry walls. At fire separation walls or floors, use Engineer approved expanding type putty, Nelson Flameseal or equal, to maintain the fire rating of the surface penetrated.
- P. Conduit Support: Support of conduit and tubing in steel stud walls shall be by #18 gauge steel wire, secured to steel bars or straps attached to steel studs. Conduits rising vertically between wall studs shall be tied to a horizontal cross support attached tightly to eliminate any movement.
- Q. Conduit Hangers:
 - 1. Conduit hangers spaced at 8'-0" on center maximum with one hanger adjacent to each outlet box, shall be installed wherever conduit cannot be directly attached to structure. Hangers shall be secured to wood structures with steel brackets and wood screws, to steel structures with appropriate clamps, and to concrete structures with preset imbedded inserts or machine screws with expansion shields. Present inserts are preferred to provide a secure anchorage with greatest location flexibility. Power or velocity driven type attachments will not be allowed. Complete hanger installation shall provide a safety factor of 5 based upon maximum CEC allowed conduit fill.
 - 2. Hangers for rigid conduit and EMT 2" and smaller in concealed spaces shall be galvanized perforated type strap wrapped around raceway and bolted; then fastened to structure as described above.

3. Trapeze type supports shall be used where conduits are run grouped together. such hangers shall consist of 3/8" minimum steel rods, structural steel channels, and clamps of Kindorf, Unistrut, or approved equal manufacture.

3.2 INSTALLATION OF EXTERIOR PULL BOXES AND MANHOLES

- A. Where pull boxes are used without bottoms they shall be set on six inches of 3/4" crushed rock of a volume equal to that of the pull box used.
- B. Where pre-case units are used all joints are to be tongue and groove, sealed with a suitable sealer.
- C. Where conduits enter horizontally, they shall be bushed with belled ends and terminate flush with the inside of window. All cracks and openings shall be grouted smooth.
- D. Where conduits enter, other than from horizontal runs, they shall be properly bushed and extended a minimum 1/2" from inside of wall or bottom into pull box. They shall be at no more than 45 degrees rise from the horizontal runs.
- E. All conduits entering pull boxes and manholes shall be sealed watertight with suitable duct sealing compound.

3.3 INSTALLATION OF JUNCTION BOXES AND INTERIOR PULL BOXES

Locate pull boxes and junction boxes above removable ceilings or in electrical rooms, utility rooms, or storage areas. No junction box will be installed in an inaccessible area.

3.4 INSTALLATION OF OUTLET AND SWITCH BOXES

- A. Mounting: Mount outlet boxes flush in areas other than mechanical rooms, electrical rooms, and above removable ceilings. Boxes shall be set true and flush with all necessary and correct adapters and/or plaster rings. All boxes set deeper than code allowable shall be corrected by use of factory-made extension rings such as Raco #976 or equal.
- B. Device Locations: Locations of devices on plans are approximate only. Contractor shall study the architectural and structure plans and locate the outlets so that his work is coordinated with the work of others and the fixtures and devices present a pleasing and symmetrical appearance when installed. The location of outlets centered on any architectural feature shall be exact. Outlet locations may be moved a maximum of 10' from the location shown on the drawings before roughing-in without cost to Owner. Switches in relation to door swings and cabinets must be coordinated with architectural drawings. This Contractor shall coordinate with Mechanical Contractor and security and fire alarm Contractor regarding thermostat and security outlets and other equipment locations.

- C. Device Height: The following dimensions for locating wall outlets represent the distance from the finished floor to the center of the outlet, unless noted otherwise.

Outlet	Inches to center
Data/ Computer	18
Convenience receptacle	18
Lighting switch	45

Adjust outlet mounting height to agree with required location for equipment served.

- D. Boxes located in stud walls shall be mounted as follows:
1. Blocking material shall be installed behind all boxes with conduit entrances on one side only or on opposite sides. Outlet box shall be securely attached to both the adjacent stud and the blocking material. Blocking material shall be same as wall studs and shall be attached to two adjacent studs.
 2. Rear blocking may be omitted for boxes with conduit entrances on two adjacent sides if conduits are secured within 8" of box to adjacent wall stud or to a horizontal support between studs. Box shall be securely attached to adjacent stud. Support material shall be same as wall studs or a piece of tubing secured between studs.
- E. Boxes in counterbacks or casework shall be installed in accordance with architectural details. Where not indicated in details, the Architect shall be consulted prior to installation.
- F. Boxes above accessible suspended ceilings shall be mounted to horizontal trapeze hangers, secured to rod attached to structure above, or attached to ceiling system suspension wire with "Caddy" clips. Conduit and boxes shall be located a minimum of 12" above ceiling where suspended depth permits. Conduit and boxes shall not be installed prior to ceiling unless system is attached or braced to structure as to prevent horizontal movement of conduit.
- G. Boxes Located in Masonry Walls: Coordinate cutting of masonry walls to achieve neat openings for boxes. Use rotary cutting equipment to cut masonry work for installation. Where furring occurs, install extension rings to bring box flush to furred surface. Where masonry is the finished surface, locate boxes uniformly for each height at either the top or bottom of a block course and install so that devices plate will fit tight to block wall without extending over mortar joints.
- H. Outlets in acoustical tile ceilings shall be located either centered on the joint between tiles, or in the center of a tile. All such outlet locations shall be carefully planned and verified with Architect.
- I. Exterior Wall Outlets: Conduits shall enter boxes or exterior wall mounted devices at the sides or top only. No conduit shall enter the bottom of such boxes.

- J. Common Boxes and Alignment: Devices shown adjacent to each other at the same mounting shall be gang installed under a common plate, except for outlets of different voltages such as telephone and duplex receptacles. Outlets mounted one over the other, or side by side, shall be in exact alignment, centered on one another.
- K. Box Separation: Boxes and conduit shall be installed in a manner which minimizes sound transmission between rooms. Boxes mounted in a common wall shall be off-set horizontally a minimum of 12 inches and mounted in different stud spaces wherever possible. Boxes in fire rated construction shall be installed per CBC. No boxes shall be mounted back to back. No through boxes shall be used. Off-set boxes shall be connected with flexible conduit not to exceed 18" in length.
- L. Sealing: All unused holes or openings in boxes shall be slugged or sealed by an acceptable means.

3.6 INSTALLATION OF WIRING DEVICES

- A. Devices shall be securely fastened to outlet box with face flush with plate.
- B. Mount receptacles vertically in appropriate boxes.

3.7 INSTALLATION OF WIRE

- A. Scope: Provide all wiring for complete electrical work, installed in code conforming raceway. Branch circuit wiring shall be #12 AWG minimum, unless noted otherwise.
- B. Home Runs: Branch circuit conductors shall be home run to panelboards or motor control centers in groupings shown on the drawings. Combining branch circuit home run conductors in single conduits other than that shown shall not be permitted.
- C. Color coding shall be strictly adhered to and shall be as follows:
 - 1. Color coding shall be:

120/208 Volt	277/480 Volt
A Phase - Black	A Phase - Brown
B Phase - Red	B Phase - Orange
C Phase - Blue	C Phase - Yellow
Neutral - White	Neutral - Grey
Ground - Green	
Travelers - Pink	
 - 2. Color coding utilized shall be noted on electrical "as constructed" drawings and shop drawings.

3. The wires shall be of solid colors in size #6 and smaller. In sizes #4 and larger the wires shall be black and 3" width of the appropriate color tape shall be applied around the wire at 12" intervals starting 2" from the termination of the end of the wire.
 4. The color coding for control circuit wires will be as noted on the plans or as agreed upon with the Architect or Electrical Engineer and will be of a color other than that designated for the phase wires. Where control wires are installed and various colors are used, they shall be noted on the "as constructed" drawings and shop drawings turned in at the completion of the job.
- D. Pulling: Use approved wire pulling lubricant for pulling #4 AWG and larger wire. Oil or grease is prohibited as a conductor pulling lubricant. All conductors #8 and small shall only be pulled by hand. Pulling lubricant for conductors over 600 V will be approved by the conductor manufacturer and the Architect or Electrical Engineer.
- E. Splices: Join the conductors securely, both mechanically and electrically using crimp, compression, or pressure type connectors, except that screw-on type connectors shall not be used for wires larger than #10 AWG. The splice area shall be taped to provide equal or greater insulation than the original. Tape run-back over the original insulation shall extend 3 to 5 overall diameters of the insulated wire.
- No splices in conductors over 600 V or feeders over #6 AWG is permitted.
- F. Splice only in accessible junction or outlet boxes.
- G. Wiring in panelboards, switchboards, and cabinets shall be neatly installed. Wiring shall be grouped, laced or clipped, and fanned out to wiring terminals.
- H. Identification and Markings: In addition to all other requirements for identification and marking of wires, panelboards, and junction boxes, the following shall be strictly adhered to:
1. The identification of individual wires terminating in either junction boxes, circuit breakers, terminal strips, or on control devices shall be done by means of appropriate tape marker.
 2. Where subdistribution wires terminate they shall be marked with the point of origination or point of destination, phase, and voltage to ground. This will include all subdistribution circuits originating from 480/277 volt or 208/120 volt distribution panels serving lighting circuits, receptacle circuits, small power equipment, and small mechanical equipment.
 3. Thus each end of a particular feeder or subdistribution class circuit shall be marked as to its phase and point of origination or destination and either voltage line to line in distribution class circuits or voltage to ground in

subdistribution class circuits.

4. All control circuits will be marked at each control panel as to their function and where they terminate.
Where control wires terminate into relays or enclosures or terminal cans remote from the main point of control, the wires will be marked as to their function and where they originate.
 5. All associated wiring integral within a control cabinet may be marked with the printed circular wire wrapping at each end.
 6. Where wires are pulled through or looped through a junction box, they shall be marked as to the point of origin and the point of destination. All markings in above ground junction boxes will be via linen tags with indelible ink and all markings on junction boxes or pull boxes below ground level will be by means of 1/4" plastic tape with embossed letters. This plastic tag will circle the wire and both ends stapled together.
- I. All junction boxes in attic spaces terminating or serving as gathering points for 208 volt circuits will have the cover painted blue.
 - J. Testing: All wires under 600 volt potential shall be tested with a 600 volt megohm prior to energization and the readings shall be recorded and handed in with the record drawings at the completion of the project. The tests shall be conducted from phase to phase and from each phase to ground.

3.8 INSTALLATION OF MECHANICAL AND OWNER'S EQUIPMENT WIRING

- A. Furnish all power supplies for Mechanical Division equipment as shown on the mechanical plans.
- B. Make all connections of power to all mechanical and Owner's equipment along with installation of required disconnection means. This Contractor shall make all connections to other miscellaneous equipment which required line or low voltage power. Verify accessibility of all outlets and re-adjust outlets if necessary to meet the Code. Verify sizes and current characteristics of all equipment before installation of wiring and adjust wiring properly as required.
- C. Supply all electrical junction boxes for mechanical equipment.
- D. After all wiring to each unit is complete, Electrical Contractor shall cooperate with Mechanical or Equipment Contractors in testing equipment for proper operation and shall correct wiring as required for proper operation.

END OF SECTION 260500

SECTION 262000 - LOW VOLTAGE ELECTRICAL TRANSMISSION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 - Specification sections, apply to work of this section.
- B. Section 26 00 00 - General Electrical, and Section 26 05 00 - Basic Materials and Methods sections apply to work specified in this section.

1.2 SCOPE

- A. Work included: Furnishing and installation of a complete electrical distribution and grounding system. Conditions of this section apply to all other 26 40 00 series sections included.
- B. Related Work: Refer to other sections, particularly those listed below, so as to properly coordinate work specified herein with that specified elsewhere to produce a finished, workmanlike, fully functioning installation.

All other Electrical Sections: Division 26, 27, and 28

1.3 QUALITY ASSURANCE

Codes and Regulations, Reference Standards: See Section 26 00 00.

1.4 NAMEPLATES

Laminated phenolic plastic, color coded black for equipment, with white letters. Provide for identification of each transformer, panelboard and motor control center, secure to face with two (2) chrome plated screws each. A schedule of nameplates shall be included with the shop drawings for approval.

1.5 SUBMITTAL

- A. Product Data: Submit manufacturer's data on service entrance equipment, switchboards, motor control centers and/or individual starters, transformers, panelboards, disconnect switches and grounding components.
- B. Trip Curves: When requested, submit trip timing curves for all circuit interrupting devices.
- C. Nameplate Schedule: Submit nameplate schedule for approval.

1.6 COMPONENT COORDINATION

In order to maintain close control and coordinate the various components of the distribution systems, the number of manufacturers shall be kept to a minimum. Equipment manufacturer shall be General Electric or Square D. It shall be the manufacturer's responsibility though the Electrical Contractor to coordinate all components of the system in order to ensure systems that will provide maximum protection of equipment and reliable safe operation.

1.7 FEEDER CONNECTIONS

Provide cast, saddle type bolted lugs or hydraulically set compression lugs for all bus connections. Manufacturer shall be Thomas and Betts, Burndy, O.Z. or approved equal. Lugs in which the set of screw embeds directly into feeder conductor shall not be used.

1.8 MISCELLANEOUS

- A. Equipment Bases: Provide appropriately sized concrete housekeeping bases for all floor-mounted equipment.
- B. Hoisting Lifting Lugs: Provide on all heavy equipment as required to ensure safe hoisting.
- C. Space for Future Protective Device: Provide as indicated on drawings; shall be completely equipped for the future addition of a circuit breaker or fused switch, including all connections.

PART 2 - PRODUCTS

2.1 PANELBOARDS

- A. Panelboards shall be Air Circuit Breaker bolted type, with voltage, phase, and breakers as specified in panelboard schedules. Panelboards shall be installed flush or surface or specified, at locations as indicated on plans. Panelboards shall be installed in code gauge rust proof steel cabinets with flush door having flush locks all keyed alike and with trim cut square and true.
 - 1. Panelboards: Square D or General Electric
- B. All panelboards and breakers shall meet the requirements of the indicated available symmetrical short circuit current or have a minimum bus bracing to meet figure shown. The minimum rating shall be 35kAIC for 120/208V systems and 42kAIC for 277/480V systems when not indicated or known.
- C. All interiors shall be completely factory assembled. They shall be so designed that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors, so that circuits may be changed without machining, drilling or tapping.

- D. Branch circuits shall be arranged using double row construction except when narrow column panels are indicated. A nameplate shall be provided listing panel type and ratings.
- E. Unless otherwise noted, full size insulated neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral bussing shall have a suitable lug or each outgoing feeder requiring a neutral connection. A ground bus will be included in all panels.
- F. Boxes shall be at least 20 inches wide made from galvanized steel. Provided minimum gutter space in accordance with California Electric Code. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space. At least four interior mounting studs with adjustable nuts shall be provided.
- G. Door hinges shall be concealed. All locks shall be flush, stainless steel, cylinder tumbler type locks with catches and spring loaded door pulls, keyed alike and directory frame and card having a transparent cover shall be furnished with each door.
- H. All exterior and interior steel surfaces of the trim shall be properly cleaned, primed with a rust inhibiting phosphatized coating and finish with a gray ANSI 61 paint. Trims for flush panels shall overlap the box for at least 3/4 inch all around. Surface trims shall have the same width and height as the box. Trims shall be mountable by a screwdriver without the need for special tools. After installation, trim clamps shall not be accessible when the panel door is closed and locked.
- I. All main bus bars shall be copper sized in accordance with UL standards to limit the temperature rise on any current carrying part to a maximum of 50 degrees C above an ambient of 40 degrees C maximum.
- J. Circuit breakers shall be quick-make, quick-break, thermal-magnetic, trip indicating, and have common trip on all multipole breakers. (Trip indication shall be clearly shown by the breaker handle taking position between ON and OFF when the breaker is tripped). Branch circuit breakers feeding convenience outlets shall have sensitive instantaneous trip settings of not more than 10 times the trip rating of the breaker to prevent repeated arcing shorts resulting from frayed appliance cords. Single pole 15 and 20 ampere circuit breakers shall be UL listed as "Switching Breakers" and carry the SWD marking. UL Class A (5 milliampere sensitivity) ground fault circuit protection shall be provided on 120V ac branch circuits as specified on the plans or panel board schedule. This protection shall be an integral part of the branch circuit breaker which also provided overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit breaker containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole breaker containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole circuit breaker with

integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional slide pole circuit breaker. Connections to the bus shall be bolt on.

2.2 DISCONNECTS

- A. Motor and circuit disconnects shall have an Underwriters' Laboratory label.
- B. Disconnect switches shall be suitable for area where they are installed, i.e., weatherproof, and shall be rated heavy duty. Use only 600 volt class with proper number of poles. Switches shall be fused unless indicated on plans. Fuses shall be of type specified on plans.
- C. When the disconnect is not clearly visible from the control location, provide it with an operating handle which is lockable in the open position.

2.3 GROUNDING

- A. Clamps, bonds, etc. suitable and as necessary to provide continuous ground system.
- B. All grounding conductors shall be copper, sizes not less than that required under CEC requirements.

2.4 MOTOR STARTERS

- A. Manual motor starters to be quick-make, quick break, with overload protection. General Electric cr 101 for 120/240 volt 1 hp or less.
- B. Magnetic motor starters shall be full voltage non-reversing unless indicated with control power transformer (120 volt coil) and with overload relay protection. Reduced voltage type starters shall have starting timing relays and multi-tap autotransformers. Combination type shall have integral fused switch, motor circuit protector, or circuit breaker as indicated. Provide Hand-Off-Auto selector switches, pushbuttons, pilot lights, control circuit disconnect, elapsed time meters, interlocks, and other control devices as required or indicated. Provide spare 2 normally open and 2 normally closed auxiliary contacts.
- C. Motor control centers shall be floor standing, NEMA I enclosures, and with Class 1, Type B wiring, unless noted otherwise.

2.5 DRY PAD-MOUNTED TRANSFORMERS

- A. Transformers shall be compartment type, K-4 rated, self-cooled, tamper resistant and weather resistant for mounting on a pad and shall comply with the latest applicable standards. The coils shall be wound with copper conductors.
- B. Transformers shall have a maximum temperature rise of 80°C above a 40°C

ambient.

- C. Primary taps shall be full capacity, with a minimum of two 2 1/2% above and below rated voltage.
- D. KVA sizes and voltages shall be as shown on the drawings.

2.6 SWITCHBOARDS AND SERVICE

- A. Manufacturer's: Subject to compliance with requirements, provide switchboards of one of the following or approved equal:

General Electric Company or Square D Company

- B. General: Except as otherwise indicated, provide switchboards of types, sizes, characteristics, and ratings indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for complete installation. Service entrance switchboards shall comply with serving utility requirements.
- C. AC Dead-Front Distribution Switchboards: Provide factory assembled, dead-front, metal enclosed, self-supporting secondary power switchboards, of types, sizes and electrical ratings and characteristics indicated; consisting of panel (vertical) units, and containing circuit breakers of quantities, ratings and types indicated. Provide copper main bus and connections to switching devices of sufficient capacity to limit rated continuous operating temperature rise to 54 degrees F, and 90 degrees F for circuit breaker branches; with main bus and tap connections silver-surfaced and tightly bolted for maximum conductivity. Brace bus for short circuit stresses up to maximum interrupting capacity. Prime and paint switchboard with manufacturer's finish and color. Construct units for outdoor, NEMA Type 3R.
- D. Enclosures: Construct dead-front switchboards, suitable for floor mounting, with front cable/wire and conduit accessibility as indicated. Provide welded steel channel framework, hinge wireway front covers to permit ready access to branch circuit breaker load slide terminals. Coat enclosures with manufacturer's standard corrosive resistant finish.
- E. Bussing: Provide switchboard with sufficient cross-sectional area to fulfill U.L. Standard 891 pertaining to temperature rise.

PART 3 – EXECUTION

3.1 INSTALLATION OF SWITCHGEAR AND SWITCHBOARDS

- A. Install switchgear and switchboards as indicated, in accordance with manufacturer's written instruction, and with recognized industry practices to ensure that switchboards comply with requirements of NEMA and NEC standards, and

applicable portions of NECA's "Standard of Installation".

- B. Prior to energization of circuitry, check all accessible connections to manufacturer's torque specifications. Subsequent to wire and cable hook-ups, energize switchboards and demonstrate functioning in accordance with requirements.

3.2 INSTALLATION OF PANELBOARDS

- A. Provide mounting brackets, busbar drilling, and filler pieces for unused spaces.
- B. Branch circuits shall be connected as shown in line diagrams and/or panelboard schedules, with wires neatly tie wrapped in panel.
- C. All distribution panelboards shall have all sub feeders and main breakers marked with 1" x 3" plastic name tags secured with two self tapping screws.
- D. All panelboards shall be provided with a 2" x 3-1/2" plastic name tag on the front of the panel door or on the trim, indicating panel designation and distribution panel and circuit feeding above panel, secured with two self tapping screws.
- E. Branch circuit panelboards shall have a plastic covered circuit directory card on the inside of each door with all circuit destinations neatly typed.
- F. Contractor shall check and tighten all factory made wire or lug connections. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A.
- G. Install four (4) spare 3/4" conduits from all panelboards to accessible ceiling space.

3.3 INSTALLATION OF DISCONNECTS

Install disconnects for all equipment and motors of the size required and as recommended by manufacturer.

3.4 INSTALLATION OF GROUNDING

- A. Scope: Provide grounding system complying with the codes and ordinances specified. Grounding system shall provide continuity through the entire electrical system.
 - 1. Panelboard ground buses.
 - 2. PVC conduit or other raceways.

3. All motors.
 4. All lighting fixtures.
 5. Grounding terminals of all receptacles.
 6. Miscellaneous grounds required by code.
- B. Equipment and raceway bonding procedures shall be rigidly maintained and meet all jurisdictional requirements of codes and regulations.
- C. Good, electrically continuous, metal to metal contacts shall be made wherever possible at all panel boxes, pull boxes, etc. Where it is not possible to obtain good contacts, the conduit shall be bonded round the boxes with a 6 BS gauge, rubber covered, double braided wire with ground clamps.
- D. A separate grounding conductor shall be run in all conduit runs from distribution, lighting, and power, etc. panelboards, motor control outlets, etc., back to their respective service or distribution panelboards.
- E. Flexible Conduit Grounding: Provide a separate grounding conductor in all flexible conduit runs to include watertight flexible conduit with integral grounding straps. Install ground conductors inside conduit with ungrounded conductors. Extend from nearest panel to device being connected.
- F. Receptacle Circuits: Provide a separate grounding conductor in all receptacle circuit conduit runs, back to serving panelboard.
- G. Fence grounding: Fence shall be grounded with a ground rod at each fixed gate post and at each corner post. Drive ground rods until the top is 12 inches below grade. Attach a No.4 AWG copper conductor, by fusion weld process, to the ground rods and extend underground to the immediate vicinity of fence post. Lace the conductor vertically into 12 inches of fence mesh and fasten by two approved bronze compression fittings, one to bond wire to post and the other to bond wire to fence. Each gate section shall be bonded to its gatepost by a 1/8 - inch by 1 - inch flexible braided copper strap and ground post clamps. Clamps shall be of the anti-electrolysis type.

3.5 INSTALLATION OF MOTOR STARTERS

- A. In finished areas, mount motor protection switches flush and install suitable coverplates.
- B. Install heaters correlated with full load current of motors provided.
- C. Set overload devices to suit motor provided.

ENVIRONMENTAL COMPLIANCE CENTER
FRESNO, CA

LOW VOLTAGE ELECTRICAL
TRANSMISSION
SECTION 262000 - 8

END OF SECTION 262000

SECTION 265000 - LIGHTING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install lighting fixtures including lamps; connect fixtures to circuits, occupancy sensors, relays, room controllers, contactors, control panels, and gateways, where applicable.
- B. Related Work:
 - 1. Common Work Results for Electrical: Section 26 05 00.
 - 2. Low Voltage Electrical Transmission: Section 26 20 00.

1.2 DESIGNATION

- A. Unless otherwise shown on the plans, fixture type designation for an individual fixture shall be typical for similarly indicated fixtures within the entire room or defined area.
- B. Unless otherwise shown on the plans, fixtures mounted in a continuous row shall be of the same type as any individual designated fixture within the row.
- C. In the event a fixture is un-designated on plans, it shall be of the same type as fixtures of similar function within rooms or areas.

1.3 COORDINATION

- A. Confirm compatibility and interface of other materials with luminaire and ceiling system. Report discrepancies to the Architect or Electrical Engineer, and defer ordering until clarified.
- B. Supply plaster frames, trim rings, and back boxes to other trades.
- C. Coordinate with Division 15 to avoid conflicts between luminaire supports, fittings & mechanical equipment.
- D. All fixtures shall be coordinated with the architectural reflected ceiling plan. If any discrepancies occur, the Architect or Electrical Engineer must be notified in writing before installation is started.

1.4 MOUNTING REQUIREMENTS

Comply with State of California earthquake requirements and CEC requirements for lighting fixture installations and support.

1.5 SUBMITTALS

- A. All submittals shall be made in accordance with Division 1 Submittal Procedures.
- B. List of Materials: Submit a complete list of material proposed for this Section.
- C. Shop Drawings for Lighting Fixtures: Provide detailed and dimensioned working drawings showing kind, weight and thickness of materials, method of fitting and fastening parts together, location and number of sockets, size and color of lamps, and complete details of the method of fitting, suspension and securing the fixtures in place. Drawings shall contain sufficient information to enable a workman to construct and install the fixtures without further instructions.
- D. Shop Drawings for Lighting Controls: Provide detailed and complete wiring diagrams and plans for lighting controls. Provide cut sheets for lighting control devices and cabling.

1.6 GUARANTEE

- A. Guarantee lighting components against service failure for five years. Indicate installation date on each driver by inscribing month, day and year on the housing.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

The fixtures described in the light fixture schedule on the drawings are to be used as a standard of quality to be maintained. Substitute items of same function, performance and dimension, are acceptable in conformance with Section 260000.

2.2 FIXTURES: General

- A. Provide fixtures complete with all fittings, internal or external drivers, stems, hangers, joiner bands, end caps, and component parts to make a complete installation. Fixtures shall have a suitable interior means of grounding the enclosure.
- B. All fixtures shall bear the U.L. label and shall be suitable for installation location.
- C. All attaching devices for recessed or surface mounted fixtures mounted in the ceiling shall be of formed or rolled steel and of sufficient strength to prevent movement of fixture after installation.
- D. The Architect or Electrical Engineer shall have the right to reject any fixture damaged due to improper packaging. Any fixture with broken or cracked porcelain, broken or bent metal, broken lenses, or an appearance deemed not to be normal, may also be rejected by the Architect or Electrical Engineer at the expense of the Contractor.
- E. Provide gasketing, stops, and barriers to form light traps and prevent light leaks.

- F. Trademarks or Monograms: There shall be no visible trademarks or monograms on the lighting fixtures.
- G. Trims and Doors: The Electrical Contractor shall use the following fixture trim frame designs unless specified otherwise.
 - 1. Lay-in frames: Lay-in frames for all exposed "T" ceiling systems.
 - 2. Flanged Trims: Flanged trims for plasterboard, spline or metal lathe and plaster ceiling systems. Provide plaster or mounting frames where required.
 - 3. Hidden "T" Systems: Electrical Contractor to provide vinyl fixture trim-outs for all fixtures installed in hidden "T" systems to complete unfinished edge of tile openings.

2.3 MATERIAL AND FABRICATION

- A. Each lighting fixture shall be the type indicated on the drawings and as specified herein. Fixtures of the same type shall be of identical make, design and appearance. The size of each lighting fixture shall be as specified herein for the lamp or fixture wattage indicated on the drawings.
- B. The design of all lighting fixtures, accessories and supports, as well as the method of hanging fixtures, shall comply with all requirements for earthquake resistant construction of the State of California.

2.4 LIGHT SOURCE

- A. LED Drivers: Drivers shall be electronic type specifically designed to save energy while maintaining full light output. Drivers shall have "A" sound rating, thermal protectors and guaranteed against service failure for three years. Drivers shall comply with FCC and NEMA limits governing electromagnetic and Radio Frequency Interference and meet all applicable ANSI, State and Federal standards. The contractor shall indicate the installation date on each driver by inscribing the month, day and year on the ballast case. Drivers shall be noiseless, high power factor type and shall be ETL certified under CBM Standards and Underwriters' Laboratory listed.
- B. LED Fixtures shall have the following minimum characteristics:
 - 1. Efficacy – 100 lumens per watt or greater
 - 2. Color rendition index – 80 or greater
 - 3. Standard deviation color matching for diodes shall fall within 1 MacAdam ellipse.

2.5 LIGHTING CONTROLS

- A. Lighting controls and control systems shall meet all requirements of the State of California Title 24 energy code.
- B. Lighting control systems shall be commissioned by a factory lighting commissioner. Commissioning by the contractor is not acceptable.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install lighting fixtures where shown on plans.
- B. Fixture installation shall conform to all applicable standards for installation, mounting, wiring, and quality.
- C. All fixtures shall be grounded and bonded in accordance with applicable codes. Where fixtures are installed in rows, a bonding screw shall be used to maintain bonding integrity from fixture to fixture.
- D. All fixtures, lenses, and other trim shall be aligned, cleaned, free of paint and blemishes before final acceptance.
- E. Fixtures weighing more than two pounds shall be supported by means other than the outlet box. All outlet boxes shall be able to support a minimum of eight pounds.
- F. For fixtures weighing more than two pounds, support shall be provided at all four corners, plus the outlet box. Each support shall be able to carry a minimum of four times its intended load.
- G. No support or insert, except pendant canopies, shall be visible from the floor.
- H. Fixture voltage shall be as shown on drawings and in the fixture schedule.
- I. Install recessed and surface-mounted fixtures with mounts or plaster frames compatible with the ceiling and wall systems employed and secure fixtures mechanically to frames.
- J. Align rows of surface-mounted fluorescent fixtures to form straight lines at uniform elevations. Provide factory joiner bands for contiguous fixtures, and end caps on ends.
- K. Recessed fixtures shall fit snugly against ceilings to prevent light leakage.
- L. Support suspended recessed fixtures in a T-bar ceiling as follows: All fixtures shall be attached to the ceiling grid to resist a horizontal force equal to the weight of the fixtures. For heavy duty grid systems, fixtures weighing less than 56 pounds must also have two 12 gauge slack safety wires from diagonal corners to the structure above; fixtures weighing more than 56 pounds shall be independently supported by not less than 4 taut No. 12 gauge wires capable of supporting four times the load.

For intermediate duty grid systems, fixtures shall be independently supported by not less than four taut No. 12 gauge wires capable of supporting four times the load. All fixture hanger wire ends shall be twisted three tight turns within a 2" distance. Fixture installation shall be coordinated with the acoustical ceiling installation.

M. Light Pole Installation:

1. Set in concrete footings; set poles plumb and straight. Grout and drypack after leveling poles. Concrete, grout and drypack are specified under Section 03 30 00, Cast-in-Place Concrete.
2. Electrically ground the fixtures and poles.
3. Solder and tape splices as required for the floodlight fixture installations.
4. Each standard shall be tapered galvanized steel, with handhole, anchor bolts, fixture mounting brackets and all accessories.
5. Poles shall be designed to withstand a minimum wind velocity of 80 mph sustained, 104 mph gusts.

N. Provide factory commissioning for lighting controls and devices. The completed installation shall comply in every way with the requirements of Title 24.

3.2 CLEANING

- A. Clean surfaces of all dirt, cement, plaster and other debris. Use cleansers compatible with material surfaces being cleaned.
- B. Clean lenses, reflectors, and the like of dust, fingerprints, and grime.

3.3 TESTING

- A. Check and adjust fixtures for even illumination.
- B. Replace defective fixtures and fixture components with new.
- C. The lighting control system shall be acceptance tested by an independent company. The agent shall not be an employee of or affiliated with the contractor. The contractor is responsible for passing the acceptance tests.

END OF SECTION 265000

SECTION 280000 - ELECTRONIC SAFETY AND SECURITY

PART 1 – GENERAL

1.1 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures
- B. Section 26 00 00 – Electrical
- C. Section 27 00 00 – Communications

1.2 APPLICABILITY

This section provides the minimum requirements for Electronic Safety and Security Systems. Additional requirements are to be found in subsections of this specification.

1.3 SUBMITTALS

- A. General Requirements
 - 1. All submittals shall be made in accordance with section 01 33 00.
- B. Licensure
 - 1. Submit proof of possession of a valid C-7 California State Contractor's License in good standing.
- C. System Submittals and Shop Drawings
 - 1. Submit a complete list of equipment and materials proposed for the system with catalog cuts, technical data, manufacturer's Specifications and detail drawings.
 - 2. Submit a complete set of detailed, scaled Shop Drawings of all racks, cabinets, and equipment, with all designations, dimensions, color, controls, wiring, and schematic diagrams of all circuits. Show interfaces to all equipment furnished, including equipment furnished by other contractors, identifying numbers of wires, termination requirements, voltages and other pertinent details. Include front elevations, cabinet dimensions, types of mounting, door barriers, catalog number of locks and finishes of terminal cabinets.
- D. Spare Parts Data
 - 1. After shop drawings are approved, and not later than thirty (30) calendar days prior to the date of beneficial occupancy, a list of spare parts data for each item of specified materials and equipment shall be submitted. The

data shall include a complete list of parts and supplies with current unit prices and source of supply.

E. Operating and Maintenance Documents

1. The contractor shall furnish to the architect (3) copies of operating and maintenance instructions.
2. Documentation shall outline the step-by-step procedures required for system start-up, operation, and shutdown.
3. Documentation shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides.
4. Documentation shall be submitted at least thirty (30) calendar days prior to acceptance test. The instructions shall include the manufacturer's name, system model number, service manual, parts list, and a description of all equipment and their basic operating features.

F. Warranty

1. A copy of the manufacturer's warranty for all equipment and materials shall be provided.

G. Close-Out Documents

1. Upon completion of the installation, the contractor shall provide four copies (one hard copy and three electronic copies) of Project Close-Out Documents to the Owner. Documentation shall include the items detailed below.
2. As-Built Drawings
 - a. The contractor shall provide a complete set of as-built drawings for the entire system upon installation completion.
 - b. These drawings shall include, but not be limited to, the exact locations of all equipment, connections between all equipment, and wiring for all equipment as the system is installed.
 - c. printout of configuration
3. All System source codes and passwords (Crestron Programs) must be handed over to, and become property of, the Owner upon completion of this project.

H. All submittals called for shall be instruments of the Contractor, even though they may have been prepared by a subcontractor, supplier, dealer, manufacturer, or by any other person, firm or organization. Prior to submission, the Contractor shall undertake its own review and stamp with its acceptance prior to submittal.

1.4 SCOPE OF WORK

It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction is required to accomplish work indicated or specified in this or other sections, it shall be the responsibility of the Contractor to provide all materials and equipment which is usually furnished with such systems in order to complete the installation, whether or not specifically mentioned herein.

1.5 APPROVAL

- A. Installation of the system shall not commence until all approvals are granted by the County of Fresno.
- B. Installation of the system shall not commence until all shop drawings and submittals are approved by the Owner, Architect of Record, and Engineer of Record.

1.6 QUALITY ASSURANCE

- A. Contractor Qualifications
 - 1. Must hold a valid State of California C-7 license in good standing;
 - 2. Must have completed at least three (3) projects of equal scope within the last three (3) years;
 - 3. Must maintain a service office within 50 miles of the project;
 - 4. Must be bonded to assure performance and satisfactory service during the guarantee period;
 - 5. Contractor must be registered with BICSI and have at least one RCDD on staff;
 - 6. Must have personnel fluent in the use of Computer Aided Design and possess and operate CAD software using .DWG or .DXF format.
- B. All equipment and wiring shall be furnished and installed by the authorized factory distributor of the equipment. The manufacturer's representative of each system shall provide a letter from the manufacturer of all major equipment with submittals stating that he is the representative and that the manufacturer will have a service representative assigned to this area for the life of the equipment.
- C. The Contractor shall furnish a letter from the manufacturer of the equipment specified, which certifies that the equipment has been installed according to factory recommended practices and that the system is operating satisfactorily.
- D. The Contractor shall provide not less than sixteen (4) hours of instruction to personnel in the operation, programming, and maintenance of each system.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

C. Handling: Protect materials from damage during handling and installation.

1.8 COORDINATION

Coordinate the Work of this section with the Work of other sections, including sprinkler systems, fire alarm systems, HVAC systems, security systems, etc., as applicable.

1.9 WARRANTY

The entire system shall be guaranteed free of mechanical or electrical defects for a period of one year after final acceptance of the installation. Any material showing mechanical or electrical defects shall be replaced promptly at no expense to the Owner. Guarantee period shall begin from the date of final acceptance by the Owner.

PART 2 – PRODUCTS

2.1 MANUFACTURER

References to manufacturer's model numbers and other information is intended to establish minimum standards of performance, function, and quality. Equivalent equipment from the specified manufacturer's may be substituted for the specified equipment, so long as the minimum standards are met.

PART 3 – EXECUTION

3.1 GENERAL

A. All Work described in the specifying documents and on the Project Drawings shall be performed in accordance with the acknowledged Professional and industry standards and practices. All installed equipment shall meet or exceed the specified manufactures regulations.

B. Materials shall be installed in strict compliance with all local, state, county, province, federal and other applicable building, safety, and fire standards, laws, codes, regulations, and guidelines including, but not limited to, all appendices and amendments and the requirements of the local authority having jurisdiction (AHJ).

C. Examine areas and surfaces to receive each system.

1. Notify Architect of conditions that would adversely affect installation or subsequent use.
2. Do not begin installation until unacceptable conditions are corrected.

D. The Contractor shall maintain a competent Supervisor and Manufacturer Certified Technicians assigned to this installation for the duration of the Project.

- E. Furnish and install all materials, devices, components and equipment required for a complete and operational system.
- F. It is the Contractor's responsibility and obligation to coordinate with all necessary trades to ensure that the integrity of and compliance with Manufacturer and industry standards are met during the duration of the installation.

3.2 INSTALLATION

- A. Furnish control panels, components, devices, cabinetry, wire, connectors, materials, parts, equipment, labor, etc. necessary for the complete installation of the systems in full accordance with the recommendations of the equipment manufacturers and the requirements of the drawings and specifications.
- B. Coordinate the required space in Data equipment frames with this and other network-based Communications systems that may share rack space. Provide racks with sufficient space to accommodate patch panels, switches, power supplies, etc. for all network interfaced systems.
- C. Installations shall follow standard wiring and installation practice and shall meet or exceed industry standards of such work.
- D. Wire not installed in equipment racks, not portable, in unrated ceiling space, or not installed in conduit shall be fire rated and meet all applicable codes.
- E. Wire and cable for all other devices shall be supplied in accordance with the recommendations of the device manufacturer, CEC, and NEC.
- F. Equipment shall be held firmly in place with proper types of mounting hardware. All equipment affixed to the building structure must be self-supporting with a safety factor of at least three. All equipment shall be installed so as to provide reasonable safety to the operator. Supply adequate ventilation for all enclosed equipment items which produce heat.
- G. Furnish each system to facilitate expansion and servicing using modular, solid-state components. All equipment shall be designed and rated for continuous operation and shall be UL listed, or manufactured to UL standards.
- H. Shields of audio cables shall be grounded at one end only, at the input side of all equipment items in the system.
- I. Observe proper circuit polarity and loudspeaker wiring polarity. No cables shall be wired with a polarity reversal between connectors with respect to either end. Special care shall be taken when wiring microphone cables, to ensure that constant polarity is maintained.
- J. Route cables and wiring within equipment racks and cabinetry according to function, separating wires of different signal levels (data, fire alarm SLC, fire alarm NAC, speaker, intrusion, etc.) by as much physical distances possible. Neatly

arrange and bundle all cables loosely with Velcro cable ties. Cables and wires shall be continuous lengths without splices.

- K. All cables in conduits shall be insulated from each other and from the conduit the entire length and shall not be spliced. All cables and wires are to be continuous lengths without splices.
- L. Mechanical connections shall be made using approved connectors of the correct size and type for the connection. Wire nuts will not be accepted.
- N. Label all wires in racks and console as to destination and purpose. Clearly and permanently label all jacks, controls, and connections. All labeling shall be completed prior to final system inspection.

3.3 PROGRAMMING

- A. Contractor shall provide all necessary programming to provide complete operating systems.
- B. Contractor shall include in their bid one (1) four (4) hour planning meeting with the Owner and their Representatives for each system to outline all specific programming issues for each system, as well as, but limited to:
 - 1. Contractor will be informed of any specific requirements for use of the system.
 - 2. Contractor will provide overview of system capabilities.
 - 3. Contractor will address all concerns of the Owner and their Representatives.

3.4 TESTING

- A. Completed systems shall be physically inspected by the Owner's representative to assure that all equipment is installed in a neat and professional manner and in accordance with these Specifications.
- B. Final systems testing and commissioning shall be performed after all installation and initial testing has been completed by the Installer, but prior to any use of the systems.
- C. The Contractor, prior to requesting systems testing and demonstration to the Owner's representative, shall ensure that all systems are in first-class working condition and free of shorts, ground faults/loops, parasitic oscillations excessive hum and noise, RF interference, or instability of any form.
- D. The Contractor shall be responsible for properly performing all setup and alignment of the systems, and all assembly and setup of portable equipment.

3.5 COMMISSIONING

- A. All testing documentation shall be supplied with the as-built documentation.

- B. The Contractor will include in their bid price six (6) hours for onsite commissioning and will provide the installation technician who was responsible for this project to be present at the system commissioning to tune, fix, repair, and/or replace all system components that do not operate within the tolerance as set forth in the specifications, project documents, and industry standards.
- C. The final acceptance of the system by the Owner will be based upon the report of its representative following inspection, testing, and commissioning. A list of items in need of completion or correction shall be generated the Owner and their consultants, which must be corrected by the Installer before final acceptance will be granted.

END OF SECTION 280000

SECTION 310513 - SOIL FOR EARTHWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Excavated (and re-used) materials and imported materials.

1.2 RELATED SECTIONS

- A. City of Fresno Standard Specifications
- B. Division 31
- C. Section 329300 – Planting

1.3 REFERENCES

- A. A Geotechnical Engineering Report was performed for this project by Fresno County. report No. T90203, dated 4-22-2020.

1.4 SUBMITTALS

- A. Submit in accordance with Section 013300 Submittal Procedures
- B. Samples: Submit, in air-tight containers, 10 lb. of Type S3, S4, and S5 fill to inspector.
- C. Soil Analysis: Submit for Type S3 and S4 soils to be imported.
- D. Materials Source: Submit location of imported materials source. Provide materials from same source throughout the work. Change of source requires approval.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Soil Type S1: Excavated and re-used material, graded; free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
- B. Soil Type S2: Excavated and reused material graded; free of roots, lumps greater than one inch, rocks larger than ½ inch, debris, weeds and foreign matter.
- C. Soil Type S3: Imported topsoil, friable loam; reasonably free of roots, rocks larger than ½ inch, debris, weeds, and foreign matter.
- D. Soil Type S4: Imported borrow, non-expansive, granular material, suitable for purposes intended, free of vegetable matter and other unsatisfactory material, and required as follows:
 - Maximum Particle Size: 3"
 - Percent Passing #4 Sieve: 75-100
 - Percent Passing #200 Sieve: 10-30

Expansion Index	<15
Plasticity Index	<15
Organics:	<3% by Weight
Sulfates:	<0.05% by Weight
Minimum Resistivity	>8,000 ohms-cm
Minimum R Value	50

- E. Soil Type S5: Imported sand. Natural river or bank sand washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
- F. Hard Pan: Hard pan soils were encountered within the upper 6" to depths of approximately 6-1/2" feet. Hard pan soils may be used as engineered fill if the hard pan soils are broken down to a maximum particle size of 3" and blended with soil types S1, S2 or S4 of this Section 31 05 13. Over-sized material should be removed from the fill soils as necessary to establish a well graded fill material.
- G. All soil material used must come from/be within a mile 5 radius of the site.

2.2 SOURCE QUALITY CONTROL

- A. Inspection of imported soil will be performed by the Construction Manager at source of import and prior to being delivered to the site.

PART 3 - EXECUTION

3.1 STOCKPILING

- A. Temporarily stockpile excavated or imported material onsite at location designated by Construction Manager.
- B. Stockpile excavated or imported material in sufficient quantities to meet project schedule and requirements.

3.2 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free-standing surface water.
- B. Dispose of excess material off-site.

END OF SECTION 310513

SECTION 312200 - GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Excavating soil and other material for surface improvements.
- B. Placing fill.
- C. Compaction of existing ground and fill.
- D. Preparation of subgrade for other improvements.
- E. Grading of soil.

1.2 RELATED SECTIONS

- A. City of Fresno Standard Specifications
- B. Division 31

1.3 REFERENCES

- A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- B. A Geotechnical Engineering Report was performed for this project by Fresno County. report No. T90203, dated 4-22-2020.

1.4 DEFINITIONS

- A. Utility: Any buried or above ground pipe, conduit, cable, associate device or appurtenances, or substructure pertaining thereto.

1.5 SUBMITTALS

- A. Submit in accordance Section 013300 Submittal Procedures
 - 1. Product Data:
 - a. Information indicating the source of all import material, the fill material type and where it is to be used.
 - 2. Quality Assurance/Control:
 - a. Material Test Reports:
 - 1) Classification of Soils.
 - 2) Compaction Characteristics of Soils.
 - 3) Density and Unit Weight of Soils in Place.
 - 3. Final Inspection:
 - a. Drawings indicating the extent and depth of all engineered fill. This information shall be a part of the Project "As-Built" and Project "Record" Documents in accordance with Section 017700 Closeout Submittals.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installer:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this project.

B. Regulatory Requirements:

1. In accordance with the following:
 - a. CARB Materials and equipment used for this Project shall comply with the current applicable regulations of the California Air Resources Board [CARB] and the Environmental Protection Agency [EPA].
 - b. CAL/OSHA Comply with all provisions of the Construction Safety Orders and the General Safety Orders of the California Division of Occupational Safety and Health, as well as all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground excavations.
 - c. CF City of Fresno, Codes and Ordinances
 - d. EPA Environmental Protection Agency.
 - e. SWRCB State Water Resources Control Board

C. Certificates:

1. Installer's certification that all Earthwork installation meets or exceeds the requirements of this specification.
2. Contractor's certification (on Contractor's letterhead paper) that the Earthwork materials and installation meets or exceeds the requirements of this specification.

D. Meetings:

1. Pre-Installation: Schedule with Construction Manager prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems, which may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
2. Progress: Scheduled by the Contractor with Construction Manager during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
3. Completion: Scheduled by the Contractor with Construction Manager upon proper completion of the work.
 - a. Inspect and identify any problems which may impede issuance of warranties or guaranties.
 - b. Maintaining installed work until the Notice of Substantial Completion has been filed.

1.7 COORDINATION

- A. Coordinate work with Construction Manager.

- B. Verify that the location of existing utilities have been indicated at work site by utility authorities.

1.8 EXISTING CONDITIONS

- A. Hard pan soils were encountered within the upper 6" of existing soils to depths of approximately 6-½ feet. It is anticipated that the hard pan layers will be exposed during excavation, digging and drilling activities. The Contractor must work with and mitigate this existing condition at no additional cost to the Owner.
- B. Existing Conditions:
 - 1. Examine site and verify conditions with the Drawings and Specifications. Contractor shall familiarize himself with existing site conditions and any changes that have occurred at the site since the preparation of the contract documents and shall be responsible to account for any such changes in the price bid for this work.
 - 2. Thoroughly investigate and verify conditions under which the Work is to be performed.
 - 3. Locate and identify utilities:
 - a. Call a Local Utility Locator Service ("Underground Service Alert" (USA) – 811) for the task of locating any applicable off-site and on-site utilities in the area where the Project is located.
 - 4. No allowance for extra Work will be granted resulting from negligence or failure to meet requirements of Article titled "Existing Conditions" above.
- C. Where subsurface work involves more than the normal depth of excavation required for the removal and/or construction of surface improvements (surface improvements such as concrete work, paving, landscaping, signs, etc.), the owner has made a diligent attempt to indicate on the plans the location of all main and trunkline utility facilities which may affect the Work. In many cases, however, the only available information relative to the existing location of said facilities may have been small scale undimensioned plats. The locations of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.
- D. Under similar circumstance to Section 31 22 00/1.8C., service laterals and appurtenances will have also been shown where information was available as to their location. In many cases, however, the only available information relative to the existing location of said facilities may have been small scale undimensioned plats. The locations of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.
- E. Determine exact location of existing buried utilities by:
 - 1. Marking on ground or pavement surface the alignment and extent of the facilities and the probable location of existing utilities using construction plans and existing surface features.
 - 2. Requesting "Underground Service Alert" (USA) at [800] 227-2600 to indicate location of existing buried facilities. Provide USA a minimum of two (2) working days of notice of request for locations, and notify Owner of said request concurrently.
 - 3. Locate exact location of existing utilities by hand methods of excavation, or by use of vacuum equipment.

- F. At proposed work location, expose by hand methods (or vacuum equipment) all existing utilities along the route of the proposed work prior to using any mechanical equipment. If mechanical equipment is allowed at a particular location, it may only be used after the completion by the Contractor of a successful exhaustive search by hand (or vacuum equipment) methods to locate all existing facilities as indicated on the plans, and/or as indicated on the ground by USA or Owner's personnel.
- G. Provide Field Engineering, or "As-Built" drawings, to record the location of all utilities encountered. Where locational conflicts exist between existing utilities and the planned location of facilities to be constructed under this Contract, submit detailed information to the Construction Manager for review and direction.
- H. Maintain all existing utility mains and service lines in constant service during construction of the Work.
- I. Where service disruptions are allowed, minimize the length of such disruptions by proper scheduling and diligent pursuit of the work.
- J. Native soils have been classified as "corrosive" to metal objects. Provide approved wrap or coating for all metallic objects that will be in contact with soil.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Dust control: Perform work in a manner as to minimize the spread of dust and flying particles. Thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors and concurrent performance of other on-site work.
 - 1. All disturbed areas, including storage piles, which are not being actively utilized for construction purposes, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, or vegetative ground cover.
 - 2. All on-site unpaved roads shall be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.
 - 3. All land clearing, demolition, grubbing, scraping, excavation, land leveling, grading, and cut and fill activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.
 - 4. When materials are transported off-site, all material shall be covered, effectively wetted to limit visible dust emissions or at least six inches of freeboard space from the top of the container shall be maintained.
 - 5. All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at least once every 24 hours when operations are occurring. The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. The use of blower devices is expressly forbidden.
 - 6. Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/ suppressant.
 - a. Contractor shall comply with all requirements of the San Joaquin Valley Air Pollution Control District (SJVAPCD) for construction activity related to this project.
 - b. A Dust Control Plan, as required by the SJVAPCD, may be required for this project. If required, Contractor shall be responsible for preparing said Dust Control Plan, submitting to the SJVAPCD for review and approval, and

- paying all SJVAPCD review and permitting fees related to the Dust Control Plan.
 - c. If a dust control plan is required, no construction activity related to this project may begin until Contractor has secured an approved Dust Control Plan.
 - d. Contractor shall be solely responsible to implement all requirements of the Dust Control Plan throughout the life of this contract.
 - e. Should fines or fees be levied against the Project for violations of the Dust Control Plan and/or related SJVAPCD regulations, Contractor shall be responsible to pay all said fines or fees and to implement all mitigation measures required by SJVAPCD in order to bring the construction activity into compliance with SJVAPCD regulations. The costs for any such fines or fees shall be included in the lump sum price bid for work under this contract and no additional payment will be made therefore
- B. Burning: No burning will be allowed on-site.
- C. Rain: Work under this section shall not be started or maintained under threat of rain, unless the work is not affected by the rain.
- D. Do not place fill during weather conditions which will alter moisture content of fill materials sufficiently to make compaction to the specified densities difficult or impossible.
- E. When reference is made to SWPPP (Storm Water Pollution Prevention Plan, if any within this Project Manual), then comply with all environmental protection requirements included therein.
- F. In accordance with EPA and CF.
- G. Protection:
 - 1. Protect cut and fill areas to prevent water running into excavation. Maintain areas free of water. Remove seeping water immediately by pumps.
 - 2. Protect cut slopes from erosion due to precipitation and other sources of runoff.
 - 3. Protect utilities to remain within the construction area and special construction. If utility lines are uncovered (water, electric, sewer, etc.) not shown on the drawings during excavation of site, notify the Construction Manager promptly for its review and action.
 - 4. Do not permit access to undeveloped portions of the site, nor to areas that are outside of the limits of grading.
 - 5. Tree Protection:
 - a. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Do not permit construction materials, debris, excavated materials, vehicles, equipment, or foot traffic within the drip line of the fenced trees. Remove fence when construction is complete.
 - b. Do not excavate within drip line of trees, unless otherwise indicated. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible. Cover exposed roots with burlap, water regularly, and backfill as soon as possible. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil. Coat cut

faces of roots more than 1-1/2 inches (38 mm) in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.

- c. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by the Construction Manager and employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

1.10 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017700 Closeout Submittals.
- B. Accurately record actual locations of utilities encountered including depth and horizontal location, as measured from permanent site features.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fill in Turf or Other Planting Areas: Type S2 or S3 per Section 31 05 13, and as required by Section 31 05 13
- B. Fill in Non-planting Areas: Type S1, S2 or S4 per Section 31 05 13

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify site conditions.

3.2 PREPARATION

- A. Layout of Work:
 - 1. Contractor shall be responsible for all lines and grades.
 - 2. Check all bench marks, monuments and property lines and verify locations.
 - 3. Locate and maintain all grade stakes.
 - 4. Monuments moved, damaged or displaced during grading operations are to be replaced by a California Registered Civil Engineer or Surveyor, at Contractor's expense.
- B. Locate, identify, and protect existing above and below grade utilities from damage.
- C. Protect plant life, lawns, trees, shrubs, and other features not authorized for removal.
- D. Protect existing structures, fences, curbs, sidewalks, paving and other improvements to remain from damage from excavation equipment and vehicular traffic.
- E. Employ equipment and methods appropriate to the work site.

- F. Protect excavated areas from drainage inflow, and provide for drainage of all excavated areas.
- G. Comply with all provisions of the Construction Safety Orders and General Safety Orders of the California Division of Industrial Safety, as well as all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground in excavations.
- H. Complete clearing and grubbing and site demolition as specified. Vegetation, root balls, trash, debris, fill material, and the near-surface soils containing objectionable organic material should be stripped and hauled off-site or used as finish fill in landscape areas.

3.3 EXCAVATION

- A. Hard Pan: It is expected that hard pan soils will be exposed during excavation. If the hard pan soil meets the satisfaction of the Construction Manager the contractor may build on top of the hard pan layers. If the hard pan soil layers do not meet the satisfaction of the Construction Manager the contractor will be required to remove the hard pan soil at no additional cost to the owner.
- B. Excavate soil to finish subgrade of improvements (or layer thereof) to be placed thereon, or to finish surface grade where no improvements are to be placed thereon.
- C. Conform excavation to the lines, grades and cross-sections shown on the plans.
- D. When excavating through tree roots, perform work by hand and cut roots, where authorized, with a saw.
- E. Remove excess soil not to be used as fill in the Work from the site. Unless requested by Construction Manager to be deposited at a site designated by Construction Manager on the property, obtain a disposal site and legally dispose of said excess material, all at no additional cost to the Owner.

3.4 FILLING AND COMPACTING

- A. Clear all debris, vegetable matter and other deleterious material from areas to receive fill.
- B. Prior to filling, complete overexcavation as described in Section 312200/3.3, and prepare the surface as specified in Section 312200/3.5.
- C. On existing slope areas steeper than 8 horizontal to 1 vertical, plow or scarify existing surface to a depth of 8" prior to filling to produce a bond with the material to be placed.
- D. Place and compact soil fill to finish subgrade of improvements (or layer thereof) to be placed thereon, or to finish surface grade where no improvements are to be placed thereon.
- E. In areas to receive non-vegetative surface improvements, place fill in uniform layers not exceeding 8-inches in uncompacted thickness, moisture condition to 3% above optimum moisture content and compact to a minimum of 92% relative compaction to within 12-inches of finished grade or subgrade, aggregate base, or concrete surface. The top 12-inches shall be compacted to 95% relative compaction.

- F. In areas to receive vegetation, place fill in uniform layers not exceeding 8-inches in uncompacted thickness, moisture condition to 3% above optimum moisture content and compact to a minimum of 92% relative compaction up to 12-inches below finished grade and obtain 85% relative compaction in the top 12-inches.
- G. Conform fill to the lines, grades and cross-sections shown on the plans.
- H. Maintain optimum moisture content of fill materials to attain required compaction density.
- I. Fill materials to conform to Section 312200/2.1.
- J. Provide, at no additional cost to Owner, imported soil material conforming to the requirements of Section 312200/2.1, as needed to attain finished grades of Work.
- K. Fill material placed beneath areas to receive asphalt concrete pavement shall have a minimum R-Value of 50.
- L. Utilize equipment which will not disturb or damage existing utilities and other improvements.
- M. Buried metallic objects shall have a protective coating or wrap to prevent direct contact with soil.

3.5 PREPARATION OF SUBGRADE FOR SURFACE IMPROVEMENTS

- A. Where concrete, asphalt-concrete, aggregate base, or other non-vegetative surface improvements, or a layer of said surface improvements, are to be constructed on the soil surface, prepare the subgrade for said improvements in accordance with this section.
- B. Scarify the ground surface to a minimum depth of 12-inches, moisture condition to 3% above optimum moisture content, and compact to at least 95% relative compaction.
- C. Thoroughly moisture condition, mix, roll and compact to the relative compaction specified herein.
- D. Prior to commencing construction of surface improvements, pass a test roller of size and weight as approved by the Construction Manager over the subgrade to establish the extent of soft or spongy areas requiring repairs. Subgrade material in such areas shall be removed and replaced to the satisfaction of the Construction Manager. No additional payment will be made for test rolling or the correction of subgrade deficiencies identified thereby.
- E. Conform finished subgrade surface to the lines, grades and cross-sections shown on the plans.

3.6 FINE GRADING

- A. Fine grade all finished surfaces to the lines, grades and cross-sections shown on the plans, and to blend to hard surface improvements.
- B. Rake and smooth all finished surfaces not to receive hard surface improvements.

3.7 TOLERANCES

- A. Top surface of Subgrade for Non-Vegetative Surface Improvements or Layers thereof: Plus or minus 0.02 feet from planned elevation.
- B. Top surface of Subgrade for Vegetative Surface Improvements or for Bare Ground - Plus or minus 0.05 feet of planned elevation, or as required for finish surface to match adjacent improvements or ground.

3.8 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of the City of Fresno Standard Specifications.
- B. Compaction testing will be performed in accordance with ANSI/ASTM D1557.
- C. If tests indicate work does not meet specified requirements, recompact, or remove and replace, and retest.
- D. All retesting required as a result of failure of initial test will be at the expense of the Contractor.
- E. Where graded surfaces are not within the tolerances of this section, correct out of tolerance areas and resurvey prior to submitting final as-graded survey.

END OF SECTION 312200

SECTION 313119 - VEGETATION CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnishing and installing soil sterilant under all new asphaltic-concrete pavement.

1.2 RELATED SECTIONS

- A. Division 31
- B. Section 321123 - Aggregate Base Courses.
- C. Section 321200 - Flexible Paving.

1.3 STANDARDS

- A. In accordance with the following:
 - 1. California Building Code, California Code of Regulations, Title 24, Part 2, CCR-T24.
 - 2. CCR-T21 - California Code of Regulations, Title 21 Public Works.
 - 3. Environmental Protection Agency.
 - 4. United States Department of Agriculture.
 - 5. All applicable Environmental Regulations and Standards.

1.4 QUALITY ASSURANCE

- A. Provide licensed operator to apply soil sterilant.
- B. All products shall comply with the current EPA laws at time of application.

1.5 SUBMITTALS

- A. Submit in accordance with Section 013300 Submittal Procedures
- B. Certificates of application.
- C. Certificates of compliance for material.

1.6 COORDINATION

- A. Coordinate with other work, including subgrade preparation and asphaltic-concrete paving.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Soil Sterilant/Herbicide: Treflan, weed and grass preventer, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that site is ready for application.

3.2 PREPARATION

- A. Identify installation locations.
- B. Employ equipment and methods appropriate to the work site.

3.3 APPLICATION

- A. Thoroughly water soak surface to be treated. Avoid excessive water runoff.
- B. Apply sterilant solution over surface to be paved prior to application of asphalt-concrete.
- C. Apply in spray form, at rate as allowable by State of California.
- D. Take all precautions to limit soil sterilant solution to areas immediately under proposed pavement. Use shields as necessary, and do not apply under windy conditions.

END OF SECTION 313119

SECTION 320001 - OFFSITE DEVELOPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnishing all labor, materials and equipment necessary to provide, construct and install street improvements, fire improvements, sewer improvements and drainage improvements to City of Fresno, Fresno Metropolitan Flood Control District and CALTRANS, standards.

1.2 RELATED SECTIONS

- A. Documents affecting work of this Section include, but are not necessarily limited to, City of Fresno Standard Specifications and Drawings.

1.3 QUALITY ASSURANCE

- A. Standards: Comply with the following standards:
 - 1. City of Fresno Standard Drawings and Specifications, latest edition.
 - 2. SSCDOT – Standard Specifications, State of California Department of Transportation (Caltrans), latest edition, except for references to method of payment and references to any State furnished materials.
- B. All work shall comply with the rules and regulations of the Division of Industrial Safety and all other local, state and federal agencies having jurisdiction. Nothing contained herein shall be construed as permitting work that is contrary to such rules, regulations and codes.

1.4 SUBMITTALS

- A. Comply with all Section 013300 Submittal Procedures
- B. Submit all test reports for compaction.

1.5 SCOPE OF WORK

- A. Street improvements include, but are not limited to, demolition, clearing and grubbing, pavement removal, relocating or reconstructing interfering existing utilities, extension of existing utilities, removing signs, posts and footings, removing fencing, sawcutting, constructing permanent pavement, concrete curb and gutter, concrete sidewalks, handicap ramp, driveway approaches, paving transitions, furnishing and placement of traffic striping and signs all as indicated on the Plans, in these Specifications, and in conformance with the City of Fresno Standard Plans and Specifications and SSCDOT.
- B. Sewer ~~and water~~ facilities shall consist of constructing ~~new water facilities~~, new sewer facilities, ~~water service~~, sewer service, valves, protect existing utilities, and trench resurfacing and all other pertinent facilities and operations required to construct ~~water and~~ sewer services as specified herein and as represented on the Plans, all in conformance with the City of Fresno Standard Plans and Specifications.

C. Water and irrigation facilities shall consist of constructing new service, valves, backflow devices, and connection to the outlet side of the meter. City Forces will wet tap and install the water service from the water main in the city street to the water meter. The water meter and box, trenching and trench resurfacing will be performed by City Forces. All other pertinent facilities and operations required to construct water services beyond the outlet of the meter will be the responsibility of the Contractor as specified herein and as represented on the Plans, all in conformance with the City of Fresno Standard Plans and Specifications.

CD. Storm drain facilities shall be protected and adjusted as represented on the plans, all in conformance with the City Fresno and Fresno Metropolitan Flood Control District Standard Plans and Specifications.

DE. The Contractor is responsible for all coordination and project scheduling with Pacific Gas and Electric Company, ~~and Telephone Company,~~ and Cable Company regarding their work of relocating and/or undergrounding their facilities within the street right of ways adjacent to the site. Such responsibility shall include, but not necessarily be limited to: the Contractor establishing and maintaining communication with the utility companies regarding his schedule and that of the utility companies; the preparation of street and sidewalk subgrade so that the utility companies can trench for their underground facilities; the establishment of surveyed street curb grades and alignments for the utility companies so that they may accurately locate their facilities; and the possible requirement to schedule his work around existing utility poles until such time as the utility companies complete their relocation or installations. Such coordination may require the Contractor to schedule multiple move-ins of equipment and personnel so that his work can be accomplished, and the utility company's work can be accomplished, as required by the construction documents. The owner has made a diligent attempt to provide the various utility companies with project plans of the work prior to bidding.

1.6 EXISTING CONDITIONS

A. Contractor shall be held to have visited the site prior to submitting proposal to determine existing conditions, nature of materials to be encountered and to evaluate other information concerning or affecting the work to be performed under the contract.

B. Before commencing excavation, the Contractor shall notify all utility authorities or utility companies having possible interest in the work of the Contractor's intention to excavate proximate to existing facilities and Contractor shall verify the location of any utilities within the work area.

C. The owner has made a diligent attempt to show on the Construction Drawings all pertinent intersecting utilities which may affect the work. Utilities shown in profile view are shown at their most probable locations, based upon available as-built drawings and known construction custom. The Contractor shall exercise caution while performing excavation for this project and shall protect existing utilities from damage, inasmuch as their exact location is unknown until exposed by the excavation.

D. All existing utility mains and service lines shall be kept in constant service during the construction of this project. Hand excavating shall be employed where necessary to safely expose existing utilities.

E. Full compensation for all costs involved in locating, verifying, protecting, exposing, relocating, reconstruction and otherwise providing for utilities shall be included in the

amount bid for the various items of work and no separate payment shall be made therefore.

1.7 DUST AND TRAFFIC CONTROL

A. Dust Control

1. Contractor to comply with San Joaquin Valley Air Pollution Control District (SJVAPCD), and City of Fresno Standard Specification requirements. The contractor shall acquire a dust control permit from SJVAPCD.

B. Traffic Control

1. Traffic control measures shall be fully and completely carried out at all times to the satisfaction of the City of Fresno.
2. Through traffic shall be provided for at all times.
3. The Contractor shall comply with all requirements of the City of Fresno Street Encroachment Permit.

1.8 PROTECTIVE MEASURES

- ##### A.
- Furnish, place, and maintain all supports, shoring, and sheet piling which may be required for the sides of excavation or for protection of adjacent existing improvements. The adequacy of such systems shall be the complete responsibility of the Contractor.

- ##### B.
- Maintain all bench marks, monuments and other reference points. If disturbed or destroyed, replace as directed.

1.9 PERMITS

- ##### A.
- The Contractor shall secure and pay for City of Fresno Encroachment Permit.

1.10 FINISH ELEVATIONS AND LINES

- ##### A.
- Carefully preserve all data and monuments set by the Owner and, if displaced or lost, the Contractor shall immediately replace such monuments to the satisfaction of the Construction Manager and at no additional cost to the Owner.

1.11 REPRESENTATION ON PLANS

- ##### A.
- The basic topographic ground feature information shown on the plans was obtained by field survey. The Contractor shall carefully examine the site of work and shall satisfy himself as to the conditions to be encountered.

1.12 MONITORING OF CONSTRUCTION SITE

- ##### A.
- The Contractor shall monitor the construction site on a regular basis during non-working hours; including weekends and holidays to ensure that no situations arise relating to the condition of the work site, which could pose a threat to public safety. In addition the contractor shall furnish to the Owner and to the City of Fresno prior to the issuance of the "Notice to Proceed", a list of persons, together with their addresses and home telephone numbers, who are authorized to act on behalf of the Contractor in an emergency arising out of conditions at the work site after normal working hours.

- B. Safe pedestrian crossings shall be maintained at all existing crosswalks and intersections.
- C. The Contractor shall secure the site of work at all times. Unauthorized persons shall not be allowed in or along the excavation, on spoil piles or at other undesirable locations within the work. The Contractor shall provide suitable traffic and pedestrian warning devices and signs necessary at or near the work as required by safety considerations and/or jurisdictional authorities. Convenient pedestrian detours and/or flagmen and/or safe temporary bridges over excavations, complete with adequate safety rails, shall be provided as necessary.

1.13 COMPACTION AND COMPACTION TESTS

- A. The Contractor shall be fully responsible for timely compaction and suitability of material for compaction. Where necessary, wet and pumping material shall be removed from the trench or excavation by the Contractor and replaced with suitable approved material as necessary to complete operations within the times allowed.
- B. Compaction requirements for all excavations within public streets shall be in accordance with the City of Fresno Encroachment Permit and in accordance with the City of Fresno Standard Specifications.
- C. Initial compaction testing shall be provided by the Owner. The Contractor shall file adequate notice to the Construction Manager when he desires compaction testing. All required compaction retesting of backfill because of failure to pass the initial compaction test shall be at the expense of the Contractor.
- D. Full compensation for all costs involved in meeting and satisfying the above requirements shall be included in the amount bid for the various items of work and no separate payment will be made therefor.

1.14 RECORD DRAWINGS

- A. Comply with Section 017700 Closeout Submittals

PART 2 - MATERIALS

2.1 GENERAL

- A. All materials incorporated in street, water, sewer and storm drain facilities construction shall conform to the City of Fresno Standard Plans and Specifications, Fresno Metropolitan Flood Control District and SCCDOT.

PART 3 - EXECUTION

3.1 GENERAL

- A. Construction of water, sewer and street facilities shall be performed in accordance with the City of Fresno Standard Plans and Specifications, Fresno Metropolitan Flood Control District and SCCDOT.

- B. The Contractor shall be responsible to protect all other existing and proposed utilities and improvements affected by his work.
- C. The Contractor shall cooperate with all other contractors on the job to insure that his activities do not delay or hinder the construction activities of others.

END OF SECTION 320001

SECTION 321123 - AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnishing, spreading and compacting aggregate base course.

1.2 RELATED SECTIONS

- A. City of Fresno Standard Specifications
- B. Division 31.
- C. Section 321200 - Flexible Paving

1.3 REFERENCES

- A. SSCDOT - Standard Specifications, State of California Department of Transportation (Caltrans), latest edition, except for references to method of payment, and references to any state furnished materials.

1.4 QUALITY ASSURANCE

- A. Furnish aggregate materials conforming to SSCDOT.
- B. Perform work in accordance with SSCDOT.

1.5 SUBMITTALS

- A. Submit in accordance with the Section 013300 Submittal Procedures.
- B. Certificates of compliance for material.
- C. Load tags for delivered material.

1.6 COORDINATION

- A. Coordinate with other work, including subgrade preparation and soil sterilization.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregate Base: 100% reclaimed asphalt concrete, Portland cement concrete, lean concrete base, cement treated base or a combination thereof meeting the requirements of Class 2, 3/4 Inch Maximum per Section 26 of SSCDOT.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify quantities required.
- B. Verify that subgrade has been compacted to minimum of 95 percent relative compaction and is dry.
- C. Verify gradients and elevations of subgrade are correct.

3.2 SUBBASE

- A. Per Sections 312200 and 312300, unless shown otherwise on the plans. Compacted soil subgrade forms the base construction for work of this Section.

3.3 INSTALLATION OF AGGREGATE BASE COURSE

- A. Install in conformance with SSCDOT Section 26, Aggregate Bases.
- B. Thickness - As shown on construction drawings.
- C. Spreading and Compacting - In accordance with Section 26, SSCDOT. The relative compaction of each layer of compacted base material shall be not less than 95 percent.
- D. The completed surface shall be thoroughly compacted, free from ruts, depressions, and irregularities and to be true to grade and cross-section, and shall conform to Section 26, SSCDOT.

3.4 TOLERANCES

- A. Finished Surface: The surface of the finish aggregate base at any point shall not vary more than 0.03 feet above or below the specified grade at that point. No more than 50% of the finish surface shall be above or below the specific grade for aggregate base.

3.5 PROTECTION

- A. Immediately after placement and compaction protect surface from mechanical injury.
- B. Protect completed surface until surfacing layers are in place.

END OF SECTION 321123

SECTION 321200 - FLEXIBLE PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Asphaltic-concrete paving.
- B. Asphaltic seal coat.

1.2 RELATED SECTIONS

- A. City of Fresno Standard Specifications
- B. Division 31
- C. Section 321123 - Aggregate Base Courses.
- D. Section 321723 - Painting and Marking Site Surfaces.
- E. Section 313119 – Vegetation Control

1.3 REFERENCES

- A. SSCDOT - Standard Specifications, State of California Department of Transportation (Caltrans), latest edition, except for references to method of payment, and references to any state furnished materials.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with SSCDOT.
- B. Perform water test on all pavement and drainage areas with Construction Manager's approval prior to sealing pavement.

1.5 SUBMITTALS

- A. Submit in accordance with Section 013300 Submittal Procedures
- B. Certificates of compliance for material.
- C. Load tags for delivered material.

1.6 COORDINATION

- A. Coordinate with other work, including subgrade preparation and soil sterilization.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphaltic-concrete when atmosphere temperature is less than 50 degrees Fahrenheit or when surface is wet or frozen.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Paint Binder: In accordance with SSCDOT Section 94, Asphaltic Emulsions.
- B. Asphalt-Concrete: Type B in accordance with Section 39, SSCDOT, ½ inch or ¾ inch maximum aggregate (medium) per Plans. The asphaltic concrete should be compacted to an average relative compaction of 97 percent, with no single test value being below a relative compaction of 95 percent based on a 50 blow Marshall maximum density. Use asphalt binder viscosity grade PG 64-10 or as directed by the Construction Manager. The bitumen ratio shall be no less than 3 and no more than 7 pounds of asphalt per 100 pounds of dry aggregate.
- C. Seal Coat: Asphalt based seal coat shall be "Guardtop" as manufactured by Industrial Asphalt, Irwindale, California, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify quantities required. New asphaltic-concrete paving is required at all locations shown on the plans, and where existing asphaltic-concrete paving to remain is removed or damaged by the Project excavation or related work.
- B. Verify that subgrade has been properly prepared and compacted to required relative compaction.
- C. Verify gradients and elevations of base are correct.
- D. Verify that subgrade has been sterilized per Section 313119.

3.2 BASE

- A. Where shown on the construction plans, place and compact aggregate base course per Section 321123.
- B. Where shown on the construction plans, place asphaltic-concrete on compacted earth subgrade per Sections 312200 and 312300.
- C. A soil sterilant shall be applied over the entire area which is to be paved. Refer to Section 313119.

3.3 PREPARATION - PAINT BINDER

- A. Apply paint binder to existing asphaltic-concrete or concrete surfaces which will be in contact with new asphaltic-concrete surfacing.
- B. Rate of application for all surfaces against which asphalt concrete is to be placed shall be no less than 0.02 and no more than 0.05 gallons per square yard. All vertical concrete surfaces which will be in contact with asphalt concrete surfacing and all areas now in place which will be covered with new surfacing materials and feathering operations shall be coated with a paint binder applied at the rate of 0.05 gallons per square yard.

3.4 INSTALLATION OF ASPHALTIC-CONCRETE

- A. Install in conformance with SSCDOT Section 39, Asphalt-Concrete.
- B. Thickness - As shown on construction plans. Where thickness exceeds 2 inches, place in no less than 2 layers with top layer no thicker than one inch. Asphaltic concrete shall be laid to the thickness designated on the Plans. The plan thickness is to be considered as a minimum thickness. The Contractor shall lay the asphaltic concrete to a depth required to insure that, after compaction, the in place compacted thickness is equal to or greater than the specified plan thickness.
 - 1. The Contractor shall provide to the Construction Manager the truck delivery weight tags for the asphaltic concrete material. The quantity delivered shall be equal to or greater than the calculated in place quantity based on the specified thickness and area to be paved as designated on the construction plans and based on a unit density of the asphaltic concrete of 141 pounds per cubic feet.
- C. Asphalt type: PG 64-10
- D. Compaction Equipment - In accordance with Section 39, SSCDOT. At small difficult areas, equipment may be altered as approved by Construction Manager.
- E. The completed surface shall be thoroughly compacted, free from ruts, depressions, and irregularities and to be true to grade and cross-section.

3.5 INSTALLATION OF SEAL COAT

- A. Immediately prior to applying the sealer, the surface shall be cleaned of all loose material which might adversely affect bonding of the sealer. Any standard cleaning method such as power sweepers and blowers may be employed.
- B. Existing Pavement
 - 1. Where cracks exceed 1/2 inch in depth of 1/4 inch in width, or both, they shall be thoroughly cleaned and repaired with asphalt crack filler material before placing the sealer. All cracks between 1/8 inch and 1/4 inch in width shall be filled with "Guardtop Crackfiller", as manufactured by Industrial Asphalt, or approved equal, in accordance with the manufacturer's recommendations.
 - 2. Whether or not specifically indicated on the plans, all potholes and badly distorted or depressed areas, except those lying within areas designated for pavement

removal and replacement shall be properly cleaned and repaired by applying a binder coat and hot mix asphalt concrete patch conforming to the requirements of Section 39, SSCDOT, before placing the seal coat. Any vegetation such as soil sterilant approved by the Construction Manager shall be applied to the area and any required pavement patching shall then be completed.

3. A prime coat of SS-1 asphalt emulsion diluted with water, to 5 parts water to 1 part asphaltic emulsion, shall be applied to all existing (not new) pavement surfaces at a rate of application of 0.05 to 0.10 gallon of diluted primer per square yard.
- C. Following the prime coat, two coats of asphalt based seal coat shall be applied. The first coat shall have added to it a silica sand mineral filler, which has passed a 50-mesh screen, at a rate of 2 to 3 pounds per 1 gallon of concentrated sealer. When the first coat is dry enough to walk on without picking the material up, a second coat shall be applied without mineral filler. If the manufacturer indicates that the product may be diluted, it may be diluted with no more than 20 percent by volume clean fresh water with the prior approval of the Construction Manager. The total application rate shall be a minimum of 35 to 45 gallons of undiluted product per 1,000 square feet, as directed by the Construction Manager. The finished surface shall be smooth and uniform in appearance. If existing depressions are such that aggregate still protrudes after the second coat of asphalt based sealer has been applied, the Contractor shall apply a third coat when so directed by the Construction Manager.
1. Seal Coat (for new pavement) - a minimum of 20 gallons of undiluted product per 1,000 square feet, as directed by the Construction Manager.
 2. Seal Coat (for existing pavement) - 35 to 40 gallons of undiluted product per 1,000 square feet, as directed by the Construction Manager.
- D. Allow asphaltic-concrete to cure 7 days minimum prior to sealing.
- E. Broom clean asphaltic-concrete prior to sealing.
- F. Protect sealed surface until it is cured.

3.6 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10-foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.

3.7 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury.
- B. Allow asphaltic-concrete to cure 7 days minimum prior to placement of seal coat, or in accordance with manufacturer's recommendations.
- C. Broom clean asphaltic-concrete prior to sealing.
- D. Protect sealed surface until it is cured.

3.8 REPLACEMENT OF PAVEMENT STRIPING AND MARKING

- A. Replace all pavement striping and marking removed or obliterated by the work per Section 321723, unless indicated otherwise on the plans.

END OF SECTION 321200

SECTION 321723 - PAINT AND MARKING SITE SURFACE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnishing and installing painted parking stall, traffic marking and wording on asphaltic-concrete surfaces.
- B. Furnishing and installing accessible marking and hatching area on asphaltic-concrete pavement.

1.2 RELATED SECTIONS

- A. City of Fresno Standard Specifications
- B. Section 321200 - Flexible Paving.
- C. Section 033000.1 – Site Cast-in-place Concrete.

1.3 REFERENCES

- A. SSCDOT - Standard Specifications, California Department of Transportation (Caltrans), latest edition, except for references to methods of payment and to furnishing of materials by State.

1.4 SUBMITTALS

- A. Submit in accordance with Section 013300 Submittal Procedures.
- B. Certificates of compliance for material.

1.5 COORDINATION

- A. Coordinate work with other work, including associated traffic signing.
- B. Commence striping or marking of asphaltic-concrete no sooner than 5 days following any sealing of the asphaltic-concrete, or as recommended by seal coat manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Paint: Quick drying, high visibility water soluble acrylic striping paint; Stripe Master, Wikel Mfg. Company, or similar by Sherwin Williams or approved equal.
- B. Paint shall be of color indicated on the construction plans.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that site is ready for application.

3.2 PREPARATION

- A. Identify installation locations. Install parking stall striping, traffic marking, wording, accessible symbol and access striping at locations, as shown on construction plans.
- B. Thoroughly clean all surfaces to be painted.
- C. Employ equipment and methods appropriate to the work site.

3.3 INSTALLATION

- A. Apply paint striping and marking as indicated on the plans.
- B. Apply paint uniformly, straight and true, with equipment designed for traffic striping and marking applications.
- C. Apply paint striping and marking per Section 84 of SSCDOT.
- D. Apply a minimum of 2 coats of paint at all striping and marking locations, including asphaltic-concrete and concrete surfaces.

END OF SECTION 321723

SECTION 323100 - FENCES AND GATES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provisions of constructing chain link fence at locations shown on the Construction Documents, including but not limited to:

1. Site chain link fencing and walk gates

1.2 RELATED SECTIONS

- A. Division 31
- C. Section 033000.1 – Site Cast-in-Place Concrete.

1.3 QUALITY ASSURANCE

- A. Qualifications of Installer

1. Throughout the progress of installation of the work of this Section, provide at least one person who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills, and who shall be present at the site and shall direct all work performed under this Section.
2. In actual installation of the work of this Section, use adequate numbers of skilled workmen to insure installation in strict accordance with the contract documents.
3. In acceptance or rejection of work performed under this Section, the Construction Manager will make no allowance for lack of skill on the part of the workmen.

1.4 PRODUCT HANDLING

- A. Protection

1. Use all means necessary to protect the materials of this Section before, during and after installation, and to protect the work of other trades.
2. Replacements
 - a. In the event of damage, immediately make all repairs and replacements necessary to the satisfaction of the Construction Manager and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 CHAIN LINK FENCING, GATES

- A. The materials and fabrication of chain link fabric shall conform to these Specifications, and as shown on the plans and details.
- B. All ferrous materials shall be new and galvanized. Imperfectly galvanized material or material upon which serious abrasions of the galvanizing occur shall not be used.

- C. Height - All fencing and gates shall stand at the heights shown on the plans.
- D. Fabric - Chain link fabric shall conform to the specifications of ASTM, Designation: A392, Class 1. The wire used in the manufacture of the fabric shall be 9-gauge. All chain link fabric shall be woven into approximately 2 inch mesh. Fabric shall be furnished with knuckling at all selvages. The knuckled selvaqe shall be used along all corners and edges. Fabric shall be GBW, galvanized before weaving.
- E. Posts, braces and gate frames - The base material for the manufacture of steel pipe used for posts and braces shall conform to the specifications of ASTM, Designation: A53, standard weight, Schedule 40, and the base material for the manufacture of other steel sections used for posts and braces shall be good commercial quality weldable steel.
- F. All posts, braces and gate frames shall conform to the size and weight designations shown on the plans.
- G. All posts shall be fitted with rainproof caps designed so as to fit securely over the top of the posts.
- H. All posts shall be of a total length of not less than the depth of the concrete footing as shown on the plans, plus the length required above ground.
- I. Posts and braces shall be galvanized in accordance with specifications of ASTM, Designation: A123.
- J. All horizontal braces shall be attached to posts by approved steel fixtures.
- K. All welding shall conform to the requirements of the California Building Code.
- L. Where the galvanized surface has been burned by welding, all surfaces of the welded connections shall be thoroughly cleaned by wire brushing and all traces of the welding flux and loose or cracked galvanizing removed. The damaged area and weld shall then be painted in accordance with the following details.
- M. All galvanized, welded, or damaged surfaces that are to be painted shall first be cleaned by washing with mineral spirit solvent sufficient to remove any oil, grease or other materials foreign to the galvanized coating.
- N. After washing, all areas shall be roughened by abrasive blasting using an abrasive that is no larger than 30-mesh. Galvanizing shall not be removed by this operation.
- O. After preparation, all galvanized surfaces that are to be painted shall be covered with one application of Zinc Dust-Zinc Oxide Primer, Federal Specification TT-P-641, Type II. The Zinc Dust-Zinc Oxide paint shall be applied by spraying to produce a complete covering of the galvanized surface.
- P. After the application of the Zinc Dust-Zinc Oxide paint, one application of Pre-Treatment, Vinyl Wash Primer, Section 91-2 of the State Standard Specifications, shall be applied to such surfaces. The Vinyl Wash Primer shall be applied by spraying to produce a uniform wet film on the surface.

- Q. Such surfaces shall then be covered with two separate applications of White Tint Base Vinyl Finish Coat, Section 91-2 of the State Standard Specifications, sufficient to completely cover the preceding color. Paint for the first application shall be tinted with a compatible coloring agent to slightly contrast with the color of the second application. After drying for 24 hours, one application of Aluminum Paint, Finish Coat, Section 91-2 of the State Standard Specifications, shall be painted on the welded areas.
- R. Stretcher bars and other required fittings and hardware shall be steel and shall be galvanized in accordance with the specifications of ASTM, Designation: A153.
- S. All swinging gates and walk gates to be installed with a gate holdback in the concrete mowstrip, unless otherwise noted.
- T. Concrete mowstrip shall be in accordance with Section 033000.1.
- U. Walk gate shall be constructed as per detailed drawings.

PART 3 - EXECUTION

3.1 CHAIN LINK FENCING AND GATES

- A. All posts shall be set in concrete footings as shown on the plans to within 3 inches of bottom.
- B. All vertical line and end posts shall be braced to the nearest adjacent vertical post with galvanized horizontal braces as shown on the plans.
- C. Perimeter fencing chain link fabric shall be fastened to the outside of the fence.
- D. All fabric shall be stretched and securely fastened to the posts, as follows:
 - 1. The fabric shall be fastened to end, corner and gate posts with 3/16 inch by 5/8 inch stretcher bars and not less than 1/8 inch by 3/4 inch stretcher bar bands spaced at one foot intervals for whatever widths of fabric are supplied. The fabric shall be fastened to line posts with tie wires or post clips. Tie wires shall be at least 9-gauge (0.148 inch diameter) steel. Post clips shall be at least 6-gauge (0.192 inch diameter) steel. The wire or clip fasteners shall be spaced at approximately 14 inches on line posts, with a minimum of 5 fasteners per 6 foot high post. Top and bottom edges of the fabric shall be secured to each horizontal brace with tie wires or fastened to tension wire with hog rings spaced at 15 inch maximum intervals. Hog rings shall be at least 9-gauge (0.148 inch diameter) steel. Wire ties shall be given at least one complete turn. Hog rings shall be closed with ends overlapping. The distance from the selvage to the braces or top rails shall be 2 inch maximum and shall be fastened to the brace or rail by wire fasteners spaced at approximately 14 inches with a minimum of 8 fasteners per each 10 foot horizontal span.
- E. Construct concrete mowstrip at the width as shown on the plans. Construct walk gate per detailed drawing with accessories. Construct backstop per detail drawings.

ENVIRONMENTAL COMPLIANCE CENTER
FRESNO, CA

FENCES AND GATES
SECTION 323100 - 4

END OF SECTION 323100

SECTION 323119 - STEEL ORNAMENTAL PICKET FENCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Steel Ornamental picket fencing.

1.2 RELATED SECTIONS

- A. DIVISION 03 - CONCRETE

1.3 SUBMITTALS

- A. Shop drawing of fences and gates with all dimensions, details, and finishes. Drawings must include post foundations.
- B. Product data: Manufacturer's catalog cuts indicating materials compliance that all conditions of the specifications have been met.

1.4 SPECIAL WARRANTY

- A. Provide manufacturer's standard limited warranty that its ornamental fence system is free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of 15 years from the date of purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Merchants Metals: Houston, Texas 77032. (Phone 866-888-5611) is the basis of design. Model / Style: Guardsman, Monroe, 3 Rails, 8' panel section with $\frac{3}{4}$ " Pickets. Height: 4'.
- B. Ameristar: 1555 N. Mingo, Tulsa, OK 74116, 1-888-333-3422, Model / Style: Montage Plus with the following options:
 - a. Rails: 11 gauge.
 - b. Posts: 12 gauge
 - c. Style: Montage Plus Majestic Style M3 (3-Rail) with Flush Bottom Rail.
 - d. All Terrain Fence (ATF) panel design.
- B. Or approved equal.

2.2 ORNAMENTAL PICKET FENCE

- C. Pickets: Galvanized square steel tubular members manufactured per ASTM F-2589, and ASTM A-924/A-924M, having a 45,000 psi (310 MPa) yield strength and hot-dip galvanized per ASTM A653/A653M with a G90 zinc coating, 0.90 oz/ft² (0.27 kg/M²). Minimum size pickets 3/4". Space pickets 3-29/32" maximum (98 mm) face to face. Attach each picket to each rail with 1/4" (6 mm) industrial drive rivets. Size #4. Minimum gauge wall thickness 16 gauge.
- D. Rails: 1-1/2" (38mm) x 1-3/8" (35mm) x 1-1/2" (38mm), 11 gauge [0.120" (3.05mm)] thick galvanized steel "U" channel per ASTM A-653/A-653M, having a 50,000 psi (344 MPa) yield strength and G90 zinc coating, 0.90 oz/ft² (0.27 kg/M²). Punch rails to receive pickets and rivets and attach rails to rail brackets with 2 each, 1/4" (6 mm) industrial drive rivets.
- E. Posts: Made of galvanized steel tube, galvanized inside and outside, produced per ASTM A-653/653M -G90 zinc coating, 0.90 oz/ft² (0.27 kg/M²), steel to have 45,000 psi (310 MPa) yield strength. Post size 2-1/2". Posts to have 11 gauge wall thickness.
- F. Finish: All primary components receive a thorough cleaning and pre-treatment; this 10-step process consists of:
 - a. Hot alkaline cleaner
 - b. Clear water rinse
 - c. Hot iron phosphate application
 - d. Clear water rinse
 - e. Reverse Osmosis rinse
 - f. Dry off oven heat at 425° F
 - g. Zinc enriched powder primer coat at 2-4 mils.
 - h. Gel oven heat at 400° F
 - i. Ultra polyester finish T.G.I.C. powder coat at 2-4 mils.
 - j. Final curing oven at 450° F
- G. Color: Black
- H. All coated materials capable of meeting the performance requirements for each quality characteristic shown below.

COATING PERFORMANCE REQUIREMENTS

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife
Corrosion Resistance	B117 & D1654	Corrosion resistance over 3,500 hours (Scribes per D1654; Failure mode is accumulation or 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	60 inch pound Impact Resistance. (Forward impact using 0.625 ball).
Weathering	D822, D2244, & D523	Weathering Resistance over 1,000

Resistance	(60° Angle Method)	hours (Failure mode is 60% loss of gloss or color variance of more than 3.0 delta-E color units).
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2.3 ACCESSORIES

- A. Industrial drive rivets hold pickets to rails and rails to brackets. Rivets must have a shear strength of 1,500# (6674 N) and a holding power of 1,100# (4894 N).
- B. Rail/Post Brackets (steel post to rail connection): Die cast of zinc (ZAMAK #3 alloy) per ASTM B86-83Z 33521. Designed to angle up to 30° (up/down or left/right) to accommodate changes in grade or direction. Bracket to have cover for complete security. Cover to be riveted to bracket for permanent installation. (Minimum shear strength 3,000 lbs. and holding power 2,200 lbs.)
- C. Post Caps: Cast aluminum or malleable iron or formed steel manufactured to form a weather-tight closure. Caps to be flat top style on all posts. Fasten to post using two #8 sheet metal screws, one on each side of cap.
- D. Rail to pilaster brackets:

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify areas to receive fencing are completed to final grades and elevations.
- B. Property lines and legal boundaries of work to be clearly established by the contractor.

3.2 FENCE INSTALLATION

- A. Panel to steel post connection:
 - a. Install fence per manufacturer's recommendations, except as otherwise noted.
 - b. Space posts uniformly at 91-3/4" (2331mm) face to face unless instructed otherwise.
 - c. Set posts in concrete. Dig holes having a diameter 4 times the diameter of the post, and 6" (152 mm) deeper than the bottom of the post. Forms are not necessary or recommended. Minimum depth of footings shall be 30".
 - d. Attach brackets using 1/4" (6 mm) carriage bolts with lock nuts. Attach panels and place tops on bracket. Rivet top to bracket in 2 places to assure security.
 - e. When cutting/drilling rails or posts adhere to manufacturer's instruction for sealing exposed steel surfaces or touch-up, with the following modifications:
 - i. Use paint pens or brushes to prime and finish exposed surfaces as approved by the manufacturer. **Do not use spray cans.**
- B. Panel to pilaster connection:
 - a. Install fence per manufacturer's recommendations, except as otherwise noted.
 - b. Imbed into pilaster 1/4" (6 mm) x 8" long carriage bolts, one per each rail end.

- c. Attach brackets to 1/4" (6 mm) x 8" long carriage bolts with two lock nuts per bracket. One each side of bracket.
- d. Attach panels and place tops on bracket. Rivet top to bracket in 2 places to assure security.
- e. When cutting/drilling rails or posts adhere to manufacturer's instruction for sealing exposed steel surfaces or touch-up, with the following modifications:
 - i. Use paint pens or brushes to prime and finish exposed surfaces as approved by the manufacturer. **Do not use spray cans.**

3.3 CLEANING

- A. Clean up debris and remove from the site.

END OF SECTION 323119

SECTION 331000 - WATER UTILITIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe and fittings for on-site domestic piping.
- B. Valves and valve boxes.
- C. Accessories.

1.2 RELATED SECTIONS

- A. City of Fresno Standard Specifications
- B. Division 31
- C. Section 033000.1 – Site Cast-in-Place Concrete.

1.3 REFERENCES

- A. ASTM Test Method D1557.
- B. ANSI/ASTM D2466 - Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.
- C. ANSI/AWWA C110 - Ductile Iron and Grey-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids.
- D. ANSI/AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- E. ANSI/AWWA C500 - Gate Valves, 3-inch through 48-inch NPS, for Water and Sewage Systems.
- F. ANSI/AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for Water.
- G. ASTM D1785 - Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and Class 200.
- H. ASTM D2855 - Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.
- I. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.

1.4 SUBMITTALS

- A. Submit in accordance with Section 013300 Submittal Procedures
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, backflow preventor and accessories.

- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017700 Closeout Submittals
- B. Accurately record actual locations of piping mains, valves, connections and appurtenances, referenced to permanent surface features.
- C. Identify and describe discovery of uncharted utilities or utilities found at locations different than indicated on plans.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with product manufacturer's recommendations and these Contract Documents.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle all products required.

PART 2 - PRODUCTS

2.1 WATER PIPE

- A. Ductile Iron Pipe (for iron pipe larger than 3 inches in diameter, above ground): ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, thickness Class 50, with cement - mortar lining and seal coating per ANSI/AWWA C104/A21.4.
 - 1. Fittings: ANSI/AWWA C110/A21.10, ductile iron.
 - 2. Joints: Flanged.
- B. PVC Pipe (for pipe 3 inches and smaller, underground): ASTM D1785, Schedule 40; 1120 high impact.
 - 1. Fittings: ANSI/ASTM D2464, Schedule 80 PVC (Schedule 40 PVC for pipes 1-1/2 inches and smaller).
 - 2. Joints: ASTM D2855, solvent weld.
- C. PVC Pipe (for pipe 4 inches and larger, underground): ANSI/AWWA C900 Class 200, 1120 high impact.
 - 1. Fittings: ANSI/AWWA C111, cast iron.
 - 2. Joints: ASTM D3139 compression gasket ring.

2.2 GATE VALVES - Up to 2 Inches (50 mm)

- A. Use full port ball valves for 2 inches and smaller and gate valves for 2-1/2 inches and larger size.

- B. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, IPS ends.

2.3 WATER METER AND BACKFLOW PREVENTOR

- A. Water Meter – Per City of Fresno Standard Specifications.
- B. Backflow Preventor – Per manufacturer's and City of Fresno Specifications.

2.4 VALVE BOXES

- A. Precast Reinforced Concrete. Cast iron lid marked for service. Christy No. G5 or approved equal.

2.5 ACCESSORIES

- A. Concrete for Thrust Blocks and Valve Box Surface Collars: Concrete type specified in Section 033000.
- B. Valve Boxes and Covers: Christy No. G5 traffic box, or approved equal. Cover marking shall read "Water". A one-piece PVC riser extension shall be provided as necessary to allow unobstructed access to valve operating nut.
- C. Solvent Cement and Primer for PVC Pipe and Fittings: Per ASTM F656 and ASTM D2564.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions. All plot dimensions are approximate. Before proceeding with any work, carefully check and verify all dimensions and report any variations to the Construction Manager.
- B. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. Carefully investigate the structural and finished conditions affecting all work, and plan work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Unless dimensions are shown, drawings are generally diagrammatic and indicative of the work to be installed in the most direct and workmanlike manner, so that conflicts between water systems, planting, and architectural features will be minimized.
- C. Do not install the facilities as indicated on the drawings when it is obvious in the field that unknown obstructions might not have been considered in the engineering. Such obstructions or differences should be brought to the attention of the Construction Manager before proceeding.

3.2 PREPARATION

- A. Prepare for pipe installation by assembling all needed materials.
- B. Cover all PVC pipe during storage.

3.3 BEDDING

- A. Excavate trench, pit or hole in accordance with Section 31 23 00.
- B. Where trench or pit has been over excavated, place bedding material at bottom of excavations, level soil materials in continuous layers not exceeding 6 inches uncompacted depth.
- C. Backfill around sides and to a level 6 inches above the top of pipe with bedding sand, tamped in place.
- D. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE AND FITTINGS

- A. Install pipe at locations and depths indicated on plans.
- B. Install pipe, fittings, and associated materials in accordance with manufacturer's recommendations.
- C. Route pipe in straight line, whenever possible. All changes in direction of pipes shall be made with fittings, not by bending.
- D. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- E. Form and place concrete for thrust blocks at each elbow, tee, angle or other significant change of direction in loose-joint pipe, per detail on plans.
- F. Establish elevations of buried piping to ensure not less than 24 inches of cover, except at connections to existing lines, which may be shallower or deeper, or where shown otherwise on plans.
- G. When two water pipes are to be installed in same trench, maintain 4-inch horizontal clearance between pipes.
- H. Connect water facilities to Prefabricated Building.
- I. Backfill trench or other excavation in accordance with Section 312300.

3.5 INSTALLATION - VALVES

- A. Set valves on solid bearing.
- B. Where valves are installed below finish surface grade, center and plumb valve box and any necessary extensions over valve. Set box cover flush with finished grade.
- C. Pour concrete collar around top of valve box per detail on plans.
- D. Furnish and install valves and valve boxes in addition to those shown on plans as required for isolation of lines for construction and disinfection, while minimizing disruption of service to buildings, at no additional cost to the Owner.

3.6 INSTALLATION - THREADED CONNECTIONS

- A. Assemble all plastic and galvanized steel threaded pipe and fittings using an approved Teflon tape applied to the male threads only. A minimum of two (2) wraps and a maximum of three (3) wraps of an approved Teflon tape will be required.
- B. At all plastic (PVC) pipe connections, work the ductile iron connections first. Connections shall always be plastic into steel, never steel into plastic.
- C. A non-hardening sealant and lubricant similar to Permatex #51, LASCO blue pipe sealant, or approved equal may be used in lieu of Teflon tape. Apply sealant to clean male threads brushing into grooves and to the first three threads of the female threads.

3.7 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect all domestic water piping systems in accordance with AWWA Standard C601, "AWWA Standard for Disinfecting Water Mains", and in accordance with administrative authority. Disinfection process shall be performed in cooperation with health department having jurisdiction and witnessed by the Owner's Inspector. During procedure, signs shall be posted at each water outlet stating, "Chlorination - Do Not Drink". After disinfection, water samples shall be collected for bacteriological analysis. Certificate of Bacteriological Purity shall be obtained and delivered to the Owner.

3.8 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of the City Standard Specifications.
- B. Compaction testing of bedding and backfill will be performed in accordance with ANSI/ASTM D1557.
- C. If tests indicate work does not meet specified requirements, recompact, or remove and replace, and retest. Any retests required due to failure of initial tests shall be paid for by the Contractor.

END OF SECTION 331000

SECTION 333000 - SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Locating existing utilities.
- B. Excavating trenches for sanitary sewer facilities.
- C. Furnishing and installing sanitary sewer facilities, including pipe, cleanouts, services, and associated facilities.
- D. Placing and compacting pipe bedding.
- E. Final backfilling, compaction and grading.

1.2 RELATED SECTIONS

- A. City of Fresno Standard Specifications
- B. Division 31
- C. Section 033000.1 – Site Cast-in-Place Concrete.

1.3 REFERENCES

- A. American Water Works Association (AWWA)
- B. ANSI/ASTM C478 - Precast Reinforced Concrete Manhole Sections.
- C. ANSI/ASTM D3034 - Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, 4-inch to 15-inch.

1.4 DEFINITIONS

- A. Bedding: Fill placed under, around, beside and directly over pipe, prior to subsequent backfill operations.
- B. Utility: Any buried or above ground pipe, conduit, cable, associate device or appurtenances, or substructure pertaining thereto.

1.5 SUBMITTALS

- A. Submit under provisions of Section 013300 Submittal Procedures.
- B. Certificates of compliance for material.

- C. Product Data: Provide data indicating pipe, accessories, and associated equipment to be furnished.
- D. Manufacturer's Installation Instructions: Indicate special procedures required to install products supplied.

1.6 COORDINATION

- A. Coordinate work with Owner's personnel.
- B. Verify that the location of existing utilities have been indicated at work site by utility authorities or Owner's personnel.
- C. Coordinate work with other project work.

1.7 EXISTING UTILITIES

- A. Existing Conditions:
 - 1. Examine site and verify conditions with the Drawings and Specifications. Contractor shall familiarize himself with existing site conditions and any changes that have occurred at the site since the preparation of the contract documents and shall be responsible to account for any such changes in the price bid for this work.
 - 2. Thoroughly investigate and verify conditions under which the Work is to be performed.
 - 3. Locate and identify utilities:
 - a. Call a Local Utility Locator Service ("Underground Service Alert" (USA) – 811) for the task of locating any applicable off-site and on-site utilities in the area where the Project is located.
 - b. .
 - 4. No allowance for extra Work will be granted resulting from negligence or failure to meet requirements of this Article.
- B. The Engineer has made a diligent attempt to indicate on the plans the location of all main and trunkline utility facilities which may affect the Work. In many cases, however, the only available information relative to the existing location of said facilities may have been small scale undimensioned plats. The locations of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.
- C. Under circumstance similar to 333000/1.7b, service laterals and appurtenances will have also been shown where information was available as to their location. In many cases, however, the only available information relative to the existing location of said facilities may have been small scale undimensioned plats. The locations of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.
- D. Determine exact location of existing buried utilities by:
 - 1. Marking on ground or pavement surface the alignment and extent of the proposed facilities and the probable location of existing utilities using construction plans and existing surface features.
 - 2. Locate exact location of existing utilities by hand methods of excavation, or by use of vacuum equipment.

- E. Maintain all existing utility mains and service lines in constant service during construction of the work when required.
- F. Where service disruptions are allowed, minimize the length of such disruptions by proper scheduling and diligent pursuit of the work.

1.8 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 017700 Closeout Submittals
- B. Accurately record actual locations of utilities encountered.
- C. Provide As-Built drawing of new sewer facilities, including surveyed position and junctions with existing lines.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. PVC Pipe and Fittings, 3-inches in Diameter and Smaller: Schedule 40 PVC pipe, per ASTM D1785, 1120 high impact.
- B. PVC Pipe and Fittings, 4-inches through 15-inches in Diameter: Per ANSI/ASTM D3034, with gasketed joints. Minimum wall thickness shall conform to SDR 35. PVC compound additives and fillers, including but not limited to stabilizers, antioxidants, lubricants, colorants, etc., shall not exceed 10 parts by weight per 100 of PVC resin in the compound.
- C. Imported sand for PVC Pipe Bedding Envelope: Soil Type S5 imported sand material per Section 310513/2.1 E.
- D. Native soil for PVC Pipe Bedding Envelope: per Section 310513.
- E. Cleanout Boxes shall be precast reinforced concrete with cast iron lid marked for sewer service, Christy G5 or approved equal.
- F. Precast Reinforced Concrete Manhole Sections: Per ANSI/ASTM C478. Elliptical single line reinforcement is not allowed and as shown on detail drawing.
- G. Poured in Place Concrete: Per Section 033000.1.
- H. Reinforcement: Per Section 032000.1.
- I. Mortar: Composed of one part, by weight, portland cement (Type II low alkali per ASTM C150), 2 parts, by weight, sand, and water.
- J. Manhole Frames, Covers and Grates: Cast Iron per ASTM A48, Class 25.
- K. Soil Fill for Concrete Pipe Bedding Envelope: Backfill or Sandfill per Section 310513 and Section 312300.

- L. Concrete collar shall be constructed as per detailed drawing.
- M. Cleanout shall be constructed as per detail drawing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify site conditions.

3.2 PREPARATION

- A. Identify location of proposed sanitary sewer facilities to be constructed. Expose connection points to existing system and pothole other existing utilities which could conflict with proposed grade of sewer. Verify design grades versus actual elevation of existing utilities. Notify Construction Manager immediately of any conflicts.
- B. Locate, identify, field survey and protect existing above and below grade utilities from damage.
- C. Protect plant life, lawns, trees, shrubs, and other features not authorized for removal.
- D. Protect existing structures and other improvements from damage from excavation equipment and vehicular traffic.
- E. Employ equipment and methods appropriate to the work site.
- F. Protect excavated areas from drainage inflow, and provide drainage of all excavated areas. Dewater existing pipeline systems as necessary to accomplish the work.
- G. Comply with all provisions of the Construction Safety Orders and General Safety Orders of the California Division of Industrial Safety, as well as all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground in excavations.
- H. Remove all interfering surface and subsurface improvements authorized for removal.

3.3 EXCAVATION

- A. Excavate soil required to locate existing utilities and install the work.
- B. Excavate trenches per Section 312300.
- C. Excavate trenches and pits to allow installation and construction of the sanitary sewer facilities to the alignment, grades, depths and cross-sections as indicated on the construction plans, or as directed by the Construction Manager. Adjust, as directed by the Construction Manager, to avoid existing intersecting utilities.
- D. Excavate trench to depth which is 4-inches below the outside bottom of the pipe barrel to be placed therein.

- E. Cut trenches just wide enough to allow the installation of the pipe and pipe bedding. Minimum trench width shall be that resulting from trench walls no closer than 4 inches outside the bell (or collar) of the pipe. Minimize trench width above the pipe.
- F. Provide protection to public per the City Standard Specifications.

3.4 INSTALLATION AND BEDDING OF SANITARY SEWER PIPE

- A. Install the pipe and fittings to the lines and grades shown on the construction plans, or to those directed by the Construction Manager.
- B. Install pipe and fittings in accordance with the manufacturer's recommendations, and these specifications.
- C. Unless otherwise approved by the Construction Manager, lay all pipe upgrade from structure to structure, with bell or socket ends of pipe upgrade.
- D. Excavate suitable bell (or socket) holes in the bedding material, so that the bells do not bear on the subgrade or bedding. Provide uniform bearing of pipe barrel on bedding material.
- E. Ensure that all joints are properly "homed" and are watertight.
- F. Place bedding material per Section 312300 and compact to a minimum of 92% relative compaction. Place and compact the soil material under, around and over the pipe, filling the trench cavity and extending from the bottom of the trench measured 6-inches below the outside bottom of the pipe barrel to a level 6-inches above the outside top of the pipe barrel.

3.5 INSTALLATION OF SANITARY SEWER STRUCTURES AND APPURTENANCES

- A. Install cleanouts at end of lines, at changes of direction greater than 45 degrees, and at spacing not greater than of 100 foot intervals. Locate cleanouts in accessible locations and bring flush to finished surface.
- B. Construct all sanitary sewer appurtenances, as shown on the construction plans.
- C. Connect sewer facilities to Prefabricated Building.

3.6 BACKFILLING TO FINISH GRADE, FINISH GRADING AND SURFACE RESTORATION

- A. Place and compact backfill per Section 312300.
- B. Conform finished surface to the lines, grades and cross-sections shown on the plans, or as otherwise directed by the Inspector.
- C. Fine grade all finished soil surfaces disturbed to the lines, grades and cross-sections shown on the plans. Rake and smooth all finished dirt surfaces.
- D. Rake and smooth all finished surfaces.
- E. Restore turfed areas disturbed by the work by per Construction Manager.

- F. Reconstruct any other surface improvements affected.

3.7 TOLERANCES

- A. Pipe laying tolerances:

- 1. Above grade: Not to exceed 1/4-inch above planned grade.
- 2. Below grade: Not to exceed 1/2-inch below planned grade.
- 3. Alignment: Not to exceed 2-inches from planned alignment, if gradual and regular over a distance of 20-feet.

- B. Structure finish grade tolerance: Within 1/4-inch of planned grade, but must match adjacent improvements.

PVC Pipe Deflection:

- 1. Up to and including 12-inch diameter: 5% maximum.
- 2. Over 12-inch and including 30-inch diameter: 4% maximum.
- 3. The maximum average inside diameter of the pipe shall be equal to the average outside diameter per applicable ASTM Standard minus two minimum wall thicknesses per applicable ASTM Standards. Manufacturing and other tolerances shall not be considered for determining maximum allowable deflections.

3.8 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of the City of Fresno Standard Specifications.
- B. Compaction testing of bedding and backfill will be performed in accordance with ANSI/ASTM D1557.
- C. If tests indicate work does not meet specified requirements, recompact, or remove and replace, and retest.
- D. Prior to final surface restoration, pull an Construction Manager approved steel mandrel through installed and backfilled PVC pipe by hand to prove deflection tolerance has not been exceeded. Remove any overdeflected pipe, and if the pipe is not damaged, reinstall it and retest it. If the pipe has been damaged, install new pipe and retest. Continue procedure until required tolerance is met. The mandrel shall:
 - 1. Be a rigid, nonadjustable, odd-numbering-leg (9 legs minimum) mandrel having an effective length not less than its nominal diameter.
 - 2. Have a minimum diameter at any point along the full length of the nominal pipe as follows:

Pipe Material	Nominal Size (Inches)	Minimum Mandrel Diameter (Inches)
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PVC - ASTM D 3034 (SDR 35)	6	5.619
	8	7.524
	10	9.405
	12	11.191
	15	13.849
PVC - ASTM F 679 (T-1 WALL)	18	16.924
	21	19.952
	24	22.446
	27	25.297
	30	28.502

3.9 STRUCTURE DETAILS

- A. Construct as shown on the plans.

END OF SECTION 333000

SECTION 334000 - STORM DRAINAGE UTILITES

PART 1 - GENERAL

i. 1.1 SECTION INCLUDES

- A. Provide all materials, labor, equipment and services necessary to furnish and install Storm Drainage System, accessories and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded.

ii. 1.2 RELATED SECTIONS

- A.
- B. Division 31
- C. Section 033000.1– Site Cast-in-Place Concrete.

iii. 1.3 REFERENCES

- A. ANSI/ASTM C76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
- B. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- C. ANSI/ASTM C478 - Precast Reinforced Concrete Manhole Sections.
- D. California Test Method No. 216 (Dry Method).

iv. 1.4 DEFINITIONS

- A. Bedding: Fill placed under, around, beside and directly over pipe, prior to subsequent backfill operations.
- B. Utility: Any buried or above ground pipe, conduit, cable, associate device or appurtenances, or substructure pertaining thereto.

v. 1.5 SUBMITTALS

- A. Submit under provisions of Section 013300 Submittal Procedures
- B. Certificates of compliance for material.
- C. Product Data: Provide data indicating pipe, accessories, and associated equipment to be furnished.
- D. Submit manufacturer's data and/or fabrication drawings for all pipes, and appurtenances installed under this Section. No items shall be incorporated into the work until submittals are approved by the Construction Manager.

vi. 1.6 COORDINATION

- A. Coordinate work with District personnel.
- B. Verify that the location of existing utilities have been indicated at work site by utility authorities and Campus personnel.

- C. Coordinate work with other project work.
 - vii. 1.7 EXISTING UTILITIES
- A. The Engineer has made a diligent attempt to indicate on the plans the location of all main and trunkline utility facilities which may affect the Work. In most cases, however, the only available information relative to the existing location of said facilities was small scale undimensioned plats. The location of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.
- B. Service laterals and appurtenances have also been shown where information was available as to their location. In most cases, however, the only available information relative to the existing location of said facilities was small scale undimensioned plats. The location of said facilities, therefore, shall be considered approximate only, until exposed by the Contractor.
- C. At new work location, expose by hand methods all existing utilities along the route of the new work prior to using any mechanical equipment. If mechanical equipment is allowed at a particular location, it may only be used after the completion by the Contractor of a successful exhaustive search by hand methods to locate all existing facilities as indicated on the plans, and as indicated at the work site by District personnel.
- D. Maintain all existing utility mains and service lines in constant service during construction of the Work.
 - viii. 1.8 PROJECT RECORD DOCUMENTS
- A. Submit under provisions of Section 017700.
- B. Accurately record actual locations of utilities encountered.

PART 2 - PRODUCTS

ix. 2.1 MATERIALS

- A. Reinforced Concrete Pipe for pipe larger than fifteen (15) inches: ANSI/ASTM C76, Class 4, with rubber gasket joints per ANSI/ASTM C443.
- B. Storm drainage sewer pipeline shall be polyvinyl chloride (PVC) pipe for storm sewer conforming to ASTM designation 3034, SDR 35 for pipe fifteen (15) inches or less.
- C. Precast Reinforced Concrete Manhole Sections: Per ANSI/ASTM C478. Elliptical single line reinforcement is not allowed and as shown on detail drawing.
- D. Site Cast in Place Concrete: Per Section 033000.1.
- E. Reinforcement: Per Section 032000.1.
- F. Mortar: Composed of one part, by weight, portland cement (Type II low alkali per ASTM C150), 2 parts, by weight, sand, and water.
- G. Manhole Frames, Covers and Grates: Cast Iron per ASTM A48, Class 25.

- H. Storm drain inlets shall be Christy U-23 drain inlet with precast extension as required. Contractor shall also construct concrete bottom as shown on detailed drawings. Christy U-23 catch basin grates shall be U23-HT, ADA approved and for H20 loading.
- I. Soil Fill for Concrete Pipe Bedding Envelope: Backfill or Sandfill per Section 31 22 00 and Section 312300.
- J. Concrete collar shall be constructed as per detailed drawing.
- K. Cleanout shall be constructed as per detail drawing.
- L. Trench Drain with pedestrian friendly grate shall be constructed per detail and manufacturer's requirements. Manufactured by NDS, install EZ-Track Trench Drain System with ADA Compliant DS-670 grate (polyoelfen). (or approved equal)

PART 3 - EXECUTION

x. 3.1 EXAMINATION

- A. Verify site conditions.

xi. 3.2 PREPARATION

- A. Identify location of proposed storm drainage facilities to be constructed. Expose connection points to existing system.
- B. Locate, identify, and protect existing above and below grade utilities from damage.
- C. Protect plant life, lawns, trees, shrubs, and other features not authorized for removal.
- D. Protect existing structures and other improvements to remain from damage from excavation equipment and vehicular traffic.
- E. Employ equipment and methods appropriate to the work site.
- F. Protect excavated areas from drainage inflow, and provide drainage to all excavated areas. Dewater existing drainage basins and existing drainage pipeline systems as necessary to accomplish the work.
- G. Comply with safety requirements as they pertain to excavations, per Section 312300.
- H. Remove all interfering surface and subsurface improvements authorized for removal.

xii. 3.3 EXCAVATION

- A. Excavate soil required to locate existing utilities and install the work.
- B. Excavate trenches and pits per Section 312300.
- C. Excavate trenches and pits to allow installation and construction of the storm drainage facilities to the alignment, grades, depths and cross-sections as indicated on the construction plans.

- D. Excavate trench to depth which is 4-inches below the outside bottom of the pipe barrel to be placed therein.
- E. Cut trenches just wide enough to allow the installation of the pipe and pipe bedding as indicated on the plans. Minimize trench width above the pipe.
- F. Provide protection to public per City of Fresno Standard Specifications
 - xiii. 3.4 INSTALLATION AND BEDDING OF STORM DRAIN PIPE
- A. Install the pipe and fittings to the lines and grades shown on the construction plans.
- B. Install pipe and fittings in accordance with the manufacturer's recommendations, and these specifications.
- C. Unless otherwise approved by the Construction Manager, lay all pipe upgrade from structure to structure, with bell or socket ends of pipe upgrade.
- D. Excavate suitable bell (or socket) holes in the bedding material, so that the bells do not bear on the subgrade or bedding. Provide uniform bearing of pipe barrel on bedding material.
- E. Ensure that all joints are properly "homed" and are watertight.
- F. Bed concrete pipe in backfill or sandfill soil envelope, and compact to a minimum of 85% relative compaction. Place and compact the bedding material under, around and over the pipe, filling the trench cavity and extending from the bottom of the trench (4-inches below the outside bottom of the pipe barrel) to a level 12-inches above the outside top of the pipe barrel.
 - xiv. 3.5 INSTALLATION OF STORM DRAINAGE STRUCTURES AND APPURTENANCES
- A. Install storm drainage structures as indicated on the construction plans, in accordance with the manufacturer's recommendations, and as specified herein.
- B. Construct poured-in-place concrete per Section 033000.1.
- C. Key top of poured-in-place concrete bases for structures to receive the tongue of precast riser sections.
- D. Joint precast manhole and structure riser sections with a minimum thickness of ½-inch of mortar to make a watertight joint. Neatly point the inside and outside of the joint. Set sections plumb.
- E. Construct cleanout, outfall structure per detail drawing.
- F. Construct Trench Drain per detail drawing and manufacturers requirements.
 - xv. 3.6 BACKFILLING TO FINISH GRADE AND FINISH GRADING
- A. Place and compact backfill per Section 312300.
- B. Conform finished surface to the lines, grades and cross-sections shown on the plans, or as otherwise directed by the Inspector.

- C. In areas to receive paving or a significant thickness of sealing material, temporarily set manhole frame and cover below finish grade, then return after final surfacing and/or pavement sealing and bring manhole frame and cover to final grade, as shown on the plans.
- D. Fine grade all finished soil surfaces disturbed to the lines, grades and cross-sections shown on the plans.
- E. Rake and smooth all finished dirt surfaces.

3.7 TOLERANCES

- A. Pipe laying tolerances:
 - 1. Above grade: Not to exceed 1/4-inch above planned grade.
 - 2. Below grade: Not to exceed 1/2-inch below planned grade.
 - 3. Alignment: Not to exceed 2-inches from planned alignment, if gradual and regular over a distance of 20-feet.
- B. Structure finish grade tolerance: Within 1/4-inch of planned grade, but must match adjacent improvements.

3.8 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of the Construction Manager.
- B. Compaction testing of bedding and backfill will be performed in accordance with ASTM D 1557.
- C. If tests indicate work does not meet specified requirements, recompact, or remove and replace, and retest.

END OF SECTION 334000