

# **CITY OF EL SEGUNDO**

**CONTRACT DOCUMENTS  
PLANS & SPECIFICATIONS**

**FOR**

**CONSTRUCTION OF A NEW  
BEACH BATHROOM FACILITY AND  
LIFEGUARD STATION  
AT THE EL SEGUNDO BEACH**

**PROJECT NO.: PW 10-09**

**PUBLIC WORKS DEPARTMENT  
ENGINEERING DIVISION  
350 MAIN STREET  
EL SEGUNDO, CA 90245**

**PROJECT MANAGER: MARYAM JONAS**

**TELEPHONE 310-524-2361  
FACSIMILE 310-640-0489**

BIDS WILL BE RECEIVED  
UPTO THE HOUR  
OF 11:00 A.M.

TUESDAY, NOVEMBER 2, 2010

IN THE

OFFICE OF THE CITY CLERK  
CITY HALL  
350 MAIN STREET  
EL SEGUNDO, CALIFORNIA 90245

AT WHICH TIME THEY WILL BE  
PUBLICLY OPENED

# **SPECIAL INSTRUCTION TO CONTRACTORS**

## **CONSTRUCTION OF A NEW BEACH BATHROOM FACILITY AND LIFEGUARD STATOIN**

**PROJECT NO.: PW 10-09**

1. A **NON MANDATORY** pre-bid meeting for **CONTRACTORS** to inspect the job site is scheduled as follows:

**Date** : **Wednesday, October 13, 2010**

**Time** : **9:00 AM**

**Location** : **105 Vista Del Mar**  
El Segundo, CA 90245  
(The parking lot at the north end of Grand Avenue  
in El Segundo Beach)

2. The Contractor will be required to apply and obtain a building permit from the City Planning and Building Safety Department. The permit will be issued on a "no-fee" basis.  
The Contractor shall be responsible for calling the Building Safety Division for inspection. All noted deficiencies shall be corrected by the contractor. The project will not be accepted as complete until the contractor obtains a final sign-off from the Department of Planning and Building Safety.
3. Liquidated damages will be **\$1,000** per calendar day. The work on this project must be completed by **June 30, 2011**.
4. All Bidders must return a signed copy of the enclosed Best Management Practices to the City with their bid package.
5. The contractor is required to review section 7-3 of the STANDARD SPECIFICATIONS pages **II-B-25 thru II-B-26** "LIABILITY INSURANCE".

**ONLY CONTRACTORS ABLE TO OBTAIN AND  
FURNISH THE REQUIRED COVERAGE AND  
ENDORSEMENT "ISO" FORMS SHOULD CONSIDER  
SUBMITTING A BID PACKAGE.**

**Best Management Practices**  
**Minimum Requirements for Construction Projects**

1. Eroded sediments and other pollutants must be retained on site and may not be transported from the site via sheet flow, swales, are drains, natural drainage course or wind.
2. Stockpiles of earth and other construction-related materials must be protected from being transported from the site by wind or water.
3. Fuels, oils, solvents and other toxic materials must be stored in accordance with their listing and are not to contaminate the soil nor the surface waters. All approved storage containers are to be protected from the weather. Spills must be cleaned up immediately and disposed of in a proper manner. Spills may not be washed into the drainage system.
4. Excess or waste concrete may not be washed into the public way or any other drainage system. Provisions shall be made to retain concrete wastes on-site until they can be disposed of as solid waste.
5. Trash and construction-related solid wastes must be deposited into a covered receptacle to prevent contamination of rainwater and dispersal by wind.
6. Sediments and other materials may not be tracked from the site by vehicle traffic. The construction entrance roadways must be stabilized to inhibit sediments from being deposited into the public ways. Accidental depositions must be swept up immediately and may not be washed down by rain or by any other means.
7. Dewatering Operations: remove sediments from ground water.
8. Paving Operation: reduce discharge of pollutants from paving operations.
9. Structure Construction and Painting: prevent and reduce discharge from construction sites and painting projects.
10. Material Delivery and Storage: prevent and reduce discharge of pollutants to storm water from material use.
11. Material Use: prevent and reduce discharge of pollutants to storm water from material use.
12. Spill Prevention and Control: prevent and reduce discharge of pollutants to storm water systems with good housekeeping.
13. Solid Waste Management: prevent and reduce discharge of pollutants to storm water system from solid waste or construction
14. Hazardous Waste Management: prevent and reduce discharge of pollutants to storm water from toxic materials.
15. Contaminated Soil Management: prevent and reduce discharge of pollutants to storm water from contaminated soil.

16. **Concrete Waste Management:** prevent and reduce discharge of pollutants to storm water from concrete waste.
17. **Sanitary/Septic Waste Management:** prevent and reduce discharge of pollutants to storm water from sanitary and septic systems.
18. **Vehicle and Equipment Cleaning:** prevent and reduce discharge of pollutants to storm water from cleaning of vehicles and equipment.
19. **Vehicle and Equipment Fueling:** prevent and reduce discharge of pollutants to storm water from fueling of vehicles and equipment.
20. **Vehicle and Equipment Maintenance:** prevent and reduce discharge of pollutants to storm water from maintenance of vehicles and equipment.
21. **Employee/Subcontractor Training:** SWPPP Storm Water Pollution Prevention Plan.
22. **Scheduling:** sequencing the construction project to reduce the amount of soil exposed to erosion.
23. **Preservation of Existing Vegetation:** minimize damage and erosion by preserving the existing vegetation.
24. **Seeding and Planting:** minimize erosion with seeding and planting.
25. **Mulching:** for stabilizing cleared and freshly seeded areas.
26. **Geotextiles and Mats:** for stabilization of soils.
27. **Dust Controls:** reduce dust and soil erosion.
28. **Temporary Stream Crossing:** recommendations for installing a temporary culvert, ford or bridge.
29. **Construction Road Stabilization:** recommendations for dust and erosion control.
30. **Stabilized Construction Entrance:** recommendation for dust, sediment and erosion control for public streets.
31. **Earth Dike:** temporary berm or ridge or compacted soil.
32. **Temporary Drain and Swales:** to divert off-site runoff around a construction site.
33. **Slope Drain:** temporary pipe to divert runoff from the top of a slope to the bottom without causing erosion.
34. **Outlet Protection:** install rip-rap to reduce sediment in the soil.
35. **Check Dams:** reduces velocity of concentrated storm water flows and reduces erosion.
36. **Slope Roughening/Terracing:** creates microclimates for establishing vegetation.
37. **Slit Fence:** for sedimentation control.

38. Straw Bale Barriers: for sedimentation control.
39. Sand Bag Barrier: for sedimentation control.
40. Brush or Rock Filter: for sedimentation control and velocity reduction.
41. Storm Drain Intel Protection: devices which detain sediment laden runoff.
42. Sediment Trap: small excavated or bermed area for sedimentation.
43. Sediment Basin: pond created to allow excessive sediment to settle.

As the project owner or authorized agent of the owner, I have read and understand the requirements (listed above) necessary to control storm water pollution from sediments, erosion, and construction materials, and I certify that I will comply with these requirements.

Print Name: \_\_\_\_\_  
Owner

Signature: \_\_\_\_\_  
Owner

Date: \_\_\_\_\_

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**NOTICE INVITING SEALED BIDS  
FOR THE**

**CONSTRUCTION OF A NEW BEACH BATHROOM FACILITY AND LIFEGUARD  
STATION AT THE EL SEGUNDO BEACH**

**IN THE CITY OF EL SEGUNDO  
SPECIFICATIONS NO.: PW 10-09**

PUBLIC NOTICE IS HEREBY GIVEN that the City of El Segundo invites sealed bids for the above project and will receive such bids in the offices of the City Clerk, 350 Main Street, El Segundo, California 90245, up to the hour of 11:00 a.m. on:

**TUESDAY, NOVEMBER 2, 2010**

at which time they will be publicly opened.

**A NON-MANDATORY PRE-BID CONFERENCE FOR BIDDERS  
TO INSPECT THE JOB SITE IS SCHEDULED FOR  
WEDNESDAY, OCTOBER 13, 2010 AT 9:00AM  
AT THE JOB SITE LOCATED AT 105 VISTA DEL MAR, EL SEGUNDO, CA 90245**

Copies of the Plans, Specifications, and Contract Documents are available from the Engineering Division of the Public Works Department, City of El Segundo, 350 Main Street, El Segundo, California, 90245. There is a non-refundable fee of **\$250.00** for each set of Plans and Specifications. A CD of the Plans and Specifications is available for **\$20.00**.

Any contract entered into pursuant to this notice will incorporate the provisions of the State Labor Code. Compliance with the prevailing rates of wages and apprenticeship employment standards established by the State Director of Industrial Relations will be required.

Affirmative action to ensure against discrimination in employment practices on the basis of race, color, national origin, ancestry, sex, or religion will also be required.

The City of El Segundo will deduct a **ten percent (10%)** retention from all progress payments as specified in **Section 9-3.2** of these Specifications. The **CONTRACTOR** may substitute an escrow holder surety of equal value to the retention and the **CONTRACTOR** shall be beneficial owner of the surety and shall receive any interest thereon.

The City of El Segundo hereby affirmatively ensures that minority business enterprises will be afforded full opportunity to submit bids in response to this notice and will not be discriminated against on the basis of race, color, national origin, ancestry, sex, or religion in any consideration leading to the award of contract.

continued on next page.....

In entering into a Public Works contract, or a subcontract, to supply goods, services, or materials pursuant to a public works contract, the **CONTRACTOR**, or **SUB-CONTRACTOR**, offers and agrees to assign to the awarding body all rights, title and interest in, and to, all causes of action it may have under Section 4 of the

Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (Chapter 2 [commencing with Section 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the **CONTRACTOR**, without further acknowledgment by the parties.

Bids must be prepared on the approved Proposal forms in conformance with the Instructions to Bidders and submitted to the City Clerk, 350 Main Street, City of El Segundo, in a sealed envelope plainly marked on the outside:

**"SEALED BIDS FOR SPECIFICATIONS NO.: PW 10-09  
IN THE CITY OF EL SEGUNDO**

**DO NOT OPEN WITH REGULAR MAIL"**

The bid must be accompanied by a bid bond, made payable to the City of El Segundo for an amount no less than **ten percent (10%)** of the amount bid for the base contract.

No bid will be accepted from a **CONTRACTOR** who has not been licensed in accordance with the provisions of the State Business and Professions Code. For this project, Class **"A"** license is required. The successful **CONTRACTOR** and his **SUB-CONTRACTORS** will be required to possess Business Licenses from the City of El Segundo.

The City of El Segundo reserves the right to reject any or all bids, to waive any irregularity, and to take all bids under advisement for a period of **sixty (60) calendar days**.

Any contract entered into pursuant to this notice shall become effective or enforceable against the City of El Segundo only when the formal written contract has been duly executed by the appropriate officer(s) of the City of El Segundo.

**BY ORDER OF** the City of El Segundo, California.

**Cindy Mortesen  
City Clerk  
City of El Segundo**

## INSTRUCTIONS TO BIDDERS

### PROPOSAL FORMS

Bids shall be submitted in writing on the Proposal forms provided by the City of El Segundo. One (1) set of these Proposal forms is inserted loose herein for use by the bidders. **Bidders are required to submit one (1) original set and one (1) copy of the proposal forms.** All information requested therein must be clearly and legibly set forth in the manner and form indicated.

### PROPOSAL GUARANTEE

Proposals must be accompanied by a proposal guarantee consisting of a bid bond payable to the City of El Segundo in the amount not less than **ten percent (10%)** of the total base contract amount bid. Any proposal not accompanied by such a guarantee will not be considered for contract award. If a bidder to whom a contract is awarded fails or refuses to execute the contract documents or furnish the required insurance policies and bonds as set forth in those documents, the proposal guarantee shall be forfeited to the City of El Segundo. Following award of the contract, the proposal guarantees of all non-awardees will be released. The proposal guarantee of the successful bidder will be held until that bidder has properly executed all contract documents and the City Officials have executed the contract.

### DELIVERY OF PROPOSAL

The Proposal shall be enclosed in a sealed envelope plainly marked on the outside, "**SEALED BIDS FOR THE ..... WRITE NAME OF PROJECT HERE.....IN THE CITY OF EL SEGUNDO - DO NOT OPEN WITH REGULAR MAIL**". Proposals may be mailed or delivered by messenger. However, it is the bidder's responsibility alone to insure delivery of the proposal to the hands of the City of El Segundo's designated official prior to the bid opening time stipulated in the **Notice Inviting Sealed Bids**. Late proposals and/or facsimile proposals will not be considered.

### WITHDRAWAL OF PROPOSALS

A proposal may be withdrawn prior to the bid opening hour stipulated in the Notice Inviting Sealed Bids by a written request signed by the bidder. Such requests must be delivered to the City of El Segundo's official designated to receive the bids on the project. Proposals may not be withdrawn after said hour without forfeiture of the proposal guarantee. The withdrawal of a proposal will not prejudice the right of the bidder to submit a new proposal, providing there is time to do so.

### IRREGULAR PROPOSALS

Unrequested/unauthorized conditions, limitations, or provisions attached to a proposal will render it irregular and may cause its rejection. The completed proposal forms shall be without interlineations, alterations, or erasures. Alternative proposals will not be considered unless specifically requested. No oral, telegraphic, or telephonic proposal, modification, or withdrawal will be considered.

## **TAXES**

No mention shall be made in the proposal of Sales Tax, Use Tax, City Business License, or any other tax, as all amounts bid will be deemed and held to include any such taxes, which may be applicable.

## **DISQUALIFICATION OF BIDDERS**

In the event that any bidder acting as a prime contractor has an interest in more than one proposal, all such proposals will be rejected, and the bidder will be disqualified. This restriction does not apply to subcontractors or suppliers who may submit quotations to more than one bidder, and while doing so, may also submit a formal proposal as a prime contractor. No proposal will be accepted from a bidder who has not been licensed in accordance with the provisions of the State Business and Professions Code.

## **DISCREPANCIES AND MISUNDERSTANDINGS**

Bidders must satisfy themselves by personal examination of the work site, Plans, Specifications, and other contract documents, and by any other means as they may believe necessary, as to the actual physical conditions, requirements and difficulties under which the work must be performed. No bidder shall at any time after submissions of a proposal make any claim or assertion that there was any misunderstanding or lack of information regarding the nature or amount of work necessary for the satisfactory completion of the job. Any errors, omissions, or discrepancies found in the Plans, Specifications, or other contract documents shall be called to the attention of the City of El Segundo and clarified prior to the submission of proposals.

## **LEGAL RESPONSIBILITIES**

All proposals must be submitted, filed, made, and executed in accordance with State and Federal laws related to bids for contracts of this nature whether the same is expressly referred to herein or not. Any bidder submitting a proposal shall by such action thereby agree to each and all of the terms, conditions, provisions, and requirements set forth, contemplated, and referred to in the Plans, Specifications, and other contract documents, and to full compliance therewith.

### **AWARD OF CONTRACT**

The award of contract, if made, will be to the lowest responsible bidder determined solely by the City of El Segundo. Additionally, the City of El Segundo reserves the right to reject any or all proposals, to waive any irregularity, and take the bids under advisement for a period of **sixty (60) calendar days**, all as may be required to provide for the best interests of the City of El Segundo. In no event will an award be made until all necessary investigations are made as to the responsibility and qualifications of the bidder to whom the award is contemplated.

### **AWARD OF ALTERNATE BIDS**

If the bid proposal contains a base bid and additive or deductive alternate bid items, the City reserves the right to award or reject any, all, or a combination of alternate bids. The lowest responsible bidder will be determined based on the scope of the contract awarded by the City.

### **PREVAILING WAGES AND PAYROLL RECORDS**

**CONTRACTOR** and subcontractors shall be required to comply with all applicable provisions of the State Labor Code. **CONTRACTOR** and subcontractors shall pay the minimum prevailing rates of per diem wages as determined by the State Department of Industrial Relations. A copy of the most recent prevailing rates are on file at the Engineering Division, 350 Main Street, El Segundo, CA 90245, which will be made available for inspection to any interested party on request.

**CONTRACTOR** and subcontractors shall keep accurate payroll records. Upon request by the **CITY**, a certified copy of these records shall be furnished to the **CITY** or its authorized representative.

Some federal fund projects are also required to comply with Federal Davis-Bacon Act wage requirements. If there is a conflict between the state wages and the federal wages, the higher of the wage rates for any particular classification shall apply.

**PROPOSAL  
FOR THE  
CONSTRUCTION OF A NEW BEACH BATHROOM FACILITY  
AND LIFEGUARD STATION AT THE EL SEGUNDO BEACH  
IN THE CITY OF EL SEGUNDO  
SPECIFICATIONS NO.: PW 10-09**

**TO THE CITY OF EL SEGUNDO:**

In accordance with the City of El Segundo's Notice Inviting Sealed Bids, the undersigned **BIDDER** hereby proposes to furnish all materials, equipment, tools, labor, and incidentals required for the above stated project as set forth in the Plans, Specifications, and contract documents therefor, and to perform all work in the manner and time prescribed therein.

**BIDDER** declares that this proposal is based upon careful examination of the work site, Plans, Specifications, Instructions to Bidders, and all other contract documents. Submittal of this bid shall be considered evidence that the **BIDDER** has satisfied himself regarding the contract documents, access and any other field conditions which may effect bid prices. If this proposal is accepted for award, **BIDDER** agrees to enter into a contract with the City of El Segundo at the unit and/or lump sum prices set forth in the following Bid Schedule. **BIDDER** understands that failure to enter into a contract in the manner and time prescribed will result in forfeiture to the City of El Segundo of the proposal guarantee accompanying this proposal.

**BIDDER** understands that a bid is required for the entire work, that the estimated quantities set forth in the Bid Schedule are solely for the purpose of comparing bids, and that final compensation under the contract will be based upon the actual quantities of work satisfactorily completed. **THE CITY OF EL SEGUNDO RESERVES THE RIGHT TO INCREASE OR DECREASE THE AMOUNT OF ANY QUANTITY SHOWN AND TO DELETE ANY ITEM FROM THE CONTRACT.** It is agreed that the unit and/or lump sum prices bid include all apparent expenses, taxes, royalties, and fees. In the case of discrepancies in the amounts bid, unit prices shall govern over extended amounts, and words shall govern over figures.

If awarded the Contract, the undersigned further agrees that in the event of the **BIDDER'S** default in executing the required contract and filing the necessary bonds and insurance certificates within ten working days after the date of the City of El Segundo's notice of award of contract to the **BIDDER**, including sending by U.S. Mail a Public Works Contract for signature by the Awardee, the proceeds of the security accompanying this bid shall become the property of the City of El Segundo and this bid and the acceptance hereof may, at the City of El Segundo's option, be considered null and void.

**EQUAL EMPLOYMENT OPPORTUNITY COMPLIANCE**

**BIDDER** certifies that in all previous contracts or subcontracts, all reports which may have been due under the requirements of any agency, State, or Federal equal employment opportunity orders have been satisfactorily filed, and that no such reports are currently outstanding.

**AFFIRMATIVE ACTION CERTIFICATION**

**BIDDER** certifies that affirmative action has been taken to seek out and consider minority business enterprises for those portions of the work to be subcontracted, and that such affirmative actions have been fully documented, that said documentation is open to inspection, and that said affirmative action will remain in effect for the life of any contract awarded hereunder. Furthermore, **BIDDER** certifies that affirmative action will be taken to meet all equal employment opportunity requirements of the contract documents.

**NONCOLLUSION AFFIDAVIT**

**BIDDER** declares that the only persons or parties interested in this proposal as principals are those named herein; that no officer, agent, or employee of the City of El Segundo is personally interested, directly or indirectly, in this proposal; that this proposal is made without connection to any other individual, firm, or corporation making a bid for the same work and that this proposal is in all respects fair and without collusion or fraud.

**CITY OF EL SEGUNDO - BID SHEET  
 CONSTRUCTION OF A NEW BEACH BATHROOM FACILITY  
 AND LIFEGUARD STATION  
 PROJECT NO.: PW 10-09**

ITEM NO.	ESTIMATED QUANTITIES	DESCRIPTION	AMOUNT
1	LS	Provide and furnish all labor, materials, tools, equipment and services necessary to perform the construction of Beach Bathroom Facility and Lifeguard Station complete in place in accordance with the Contract plans and specifications @  _____ Lump Sum	\$ _____
2	LS	Special project site maintenance and public convenience and safety (not to exceed price is for comparison of bids only and may not be the final payment, complete). See Section 10 of the Specifications @  _____ Lump Sum	\$25,000.00

**TOTAL BASE BID = \$ \_\_\_\_\_**

**TOTAL BASE BID WRITTEN IN WORDS**

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## **Special Instructions**

### **Section 10 – Special Project Site Maintenance and Public Convenience and Safety**

Section 10 is here by added to the standard Specifications as follows:

Pursuant to the provisions of section 7-8 and section 7-10 of the standard specifications and these special provisions, the contractor is responsible fro project site maintenance and fro public convenience and safety. Payment fro compliance with these provisions is considered as included in the price bid for contract.

The City, however, to maintain good public relation, may deem it necessary to require special project site maintenance and public convenience and safety actions and work to be performed by the contractor that are over and above those required by the provisions of Section 7-8 and section 7-10 of the standard specifications and these Standard Provisions.

These actions and work shall be as directed only by the Engineer in writing and payment for compliance therewith shall be on a cost plus basis for extra work per Section 3-3 of the Standard Specifications and applied against the not-to-exceed bid item for Special Project site Maintenance and Public Convenience and Safety.

**BIDDER'S INFORMATION**

**BIDDER** certifies that the following information is true and correct:

Bidder's Name \_\_\_\_\_

Form of Legal Entity (i.e., individual, partnership, corporation, etc.)

\_\_\_\_\_

If corporation, State of Incorporation (i.e., California) \_\_\_\_\_

Business \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

Telephone No. \_\_\_\_\_

Facsimile No. \_\_\_\_\_

State Contractor's License No. and Class \_\_\_\_\_

Original Date Issued \_\_\_\_\_ Expiration Date \_\_\_\_\_

The following are the names, titles, addresses, and phone numbers of all individuals, firm members, partners, joint venturers, and/or corporate officers having principal interest in this proposal:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

The date of any voluntary or involuntary bankruptcy judgments against any principal having an interest in this proposal is as follows:

\_\_\_\_\_

\_\_\_\_\_

All current and prior DBA's, aliases, and/or fictitious business names for any principal having an interest in this proposal are as follows:

\_\_\_\_\_

\_\_\_\_\_

**IN WITNESS WHEREOF, BIDDER** executes and submits this proposal with the names, titles, hands, and seals of all aforementioned principals this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**BIDDER**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Subscribed and sworn to this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**NOTARY PUBLIC**

\_\_\_\_\_

**PROPOSAL GUARANTEE  
BID BOND**

**CONSTRUCTION OF A NEW BEACH BATHROOM FACILITY  
AND LIFEGUARD STATION AT THE EL SEGUNDO BEACH**

**IN THE CITY OF EL SEGUNDO  
SPECIFICATIONS NO.: PW 10-09**

**KNOW ALL MEN BY THESE PRESENTS that,**

, as **BIDDER**, and

, as **SURETY**, are held and firmly bound unto the City of El Segundo,  
in the penal sum of **DOLLARS (\$ \_\_\_\_\_)**, which is ten (10%) percent of the  
total amount bid by **BIDDER** to the City of El Segundo for the above stated project, for the payment  
of which sum, **BIDDER and SURETY agree to be bound, jointly and severally, firmly by these  
presents.**

**THE CONDITIONS OF THIS OBLIGATION ARE SUCH** that, whereas **BIDDER** is about to submit a  
bid to the City of El Segundo for the above stated project, if said bid is rejected, or if said bid is  
accepted and a contract is awarded and entered into by **BIDDER** in the manner and time specified,  
then this obligation shall be null and void, otherwise it shall remain in full force and effect in favor of  
the City of El Segundo.

**IN WITNESS WHEREOF** the parties hereto have set their names, titles, hands, and seals this

\_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

**BIDDER\*** \_\_\_\_\_

**SURETY\*** \_\_\_\_\_

Subscribed and sworn to this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

**NOTARY PUBLIC**

- \* Provide **BIDDER/SURETY** name, address and telephone number and the name, title, address and telephone number for authorized representative.

**CONTRACTOR'S LICENSE DECLARATION**  
**(Business and Professions Code Section 7028.15)**

1. **BIDDER'S** Contractor's License Number is:

\_\_\_\_\_ Class No.: \_\_\_\_\_

2. The expiration date of **BIDDER'S** Contractor License is:

\_\_\_\_\_, 20 \_\_\_\_.

3. **BIDDER'S** acknowledges that Section 7028.15(e) of the Business and Professions Code provides as follows:

"A licensed contractor shall not submit a bid to a public agency unless his or her contractor's license number appears clearly on the bid, the license expiration date is stated, and the bid contains a statement that representations herein are made under penalty of perjury. Any bid not containing this information, or a bid containing information which is subsequently proven false, shall be considered non-responsive and shall be rejected by the public agency."

The undersigned declares, under penalty of perjury, that the representations made by the undersigned in this bid proposal are true and correct.

Executed on \_\_\_\_\_, 20\_\_\_\_, at

\_\_\_\_\_ (insert City and State where Declaration is signed).

\_\_\_\_\_  
**Signature**

\_\_\_\_\_  
**Typed Name:**

\_\_\_\_\_  
**Title:**

\_\_\_\_\_  
**Name of Bidder:**

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

State of California    )  
                                  ) ss.  
County of                )

\_\_\_\_\_, being first duly sworn, deposes and say that he or she is  
\_\_\_\_\_ of \_\_\_\_\_

the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the **BIDDER** has not directly or indirectly induced or solicited any other **BIDDER** to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any **BIDDER** or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that 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**, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further, that 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, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name of Bidder

\_\_\_\_\_  
Typed Name

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

**CERTIFICATION**

**Section 1861 OF THE LABOR CODE  
(Workers' Compensation)**

Pursuant to Section 1861 of the Labor Code, the **BIDDER**, in submitting his/her **PROPOSAL**, shall sign the following certification:

"I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract."

Signature of Bidder: \_\_\_\_\_

Title: \_\_\_\_\_

Business Name: \_\_\_\_\_  
\_\_\_\_\_

Business Address: \_\_\_\_\_  
\_\_\_\_\_

Telephone Number: (\_\_\_\_\_) \_\_\_\_\_

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

**BIDDER'S CERTIFICATION OF SUBCONTRACTORS**

As detailed in Section 2-3.1 (Page II-B-3) of the City Standard Specifications, Bidder certifies that he has listed below all subcontractors who will perform work in excess of one-half of one percent (1/2 %) of the total bid price or certifies that the bidder is fully qualified to perform and will perform that portion of the work himself.

**NAME, ADDRESS AND PHONE  
NUMBER OF SUBCONTRACTORS**

**SUBCONTRACTED WORK**

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(Make copies of this page if additional space is needed)

\_\_\_\_\_  
Signature of Bidder

\_\_\_\_\_  
Date

## REFERENCES

The following are the names, addresses, and telephone numbers for three (3) public agencies for which **BIDDER** has performed similar work as the prime contractor or major subcontractor within the past two (2) years:

1. Project Title: \_\_\_\_\_  
Location: \_\_\_\_\_  
\_\_\_\_\_  
Name and address of owner  
\_\_\_\_\_  
Name and telephone number of person familiar with project  
Type of Work: \_\_\_\_\_  
Contract amount: \$ \_\_\_\_\_ Date completed: \_\_\_\_\_  
Amount of work done by my/our firm under contract \$ \_\_\_\_\_  
Did your firm have any financial interest in Project? \_\_\_\_\_
  
2. Project Title: \_\_\_\_\_  
Location: \_\_\_\_\_  
\_\_\_\_\_  
Name and address of owner  
\_\_\_\_\_  
Name and telephone number of person familiar with project  
Type of Work: \_\_\_\_\_  
Contract amount: \$ \_\_\_\_\_ Date completed: \_\_\_\_\_  
Amount of work done by my/our firm under contract \$ \_\_\_\_\_  
Did your firm have any financial interest in Project? \_\_\_\_\_
  
3. Project Title: \_\_\_\_\_  
Location: \_\_\_\_\_  
\_\_\_\_\_  
Name and address of owner  
\_\_\_\_\_  
Name and telephone number of person familiar with project  
Type of Work: \_\_\_\_\_  
Contract amount: \$ \_\_\_\_\_ Date completed: \_\_\_\_\_  
Amount of work done by my/our firm under contract \$ \_\_\_\_\_  
Did your firm have any financial interest in Project? \_\_\_\_\_

4. Project Title: \_\_\_\_\_  
Location: \_\_\_\_\_  
\_\_\_\_\_  
Name and address of owner  
\_\_\_\_\_  
Name and telephone number of person familiar with project  
Type of Work: \_\_\_\_\_  
Contract amount: \$\_\_\_\_\_ Date completed: \_\_\_\_\_  
Amount of work done by my/our firm under contract \$ \_\_\_\_\_  
Did your firm have any financial interest in Project? \_\_\_\_\_

5. Project Title: \_\_\_\_\_  
Location: \_\_\_\_\_  
\_\_\_\_\_  
Name and address of owner  
\_\_\_\_\_  
Name and telephone number of person familiar with project  
Type of Work: \_\_\_\_\_  
Contract amount: \$\_\_\_\_\_ Date completed: \_\_\_\_\_  
Amount of work done by my/our firm under contract \$ \_\_\_\_\_  
Did your firm have any financial interest in Project? \_\_\_\_\_

The following are the names, addresses, and telephone numbers for all brokers and sureties from whom **BIDDER** intends to procure insurance bonds:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## **SECTION II - GENERAL REQUIREMENTS**

### **A. GENERAL SPECIFICATIONS**

#### **SCOPE AND LOCATION OF WORK**

The work to be done consists of furnishing all materials, equipment, tools, labor, and incidentals as required by the Plans, Specifications, and contract documents. The general items of work include the following:

**Provide and furnish all labor, materials, tools, equipment and services to perform the Construction of Beach Bathroom Facility and Lifeguard Station (105 Vista del Mar) complete in place including preparations and associated work.**

#### **TIME FOR COMPLETION**

**CONTRACTOR** will commence work on date specified in the **Notice to Proceed** to be issued to said **CONTRACTOR** by the Public Works Department of **CITY** and shall complete work on the **PROJECT FOR CITY FUNDED WORK** within **ONE HUNDRED THIRTY (130) WORKING DAYS** after the date of commencement.

#### **REGISTRATION OF CONTRACTORS**

No bid will be accepted from a **CONTRACTOR** who has not been licensed in accordance with the provisions of the laws of the State of California relating to licensing of contractors, for the type of work to be performed under this Contract.

#### **CITY BUSINESS LICENSE**

**CONTRACTOR** and **SUB-CONTRACTORS** shall obtain a City Business License prior to execution of the construction contract.

## NOTIFICATIONS

The **CONTRACTOR** will notify all agencies listed here in a minimum of **forty-eight (48) hours** before start of operation. The following list of names and telephone numbers are intended for the convenience of the **CONTRACTOR** and the City does not guarantee either the completeness or correctness of this list.

<u>OPERATION</u>	<u>OFFICE</u>	<u>TELEPHONE</u>
Start of work, shutdown of work, or resumption of work after shutdown	<b>Public Works/ <u>General Services Division:</u></b>	
	Stephanie Katsouleas, Director of Public Works Maryam Jonas, Principal Engineer	310-524-2356 310-524-2361
Closing of streets	El Segundo Police Department **	310-524-2200
	El Segundo Fire Department **	310-524-2236
Street striping	Street Maintenance Division	310-524-2709

\*\* The **CONTRACTOR** will notify the Engineering Division before notifying these offices.

The following information is provided for **CONTRACTOR'S** use to notify agencies if their facilities are affected by **CONTRACTOR'S** work:

1.	Underground Service Alert (all excavation in public right-of-way) -	800-227-2600
2.	City of El Segundo - Water Division Wastewater Division	310-524-2742 310-524-2754
3.	City of El Segundo - Recreation and Parks	310-524-2707
4.	Southern California Gas Company	310-671-9002
5.	Southern California Edison Company (SCE)	310-417-3366
6.	Pacific Bell	310-515-4430
7.	Time Warner Communication (Cable)	310-768-0400 Extension 414
8.	Los Angeles County Sanitation District	310-699-7411
9.	El Segundo Unified School District	310-615-2650

## EMERGENCY INFORMATION

The names, addresses and telephone numbers of the **CONTRACTOR** and subcontractors, or their representatives, will be filed with the City Engineer and the City Police Department **BEFORE PERFORMING WORK.**

## **FURNISHING OF WATER**

Water necessary for the prosecution of the work as herein specified will be furnished by the City in the following manner:

The **CONTRACTOR** will deposit with the City Water/Wastewater Division the sum of **Three Hundred Fifty Dollars (\$ 350.00)** to insure against damage to a 2 ½" Fire Hydrant water meter which will be furnished and installed by the City at a point convenient to the site of the work. This deposit will be refunded to the **CONTRACTOR** upon completion of the Project if, after removal and inspection of said meter by the City, it is found to be in satisfactory condition. In event of damage to this meter while under the jurisdiction of the **CONTRACTOR**, all or any part of said deposit may be retained by the City.

## **CALIFORNIA - OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION**

All work performed under this contract will be done in strict compliance with the Cal-OSHA Rules and Regulations, latest edition.

## **SOUND CONTROL**

The **CONTRACTOR** will comply with all local sound control and noise level rules, regulations and ordinances that apply to any work performed pursuant to the contract.

Each internal combustion engine, used for any purpose on the Project or related to the Project, will be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine will be operated on the Project without said muffler.

The use of loud signals will be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

## **AIR POLLUTION CONTROL**

The **CONTRACTOR** is put on notice that he must abide by all existing rules and regulations of the SCAQMD (South Coast Air Quality Management District), relating to all operations or equipment which discharge visible emissions or solid or liquid particles to the atmosphere.

## **WORKER UNIFORMS**

All workers under the employment of the **CONTRACTOR** or his/her **SUBCONTRACTOR** will wear an orange vest or an orange shirt while working in the public right-of-way.

**CITY OF EL SEGUNDO  
PUBLIC WORKS DEPARTMENT**

**STANDARD SPECIFICATIONS**

0-0        STANDARD SPECIFICATIONS

0-1        GENERAL

Except as modified by these Standard Specifications, the provisions of the latest edition of the "Standard Specifications for Public Works Construction" and its supplements prepared and promulgated by the Southern California Chapters of the American Public Works Association and the Associated General Contractors of America, constitute the Standard Specifications for this project.

0-2        NUMBERING OF SECTIONS

The numbering contained within the Standard Specifications of the Contract Documents is intended to correspond with SSPWC numbering.

0-3        MODIFICATIONS

To the extent that the provisions of the Contract Documents conflict with the SSPWC, the Contract Documents take precedence.

1-2        DEFINITIONS

The following subsection is added to Subsection 1-2 of the SSPWC.

1-2.1     ADDITIONAL DEFINITIONS

Acceptance – The date on which the City Council accepts the Work as complete.

Architect, Design Engineers, Soils Engineer, Structural Engineers - Advisors employed by the City.

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

City Council - The body constituting the awarding authority of the City.

Compensable Delay -- a delay entitling the Contractor to an adjustment of the Contract Sum and an adjustment of the Contract Time in accordance with this Agreement.

Due Notice - A written notification, given in due time, of a proposed action where such notification is required by the contract to be given a specified interval of time (minimum 48 hours or two working days) before the commencement of the contemplated action. Notification may be from Engineer to Contractor or from Contractor to Engineer.

Engineer - The City Engineer, or designee, as defined in the SSPWC. Unless otherwise provided, all correspondence and decisions made relative to the contract will be by the City Engineer or his designated representative.

PCC – California Public Contract Code.

Prompt - The briefest interval of time required for a considered reply, including time required for approval of a governing body.

Public Works Director – The City’s Public Works Director, or designee.

State Standard Specifications - State of California Standard Specifications, dated July 1992, Business and Transportation Agency, Department of Transportation

Working Days - A working day is defined as any day, except Saturdays, Sundays, legal holidays and days when work is suspended by the Engineer, as provided in Subsection 6-3 and days determined to be non-working in accordance with Subsection 6-7, "Time of Completion."

1-3 ABBREVIATIONS

The following Subsection is added to Subsection 1-3 of the SSPWC.

1-3.1 The following abbreviations are added to Subsection 1-3 of the SSPWC:

AAN	American Association of Nurserymen
AGC	Associated General Contractors of America
AISC	American Institute of Steel Construction
APWA	American Public Works Association
ASME	American Society of Mechanical Engineers
IEEE	Institute of Electric and Electronic Engineers
NEC	National Electric Code
SSPWC	Standard Specification for Public Works Construction, 2000 edition, and subsequent supplements prepared by Southern California Chapters of AGC and APWA

WATCH	Work Area Traffic Control Handbook
SPPWC	Standard Plans for Public Works Construction by the American Public Works Association 1997 edition and subsequent supplements
ASA	American Standard Association
CITY	City of El Segundo
SSP	State of California Standard Plans, July 1995 edition
SSS	State of California Standard Specifications, July 1999 edition

## SECTION 2 – SCOPE AND CONTROL OF WORK

The following subsections 2-1.1 and 2-1.2 are added to the SSPWC.

### 2-1.1 ACCESS TO PROJECT SITE

Not later than the date designated in the current Contract Schedule submitted by the Contractor, the City will provide access to the real property and facilities upon which the Work is to be performed, including access to real property and facilities designated in the Contract Documents for the Contractor's use.

### 2-1.2 OWNERSHIP AND USE OF CONTRACT DOCUMENTS.

The Contract Documents and all copies furnished to or provided by the Contractor are the City's property and may not be used on other work.

### 2-3 SUBCONTRACTS

Subsection 2-3 Subcontractors of SSPWC is deleted in its entirety and replaced with the following subsection.

#### 2-3.1 GENERAL

Except as provided in PCC §§ 4100 et. seq., each bidder will file with its bid the name and location of the place of business of each subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State of California who, under subcontract to the prime contractor, specifically fabricates and installs a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of one percent of the prime contractor's total bid. Only one subcontractor will be listed for each portion of the work, which portion will be defined in the bid. In each instance, the nature and extent of the work to be sublet will be described. The failure of the Contractor to specify a subcontractor, or the listing of more than one

subcontractor for the same portion of the work, constitutes an agreement by the Contractor that it is fully qualified to perform that portion itself and that it will perform that portion itself.

The Contractor must have the City Council's written consent to substitute a subcontractor other than that designated in the original bid, to permit any subcontract to be assigned or transferred, or to allow a subcontract to be performed by other than the original subcontractor.

Subcontracting of work for which no subcontractor was designated in the original bid, and which is more than one-half of one percent of the work, will be allowed only in cases of public emergency or necessity, and then only after a finding reduced to writing as a public record of the City Council setting forth the facts constituting the emergency or necessity.

Violation of any of the above provisions will be considered a breach of the Contract, and the City may terminate the Contractor's control over the Work, cancel the contract, or assess the Contractor a penalty of not more than ten percent of the subcontract involved.

All persons engaged in the work, including subcontractors and their employees will be considered as employees of the Contractor. The Contractor will be solely responsible for and have control over construction means, methods, techniques, sequences, procedures, and the coordination of all portions of the Work. The City will deal directly with, and make all payments to, the prime Contractor.

When subcontracted work is not being prosecuted in a satisfactory manner, the Contractor will be notified to take corrective action. The Engineer may report the facts to the City Council. If the City Council so orders, and on receipt by the Contractor of written instructions from the Engineer, the subcontractor will be removed immediately from the Work. That subcontractor will not again be employed on the Work.

#### 2-3.2 ADDITIONAL RESPONSIBILITY

Add the following to Subsection 2-3.2 Additional Responsibility:

The Contractor will submit experience statements for each subcontractor who will perform contract work that amounts to more than ten percent (10%) of the Work.

#### 2-4 CONTRACT BONDS

The following paragraph is added to Subsection 2-4 of the SSPWC.

The Faithful Performance Bond and the Labor and Materials Bond must be paid up and in effect for one year after the acceptance of the job by the City

in accordance with the guarantee required by Subsection 6-8.1.

## 2-5 PLANS AND SPECIFICATIONS

Subsection 2-5.1 of the SSPWC is replaced by the following subsection.

### 2-5.1 GENERAL

The Contractor will maintain the following at the Work site:

1. One as-built copy of the Plans and Specifications, in good order and marked to record current changes and selections made during construction.
2. The current accepted Contract Schedule.
3. Shop Drawings, Product Data, and Samples.
4. Approved permits from other agencies, including Cal-OSHA permits for trench shoring.
5. All other required submittals.

The Plans, Specifications, and other Contract Documents will govern the Work. The Contract Documents are intended to be complementary and cooperative and to describe and provide for a complete project. Anything in the Specifications and not on the Plans, or on the Plans and not in the Specifications, will be as though shown or mentioned in both.

Payment for any items on the plans for which there are no specific bid item will be included in the various items of work or in any item to which it is appurtenant.

If the Contractor performs any work which it knows or should know involves an error, inconsistency, or omission without notifying and obtaining written consent from the Engineer, the Contractor will be responsible for the resulting losses, including, without limitation, the costs of correcting defective work.

### 2-5.2 PRECEDENCE OF CONTRACT DOCUMENTS

The following paragraph is added to subsection 2-5.2 of the SSPWC:

As the figured dimensions shown on the plans and in the specifications of the Contract may not in every case agree with scaled dimensions, the figured dimensions will be followed in preference to the scaled dimensions, and

plans to a large scale will be followed in preference to the plans to a small scale. Should it appear that the work to be done, or any of the matters relative thereto, are not sufficiently detailed or explained in the Contract, the Contractor will apply to the Engineer for such further explanations as may be necessary, and will conform thereto as part of the Contract so far as may be consistent with the terms thereof. Any items shown on drawings and not mentioned in the specifications will be of like effect as if shown or mentioned in both.

#### 2-5.5 ACCURACY OF PLANS AND SPECIFICATIONS

Although it is believed that much of the information pertaining to conditions and existing utilities that may affect the cost of the Work will be shown on the Plans or indicated in the Specifications, the City does not warrant the completeness or accuracy of such information.

The Contractor will carefully study and compare each of the Contract Documents with the others and with information furnished by the City and will promptly report in writing to the Engineer any errors, inconsistencies, or omissions in the Contract Documents or inconsistencies with applicable law observed by the Contractor.

The Contractor will take field measurements, verify field conditions, perform soil investigations, and carefully compare with the Contract Documents such field measurements, conditions, and other information known to the Contractor before commencing the Work. Errors, inconsistencies, or omissions discovered at any time will be promptly reported in writing to the Engineer.

#### 2-8 RIGHT-OF-WAY

The following subsection is added to Subsection 2-8 of the SSPWC.

##### 2-8.1 ADDITIONAL WORK AREAS AND FACILITIES

When the Contractor arranges for additional temporary work areas and facilities, the Contractor will provide the City with proof that the additional work areas or facilities have been left in a condition satisfactory to the owner(s) of said work areas or facilities before acceptance of the work.

#### 2-9 SURVEYING

Subsection 2-9.3, Survey Service, is deleted in its entirety and replaced by the following subsection:

##### 2-9.3 SURVEY SERVICE

### 2-9.3.1 CONSTRUCTION SURVEYING

The Contractor will provide for all construction surveying required to layout, monitor and complete the work. The surveying will be performed by a Land Surveyor or Civil Engineer authorized to practice land surveying by the State of California.

The Project Benchmark is shown on the plans. The Contractor will establish all necessary control lines based on the plans and record information on file with the County of Los Angeles Surveyor and the Engineer.

It is the responsibility of the Contractor to protect the survey control as shown on the plans. If the survey control is destroyed or disturbed during construction, the Contractor will provide for resetting them and file appropriate documents with the County of Los Angeles at the direction of the Engineer.

Computations, survey notes, and other data used to accomplish the work will be neat, legible and accurate. Copies of all computations, survey notes, and other data (electronic format may be required) will be furnished to the Engineer before beginning work that requires their use.

### 2-9.3.2 MEASUREMENT AND PAYMENT

Construction Survey – Unless a separate bid item is provided, payment will be considered included in the other items of the bid and no additional payment will be made therefore.

### 3-3.2.2 BASIS FOR ESTABLISHING COSTS

Subsection 3-3.2.2 (c), Tool and Equipment Rental is modified where the second and third paragraphs are replaced with “Regardless of ownership, the rates to be used in determining the equipment usage costs will not exceed those listed for the same or similar equipment in the California State Department of Transportation publication of Labor Surcharge and Equipment Rates effective for the period of usage.”

### 3-3.2.3 MARK UP

Subsection 3-3.2.3, Mark Up, is deleted in its entirety and replaced by the following subsection:

- (a) Work by Contractor. The following percentages will be added to the Contractor's costs and will constitute the markup for all overhead and profits.

- 1) Labor .....20
- 2) Materials ..... 15
- 3) Equipment Rental ..... 15
- 4) Other Items and Expenditures 15

To the sum of the costs and markups provided for in this subsection, 1 percent will be added as compensation for bonding.

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

3-3.3 DAILY REPORTS BY CONTRACTOR

Add the following paragraph to subsection 3-3.3, Daily Reports by Contractor:

If disagreement continues regarding extra work, the Contractor may seek compensation in accordance with the Claims procedure. Daily Reports required by this subsection must be made part of the Claim as supporting data for the Claim.

3-4 CHANGED CONDITIONS

Subsection 3-4, Changed Conditions, is deleted in its entirety and replaced with the following subsection:

If the Contractor encounters concealed or unknown conditions that differ materially from those anticipated or expected (“changed conditions”), the Contractor will immediately notify the Engineer in writing of such changed conditions (upon discovery and before disturbing such changed conditions), as provided in Subsection 6-11, so that the Engineer can determine if such conditions require design details that differ from those design details shown in the Contract Documents. Notwithstanding the thirty (30) day time period set forth in Subsection 6-11.3, the Contractor will be liable to the City for any extra costs incurred as a result of the Contractor’s failure to promptly give such notice.

Changed conditions will include, without limitation, the following:

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

The Engineer will promptly investigate conditions that appear to be changed conditions. The Engineer's decision, and any dispute regarding that decision, will be made in accordance with Section 6-11 except that the Engineer will render a decision promptly.

Any information provided pursuant to INFORMATION AVAILABLE TO BIDDERS is subject to the following provisions:

1. The information is made available for the Bidders' convenience and is not a part of the Contract.
2. The City has not determined the accuracy or completeness of such information and all such information is made available to Bidders without any representation or warranty by the City whatsoever as to its accuracy, completeness, or relevancy.
3. Bidders will independently evaluate such information for their use and will be solely responsible for use or interpretation of such information. Any such use or interpretation will not be the basis of any claim against the City.

### 3-5 DISPUTED WORK

Subsection 3-5 is deleted in its entirety and replaced by the following subsection.

If the Contractor and the City do not reach agreement on disputed work, the City may direct the Contractor to proceed with the work. Any payment for the disputed work will be determined pursuant to the claims procedures in these Standard Specifications. Although not to be construed as proceeding under

extra work provisions, the Contractor will keep and furnish records of disputed work as required by the Contract Documents.

#### 4-1.3 INSPECTION REQUIREMENTS

Subsection 4-1.3, Inspection Requirements, is deleted in its entirety and replaced by the following subsections.

##### 4-1.3.1 GENERAL

Unless otherwise specified, inspection at the source of production for such materials and fabricated items as bituminous paving mixtures, structural concrete, fabricated metal products, cast metal products, welding, reinforced and unreinforced concrete pipe, application of protective coatings, and similar shop and plant operations is not required. A certificate of compliance, signed by an authorized officer of the producer, certifying compliance with the contract documents will be submitted for all of the following materials: steel pipe, sizes less than 18 inches; vitrified clay pipe; asbestos cement pipe; cast iron pipe; reinforced concrete pipe; non-reinforced concrete pipe; and PVC sewer and water pipe; subject to sampling and testing by City.

Standard items of equipment, such as electric motors, conveyors, plumbing fittings and fixtures, lumber, plywood, and so on, are subject to inspection at the job site, at the Engineer's sole discretion.

All other equipment items will be inspected and tested in accordance with the contract documents.

The City does not provide full time inspection. The Contractor will provide 24-hour minimum notice for each inspection required by the work unless other arrangements have been agreed upon, in writing, with the City Engineer. Any inspection required outside of normal working hours and days, including holidays, will be at the Contractor's cost at rates established by the City.

##### 4-1.3.2 INSPECTION OF MATERIALS NOT PRODUCED LOCALLY

Contractor purchased materials, fabricated items, and equipment, produced at sources located more than 50 miles outside the corporate limits of the City, and which are specified to be inspected in the Contract Documents, will be inspected by inspectors or testing laboratories arranged for and paid for by City. Report of such inspection must be submitted to the City. If any item inspected fails to meet the specified criteria, the Contractor will pay all costs for reinspection, and such costs may be deducted from payments due to the Contractor.

#### 4-1.6 TRADE NAMES OR EQUALS

Whenever any material, product, equipment, or service is specified by brand, trade, or proprietary name, the item so specified will be deemed to be followed by the words "or equal".

For the City's consideration of a proposed "equal" item, the Bidder will submit, a minimum of ten (10) calendar days before the date of the bid opening, documentation of the particulars of the proposed "equal item". At a minimum, the submitted documentation will include:

- Written request with explanation of why the product should be considered as an equal product.
- Material specifications.
- Technical specifications.
- Test data.
- Samples.
- Comparison chart of key specifications of the "equal" item against similar specifications of the specified item.
- Work locations and reference telephone numbers of at least three (3) locations where the proposed "equal" item has been recently installed under similar conditions.
- Warranty data.

The Bidder will be notified by the Engineer whether or not the proposed "equal" product is acceptable to the City five (5) calendar days before the date of the bid opening. Failure to submit all required documentation and/or submittal of incomplete documents may result in the City's rejection of the proposed "equal" product without further consideration.

#### 5-2 PROTECTION

The following subsection is added to Subsection 5-2 of the SSPWC.

##### 5-2.1 INCORRECT LOCATION OF UTILITIES

If the Contractor, while performing the Work, discovers utility facilities not identified correctly or not shown in the contract plans or specifications by the City, the Contractor will immediately notify the City and utility owner in writing.

#### 5-4 RELOCATION

The following subsection is added to Subsection 5-4 of the SSPWC.

##### 5-4.1 RESPONSIBILITY OF UTILITY REMOVAL OR RELOCATION

The City will be responsible to arrange for the removal, repair, or relocation of existing utilities located within the project limits if such utilities are not correctly identified in the contract plans or specifications by the City. The City will have the sole discretion to perform repairs or relocation work or permit the Contractor to do such repairs or relocation.

#### 5-5 DELAYS

The following paragraphs are added to Subsection 5-5 of the SSPWC.

Actual loss, as used in this Subsection, will be understood to include no items of expense other than idle time of equipment and necessary payments for idle time of workers, cost of extra moving of equipment, and cost of longer hauls. Compensation for idle time of equipment and idle time of workers will be determined by Subsection 5-5.1 and no markup will be added in either case for overhead and profit. The cost of extra moving of equipment and the cost of longer hauls will be paid for as extra work.

The following subsection is added to Subsection 5-5 of the SSPWC.

##### 5-5.1 CALCULATING IDLE TIME

Equipment idle time will be calculated in accordance with Subsection 3-3.2.2(c) and based upon the actual normal working time during which the delay condition exists, but in no case will exceed 8 hours in any one day. The days for which compensation will be paid will be the calendar days, excluding Saturdays, Sundays and legal holidays, during the existence of the delay.

Worker idle time will be calculated in accordance with Subsection 3-3.2.2(a).

#### 6-1 CONSTRUCTION SCHEDULE AND COMMENCEMENT OF WORK

Section 6-1, Construction Schedule and Commencement of Work, is deleted in its entirety and replaced by the following subsections.

##### Pre-Construction Meeting:

After contract award, the City will arrange for a pre-construction meeting to discuss the construction of the project. City will invite utility agencies and the

contractor will arrange for all of its sub-contractors to attend the meeting.

#### 6-1.1 CONTRACT SCHEDULE

After notification of award and before starting any work, the Contractor will submit a Contract Schedule to the Engineer for review, as required by these Specifications within fifteen (15) days of award.

#### 6-1.2 CONTENT OF CONTRACT SCHEDULE

The Contract Schedule, and any updated Contract Schedule, will meet the following requirements:

1. Schedules must be suitable for monitoring progress of the Work.
2. Schedules must provide necessary data about the time for the Engineer's decisions.
3. Schedules must be sufficiently detailed to demonstrate adequate planning for the Work.
4. Schedules must represent a practical plan to complete the Work within the Contract Time.
5. Schedules must show the critical path method for completing the Work.

The Engineer's review of the form and general content of the Contract Schedule and any updated Contract Schedules is only for the purpose of determining if the listed requirements are satisfied, nothing more.

#### 6-1.3 EFFECT OF CONTRACT SCHEDULE

The Contract Schedule, and any updated Contract Schedules, will represent a practical plan to complete the Work within the Contract Time. Extension of any schedule beyond the Contract Time will not be acceptable. Schedules showing the Work completed in less than the Contract may be acceptable if judged by the Engineer to be practical. Acceptance of such a schedule by the Engineer will not change the Contract Time. The Contract Time, not the Contract Schedule, will control in determining liquidated damages payable by the Contractor and in determining any delay.

If a schedule showing the Work completed in less than the Contract Time is accepted, the Contractor will not be entitled to extensions of the Contract Time for Excusable Delays or Compensable Delays or to adjustments of the Contract Sum for Compensable Delays until such delays extend the

completion of the Work beyond the expiration of the Contract Time.

The Contractor will plan, develop, supervise, control, and coordinate the performance of the Work so that its progress and the sequence and timing of Work activities conform to the current accepted Contract Schedule. The Contractor will continuously obtain from Subcontractors information and data about the planning for and progress of the Work and the delivery of equipment, will coordinate and integrate such information and data into updated Contract Schedules, and will monitor the progress of the Work and the delivery of equipment. The Contractor will act as the expeditor of potential and actual delays, interruptions, hindrances, or disruptions for its own forces and those forces of Subcontractors. The Contractor will cooperate with the Engineer in developing the Contract Schedule and updated Contract Schedules.

The Engineer's review and comments about any schedule or scheduling data will not relieve the Contractor from its sole responsibility to plan for, perform, and complete the Work within the Contract Time. Review and comments about any schedule will not transfer responsibility for any schedule to the Engineer or the City nor imply their agreement with (1) any assumption upon which such schedule is based or (2) any matter underlying or contained in such schedule.

The Engineer's failure to discover errors or omissions in schedules that have been reviewed, or to inform the Contractor that the Contractor, Subcontractors, or others are behind schedule, or to direct or enforce procedures for complying with the Contract Schedule will not relieve the Contractor from its sole responsibility to perform and complete the Work within the Contract Time and will not be a cause for an adjustment of the Contract Time or the Contract Sum.

The Contractor will perform the Work in accordance with the currently accepted Contract Schedule.

#### 6-1.4 COMMENCEMENT OF CONTRACT TIME

The Contract Time will commence when the City issues a Notice to Proceed. The Work will start on the date specified in the Notice to Proceed and within a maximum of fifteen (15) days after the date of the Notice to Proceed, and be diligently prosecuted to completion with the time provided in the Specifications.

#### 6-4 DEFAULT BY CONTRACTOR

The language in subsection 6-4 is deleted in its entirety and replaced with the following subsections.

#### 6-4.1 GENERAL

Should the Contractor fail to begin delivery of material and equipment, to commence the Work within the time specified, to maintain the rate of delivery of material, to execute the Work in the manner and at such locations as specified, or fail to maintain the Work schedule (as determined by the current accepted Contract Schedule) which will ensure the City's interest, or if the Contractor is not carrying out the intent of the Contract, the City may serve written notice upon the Contractor and the Surety on its Faithful Performance Bond demanding satisfactory compliance with the Contract.

#### 6-4.2 TERMINATION OF CONTRACTOR'S CONTROL OVER THE WORK

The City may terminate the Contractor's control over the Work without liability for damages when, in the City's opinion, the Contractor is not complying in good faith, has become insolvent, or has assigned or subcontracted any part of the Work without the City's consent. Should such termination occur, the Contractor will be paid the actual amount due based on Contract Unit Prices or lump sums bid and the quantity and quality of the work completed and in place at the time of termination, less damages caused to the City by the Contractor's action or inaction.

In the event of such termination of control, the City may do any one, or combination of, the following:

1. Serve written notice upon the Surety on its Faithful Performance Bond demanding satisfactory compliance with the Contract. In such event the Surety will, within 5 days, assume control and perform the Work as successor to the Contractor;
2. The City may perform the Work itself and deduct the cost thereof from any payment due to the Contractor;
3. The City may replace the Contractor with a different contractor to complete the work and deduct the cost thereof from any payment due to the Contractor.

Nothing herein will waive, or serve as a limitation upon, any additional remedy the City may have under these Contract Documents or applicable law.

#### 6-4.3 SURETY'S ASSUMPTION OF CONTROL

Should the Surety assume any part of the Work, it will take the Contractor's place in all respects for that part, and will be paid by the City for all work

performed by it in accordance with the Contract. If the Surety assumes the entire Contract, all money due the Contractor at the time of its default will be payable to the Surety as the Work progresses, subject to the terms of the Contract.

If the Surety does not assume control and perform the Work within 5 days after receiving notice of cancellation, or fails to continue to comply, the City may exclude the Surety from the premises. The City may then take possession of all material and equipment and complete the Work by City's forces, by letting the unfinished work to another contractor, or by a combination of such methods. In any event, the cost of completing the Work will be charged against the Contractor and its Surety and may be deducted from any money due or becoming due from the City. If the sums due under the Contract are insufficient for completion, the Contractor or Surety will pay to the City within 5 days of completion, all costs in excess of the sums due.

The provisions of this subsection will be in addition to all other rights and remedies available to the City under applicable law.

## 6-6 DELAYS AND EXTENSIONS OF TIME

Subsections 6-6.1 to 6-6.4 are deleted and replaced with the following subsections.

### 6-6.1 GENERAL

If delays are caused by unforeseen events beyond the control of the Contractor, such delays will entitle the Contractor to an extension of time as provided herein, but the Contractor will not be entitled to damages or additional payment due to such delays except as otherwise provided herein. Excusable delay may include: war, earthquakes exceeding 3.5 on the Richter Scale, government regulation, labor disputes outside the contemplation of the parties, strikes outside the contemplation of the parties, fires, floods, changes to the Work as identified herein, or other specific events that may be further described in the Specifications.

Delays to the project caused by labor disputes or strikes involving trades not directly related to the project, or involving trades not affecting the project as a whole will not warrant an extension of time.

The City will not grant an extension of time for a delay by the Contractor's inability to obtain materials unless the Contractor furnishes to the Engineer documentary proof. The proof must be provided in a timely manner in accordance with the sequence of the Contractor's operations and accepted construction schedule.

Should delays be caused by events other than those included herein, the Engineer may, but is not required to, deem an extension of time to be in the City's best interests.

6-6.2 EXTENSIONS OF TIME

If granted, extensions of time will be based upon the effect of delays to the critical path of the Work as determined by the current accepted Contract Schedule. Delays to minor portions of the Work that do not affect the critical path will not be eligible for extensions of time.

6-6.3 PAYMENT FOR DELAYS TO CONTRACTOR

Any payment for compensable delay will be based upon actual costs as set forth in Subsection 5-5 excluding, without limitation, what damages, if any, the Contractor may have reasonably avoided. The Contractor understands that this is the sole basis for recovering delay damages and explicitly waives any right to calculate daily damages for office overhead, profit, or other purported loss, using different formulas including, without limitation, the Eichleay Formula.

6-6.4 WRITTEN NOTICE AND REPORT

If the Contractor desires payment for a delay or an extension of time, it will give the Engineer written notice of such request not later than the time limit set forth in the Proposal for submitting a claim after the event or occurrence giving rise to a delay claim. Failure to submit a written request within such amount of time will result in the Contractor waiving its delay claim.

Any claim for payment or an extension of time must be in the form required by the "Claims" sections of these Specifications.

In no event will the City grant the Contractor an extension of time if the delay is within the Contract Time as identified by the Contract Documents.

6.72 WORKING HOURS

On workdays, Contractor's activities will be confined to the hours between 7:00 a.m. and 4:00 p.m.

6-7.4 NIGHT WORK

The following paragraph is added to Section 6-7 of the SSPWC:

The City will not permit Work between the hours of 4 p.m. and 7 a.m. of the following day unless specifically provided for in the bid documents or unless

the Contractor receives prior written approval.

6.7.5 WEEKEND AND HOLIDAY WORK

The Engineer may, but is not required to, allow the Contractor to work on Saturdays, Sundays and City Holidays.

6-8 COMPLETION AND ACCEPTANCE

Subsection 6-8 is deleted in its entirety and replaced by the following subsection:

6-8 COMPLETION AND ACCEPTANCE

The Work will be inspected by the Engineer for acceptance upon the Engineer receiving the Contractor's written assertion that the Work is complete.

If, in the Engineer's judgment, the Work is complete and is ready for acceptance, the Engineer will accept the Work on behalf of the City in the manner prescribed by the City. The Engineer will recommend approval of the Notice of Completion to the City Council. This will be the date when the Contractor is relieved from responsibility to protect the Work.

All work will be guaranteed by the Contractor against defective workmanship and materials furnished by the Contractor for a period of 1 year from the date the Work was completed. The Contractor will replace or repair any such defective work in a manner satisfactory to the Engineer, after notice to do so from the Engineer, and within the time specified in the notice. If the Contractor fails to make such replacement or repairs within the time specified in the notice, the City may perform this work and the Contractor's sureties will be liable for the cost thereof.

6-8.1 GENERAL GUARANTY

The Contractor will remedy any defects in the work and pay for any damage to other work resulting therefrom, which will appear within a period of one year from the date of final acceptance of the work unless a longer period is specified. The owner will give notice of observed defects with reasonable promptness.

6-9 LIQUIDATED DAMAGES

Subsection 6-9, Liquidated Damages, of the SSPWC is deleted in its entirety and replaced by the following subsections.

## 6-9.1 FAILURE TO COMPLETE WORK ON TIME

If all the work called for under the contract is not completed before or upon the expiration of the Contract Time, the City will sustain damage. Since it is and will be impracticable to determine the actual damage which the City will sustain in the event of and by reason of such delay, it is therefore agreed that the Contractor will pay to the City the sum specified in the Proposal for each and every calendar day beyond the time prescribed to complete the work not as a penalty, but as a predetermined liquidated damage. The Contractor agrees to pay such liquidated damages as are herein provided, and in case the same are not paid, agrees that the City may deduct the amount thereof from any money due or that may become due to the Contractor under the contract.

Unless otherwise specified, liquidated damages will be \$250 per calendar day.

## 6-11 DISPUTES AND CLAIMS; PROCEDURE

### 6-11.1 GENERAL

Consistent with PCC § 10240.6, "Claim" means a written demand or assertion by the Contractor that seeks an adjustment or interpretation of the terms of the Contract Documents, payment of money, extension of time, or other relief with respect to the Contract Documents, including a determination of disputes or matters in question between the City and the Contractor arising out of or related to the Contract Documents or the performance of the Work, and claims alleging an unforeseen condition or an act, error, or omission by the City, the Engineer, their agents or employees. "Claim" does not mean, and the Claims procedures herein do not apply, to the following:

1. Claims respecting penalties for forfeitures prescribed by statute or regulations, which a government agency is specifically authorized to administer, settle, or determine.
2. Claims respecting personal injury, death, reimbursement, or other compensation arising out of or resulting from liability for personal injury or death.
3. Claims respecting a latent defect, breach of warranty, or guarantee to repair.
4. Claims respecting stop notices.

If a Claim is subject to the Change Order procedures, the Claim arises upon

the issuance of a written final decision denying in whole or in part the Contractor's Change Order Request. If a Claim is not subject to the Change Order Procedures, the Claim arises when the Contractor discovers, or reasonably should discover, the condition or event giving rise to the Claim.

#### 6-11.2 FORM

A Claim must include the following:

1. A statement that it is a Claim and a request for a decision.
2. A detailed description of the act, error, omission, unforeseen condition, event or other condition giving rise to the Claim.
3. If the Claim is subject to the Change Order procedures, a statement demonstrating that a Change Order Request was timely submitted and denied.
4. A detailed justification for any remedy or relief sought by the Claim, including to the extent applicable, the following:
  - a) If the Claim involves extra work, a detailed cost breakdown claimed. The breakdown must be provided even if the costs claimed have not been incurred when the Claim is submitted.
  - b) To the extent costs have been incurred when the Claim is submitted, the Claim must include actual cost records (including, without limitation, payroll records, material and rental invoices) demonstrating that costs claimed have actually been incurred.
  - c) To the extent costs have not yet been incurred at the time the Claim is submitted, actual cost records must be submitted on a current basis not less than once a week during any periods costs are incurred. A cost record will be considered current if submitted within 7 days of the date the cost reflected in the record is incurred. At the Engineer's request, claimed extra costs may be subject to further verification procedures (such as having an inspector verify the performance of alleged extra work on a daily basis).
5. If the Claim involves an error or omission in the Contract Documents:
  - a) An affirmative representation that the error or omission was not discovered before submitting a bid for the Contract; and

- b) A detailed statement demonstrating that the error or omission reasonably should not have been discovered by the Contractor, its Subcontractors and suppliers, before submitting a bid for the Contract.
- 6. If the Claim involves an extension of the Contract Time, written documentation demonstrating the Contractor's entitlement to a time extension.
- 7. If the Claim involves an adjustment of the Contract Sum for delay, written documentation demonstrating the Contractor's entitlement to such an adjustment.
- 8. A personal certification from the Contractor that reads as follows:

"I, \_\_\_\_\_, BEING THE \_\_\_\_\_ (MUST BE AN OFFICER) OF \_\_\_\_\_ (CONTRACTOR NAME), DECLARE UNDER PENALTY OF PERJURY UNDER CALIFORNIA LAW, AND DO PERSONALLY CERTIFY AND ATTEST THAT I HAVE THOROUGHLY REVIEWED THE ATTACHED CLAIM FOR ADDITIONAL COMPENSATION OR EXTENSION OF TIME, AND KNOW ITS CONTENTS, AND SAID CLAIM IS MADE IN GOOD FAITH; THE SUPPORTING DATA IS TRUTHFUL AND ACCURATE; THAT THE AMOUNT REQUESTED ACCURATELY REFLECTS THE CONTRACT ADJUSTMENT FOR WHICH THE CONTRACTOR BELIEVES CITY IS LIABLE; AND, FURTHER, THAT I AM FAMILIAR WITH CALIFORNIA PENAL CODE § 72 AND CALIFORNIA GOVERNMENT CODE § 12650, ET SEQ., PERTAINING TO FALSE CLAIMS, AND FURTHER KNOW AND UNDERSTAND THAT SUBMITTING OR CERTIFYING A FALSE CLAIM MAY LEAD TO FINES, IMPRISONMENT, AND OTHER SEVERE LEGAL CONSEQUENCES."

6-11.3 CLAIMS SUBMITTED TO ENGINEER

Within 30 days after the circumstances giving rise to a Claim occur, the Contractor will submit its Claim to the Engineer for a decision. Regardless of any Claim submittal, or any dispute regarding a Claim, unless otherwise directed by the Engineer, the Contractor will not cause any delay, cessation, or termination of the Work, but will diligently proceed with the performing the Work in accordance with the Contract Documents. Except as otherwise provided, the City will continue to make payments in accordance with the Contract Documents.

6-11.4 CLAIM IS PREREQUISITE TO OTHER REMEDY

The Contractor certifies that it is familiar with PCC § 10240.2 and understands and agrees that submitting a Claim in accordance with these Specifications is an express condition precedent to the Contractor's right to otherwise pursue a claim whether through alternative dispute resolution or by litigation. Should the Contractor fail to submit a claim in accordance with these Specifications, including the time limits set forth herein, it will waive any right to a remedy, whether in law or equity, it might otherwise have pursuant to the Contract Documents or applicable law.

#### 6-11.5 DECISION ON CLAIMS

The Engineer will promptly review Claims submitted by the Contractor in accordance with these Specifications. Should the Engineer require additional supporting evidence to evaluate the claim, the Engineer will request such additional information in writing. Any such requested data will be furnished not later than 10 days after the Contractor receives the Engineer's request.

The Engineer will render a decision not later than 60 days after either receiving the Claim or the deadline for furnishing additional supporting data, whichever is later. If the Engineer fails to render a decision within the time period established herein, then the Claim will be deemed denied. The Engineer's decision will be final and binding unless appealed in accordance with these Specifications.

The Engineer's decision on a Claim will include a statement substantially as follows:

"This is a decision pursuant to the General Specifications of your contract. If you are dissatisfied with the decision, and have complied with the procedural requirements for asserting claims, you may have the right to alternative dispute resolution or litigation. Should you fail to take appropriate action within 30 days of the date of this decision, the decision will be come final and binding and not subject to further appeal."

#### 6-11.6 APPEAL OF ENGINEER'S DECISION

Should the Contractor dispute the Engineer's decision, then the Contractor must appeal that decision to the City's Public Works Director within 30 days of receiving the Engineer's decision.

The Public Works Director will address disputes or claims within 30 calendar days after receiving such request and all necessary supporting data. The Public Works Director's decision on the dispute or claim will be the City's final decision.

If the Contractor disputes the Public Works Director's decision, then the Contractor must demand alternative dispute resolution in accordance with this Section and the PCC within 30 days of the City's final decision.

#### 6-11.7 MEDIATION

If the City and the Contractor agree, disputes between the parties may be submitted to non-binding mediation. If the parties cannot agree to an alternative form of mediation, then mediation will be administered by the American Arbitration Association ("AAA") under its Construction Industry Mediation Rules, unless the use of such rules are waived by mutual stipulation of both parties.

The parties may, but are not required to be, represented by counsel in mediation.

The requirement for mediation will not alter or modify the time limitations otherwise provided for claims and no conduct or settlement negotiation during mediation will be considered a waiver of the City's right to assert that claim procedures were not followed.

#### 6-11.8 ARBITRATION

If the City and Contractor do not agree to mediation, then a disputes will be submitted to neutral non-binding (except as provided herein) arbitration. Arbitration will be conducted in accordance with PCC § 10240.3. Any decision rendered by an arbitrator will be consistent with PCC § 10240.8.

The exclusive venue for any arbitration will be in Los Angeles County.

The expenses and fees of the arbitrators and the administrative fees, if any, will be divided among the parties equally. Each party will pay its own counsel fees, witness fees, and other expenses incurred for its own benefit.

#### 6-11.9 WHEN ARBITRATION DECISION BECOMES BINDING

The decision rendered by the arbitrator will become binding upon the parties unless appealed to the Los Angeles County Superior Court pursuant to PCC § 10240.12 within 30 days of the decision. If subsequent litigation results in an award to the party appealing the arbitration that is less than or equal to that of the arbitration decision, or if the litigation results in a decision in favor of the nonappealing party, then the party appealing the arbitration will pay the nonappealing party's attorney's fees and court costs.

#### 6-11.10 APPEAL TO SUPERIOR COURT; WAIVER OF JURY TRIAL

Should a party timely object to the arbitration decision, it may file a petition with the Los Angeles County Superior Court in accordance with California Code of Civil Procedure ("CCP") §§ 1285, et seq. Notwithstanding the limitations set forth in CCP § 1286.2, the court may vacate, correct, or adjust an arbitration award, and enter judgment in accordance with CCP § 1287.4, for any legal or equitable basis including, without limitation, error of law. The court will apply the substantial evidence standard of review when considering the appeal of an objecting party.

BY EXECUTING THESE CONTRACT DOCUMENTS, THE CONTRACTOR AGREES TO HAVE DISPUTES OR CONTROVERSY CONCERNING THE CONSTRUCTION, INTERPRETATION, PERFORMANCE, OR BREACH OF THESE CONTRACT DOCUMENTS, INCLUDING CLAIMS FOR BREACH OF CONTRACT OR ISSUES OF BAD FAITH DECIDED IN ACCORDANCE WITH THIS SECTION 6-11. BOTH THE CITY AND THE CONTRACTOR WAIVE THEIR RIGHT TO A JURY TRIAL FOR THESE DISPUTES OR ISSUES.

## 7-2 LABOR

The following subsections are added to Subsection 7-2 of the SSPWC.

### 7-2.3 PREVAILING WAGES

The Contractor will post at appropriate conspicuous points at the site of the project a schedule showing determinations of the Director of Industrial Relations of the prevailing rate of per diem wages. It will be the Contractor's responsibility to obtain copies of the prevailing rate of per diem wages. One source that may be used is the California Department of Industrial Relations website which is currently located at [www.dir.ca.gov](http://www.dir.ca.gov), or by calling the Prevailing Wage Unit at (415) 703-4774.

Attention is directed to Labor Code §§ 1777.5, 1777.6 and 3098 concerning the employment of apprentices by the Contractor or any subcontractor.

Labor Code § 1777.5 requires the Contractor or subcontractor employing tradesmen in any apprenticeship occupation to apply to the joint apprenticeship committee nearest the site of the public works project and which administers the apprenticeship program in that trade for a certificate of approval. The certificate will also fix the ratio of apprentices to journeymen that will be used in the performance of the contract. The ratio of apprentices to journeymen in such cases will not be less than one to five except:

- a) When employment in the area of coverage by the joint apprenticeship committee has exceeded an average of 15 percent in the 90 days before the request for certificate, or

- b) When the number of apprentices in training in the area exceeds a ratio of one to five, or
- c) When the trade can show that it is replacing at least 1/30 of its membership through apprenticeship training on an annual basis state-wide or locally, or
- d) When the Contractor provides evidence that the Contractor employs registered apprentices on all of his contracts on an annual average of not less than one apprentice to eight journeymen.

The Contractor is required to make contributions to funds established for the administration of apprenticeship programs if the Contractor employs registered apprentices or journeymen in any apprenticeable trade on such contracts and if other contractors on the public works site are making such contributions.

The Contractor and any subcontractor will comply with Labor Code §§ 1777.5 and 1777.6 in the employment of apprentices.

Information relative to apprenticeship standards, wage schedules and other requirements may be obtained from the Director of Industrial Relations, ex-officio the Administrator of Apprenticeship, San Francisco, California, or from the Division of Apprenticeship Standards and its branch offices.

#### 7-2.4 RECORD OF WAGES PAID: INSPECTION

Every Contractor and subcontractor will keep an accurate certified payroll records showing the name, occupation, and the actual per diem wages paid to each worker employed in connection with the Work. The record will be kept open at all reasonable hours to the inspection of the body awarding the contract and to the Division of Labor Law Enforcement. If requested by the City, the Contractor will provide copies of the records at its cost.

#### 7-3 LIABILITY INSURANCE

Subsection 7-3, Liability Insurance, of the SSPWC is deleted in its entirety and replaced by the following subsections.

##### 7-3.1 GENERAL

Contractor will procure and maintain for the duration of the contract the following insurance coverages and limits against claims for injuries to persons or damage to property which may arise from or in connection with the performance of the work covered by this agreement by the Contractor, its

agents, representatives, employees or subcontractors:

<b>COVERAGE PER OCCURRENCE</b>	<b>ISO FORM</b>	<b>COMBINED SINGLE LIMIT</b>
Comprehensive General Liability	CG 20 10 11 85 or 88	\$2,000,000
Business Auto	CA 00 01 01 87	\$2,000,000
Workers' Compensation		Statutory

Contractor will provide endorsements or other proof of coverage for contractual liability.

Combined single limit per occurrence will include coverage for bodily injury, personal injury, and property damage for each accident.

If Commercial General Liability Insurance or other form with a general aggregate limit is used, the policy will be endorsed such that the general aggregate limit will apply separately to this contract and a copy of the endorsement provided to the City.

Liability policies will contain, or be endorsed to contain the following provisions:

#### **GENERAL LIABILITY AND AUTOMOBILE LIABILITY:**

The City, its officers, officials, employees, agents, and volunteers will be covered as insureds as respects: liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor; premises owned, occupied or used by the Contractor; or automobiles owned, leased, hired or borrowed by the Contractor. The coverage will contain no special limitations on the scope or protection afforded to the City, its officers, officials, employees, agents, or volunteers.

The Contractor's insurance coverage will be primary insurance as respects the City, its officers, officials, employees, agents, and volunteers. Any insurance or self-insurance maintained by the City, its officers, officials, employees, agents, and volunteers will be excess of the Contractor's insurance and will not contribute with it.

Any failure to comply with reporting provisions of the policies will not affect coverage provided to the City, its officers, officials, employees, agents and volunteers.

The Contractor's insurance will 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.

## WORKERS' COMPENSATION:

The insurer will agree to waive all rights of subrogation against the City, its officers, officials, employees and volunteers for losses arising from work performed by the Contractor for the City.

## ALL COVERAGES:

Each insurance policy required by this subsection will be endorsed to state that coverage will not be suspended, voided, cancelled by either party, reduced in coverage or in limits except after thirty (30) days written notice by certified mail, return receipt requested, has been given to:

CITY CLERK  
City of El Segundo  
350 Main Street  
El Segundo, CA 90245

Notwithstanding the foregoing, the endorsement may state that insurance may be cancelled upon ten (10) day notification for non-payment of premium. The Contractor will provide the City with updated proof of insurance should the Contract Time extend beyond the policy expiration date.

All liability insurance will be on an occurrence basis. Insurance on a claims made basis will be rejected. Any deductibles or self-insured retentions will be declared to and approved by City. The insurer will provide an endorsement to City eliminating such deductibles or self-insured retentions as respects the City, its officials, employees, agents, and volunteers.

Except for Workers Compensation Insurance, Contractor will furnish to City certificates of insurance and endorsements on forms acceptable to the City's City Attorney, duly authenticated, giving evidence of the insurance coverages required in this contract and other evidence of coverage or copies of policies as may be reasonably required by City from time to time. Certificate/endorsement for Workers Compensation Insurance will be furnished on State Comp Fund or other industry standard form. Except for worker's compensation insurance, all insurance required herein will be placed with insurers with a Best's Rating of not less than A:VII. Worker's compensation insurance policies will meet the requirements of California law.

All subcontractors employed on the work referred to in this contract will meet the insurance requirements set forth for Contractor. Contractor will furnish certificates of insurance and endorsements for each subcontractor at least five days before the subcontractor entering the job site, or Contractor will furnish City an endorsement including all subcontractors as insureds under its policies.

Except as provided in Subsection 6-10, the Contractor will save, keep and hold harmless the City, its officers, officials, employees, agents and volunteers from all damages, costs or expenses in law or equity that may at any time arise or be claimed because of damages to property, or personal injury received by reason of or in the course of performing work, which may be caused by any willful or negligent act or omission by the Contractor or any of the Contractor's employees, or any subcontractor. The City will not be liable for any accident, loss or damage to the work before its completion and acceptance, except as provided in Subsection 6-10.

The cost of such insurance will be included in the various items of work in the Contractor's bid and no additional compensation for purchasing insurance or additional coverages needed to meet these requirements will be allowed.

In the event that any required insurance is reduced in coverage, cancelled for any reason, voided or suspended, Contractor agrees that City may arrange for insurance coverage as specified, and Contractor further agrees that administrative and premium costs may be deducted from payments due to the Contractor. Contractor will not be allowed to work until alternate coverage is arranged.

#### 7-3.2 RESPONSIBILITY FOR DAMAGE

In addition to the provisions of Subsection 7-3 of the SSPWC as between the City and Contractor, Contractor will take and assume all responsibility for the work as stated herein or shown on the plans.

The Contractor will bear all losses and damages directly or indirectly resulting to it, to the City, its officers, employees, and agents, or to others on account of the performance or character of the work, unforeseen difficulties, accidents, traffic control, job site maintenance, or any other causes whatsoever.

The Contractor will assume the defense of and indemnify and save harmless the City of El Segundo, its officers, employees, and agents, from and against any and all claims, losses, damage, expenses and liability of every kind, nature, and description, directly or indirectly arising from the performance of the contract or work, regardless of responsibility for negligence, and from any and all claims, losses, damage, expenses, and liability, howsoever the same may be caused, resulting directly, or indirectly from the nature of the work covered by the contract, regardless of responsibility for negligence, to the fullest extent permitted by law. In accordance with Civil Code § 2782, nothing in this Subsection 7-3.2 or in Subsection 7-3 of the Standard Specifications will require defense or indemnification for death, bodily injury, injury to property, or any other loss, damage or expense arising from the sole

negligence or willful misconduct of the City, or its agents, servants or independent contractors who are directly responsible to the City, or for defects in design furnished by such persons. Moreover, nothing in this Subsection 7-3.2 or in Subsection 7-3 will apply to impose on the Contractor, or to relieve the City from, liability for active negligence of the City.

The City does not, and will not, waive any rights against the Contractor which it may have by reason of the aforesaid hold harmless agreements because of the acceptance by the City, or deposit with City by Contractor, of any insurance policies described in Subsection 7-3 of the Standard Specifications. This hold harmless agreement by the Contractor will apply to all damages and claims for damages of every kind suffered, or alleged to have been suffered by reasons of any of the aforesaid operations of Contractor, or any subcontractor, regardless of whether or not such insurance policies are determined to be applicable to any of such damages or claims for damages.

No act by the City, or its representatives in processing or accepting any plans, in releasing any bond, in inspecting or accepting any work, or of any other nature, will in any respect relieve the Contractor or anyone else from any legal responsibility, obligation or liability he might otherwise have.

## 7-5 PERMITS

The following paragraph will be added to Subsection 7-5 of SSPWC:

The Contractor will apply for permits required by the City Building Safety Division. These permits will be issued on a “no-fee” basis. However, the Contractor must pay for and obtain all other permits from other governmental and utility agencies necessitated by their operations.

All bonding fees, (overweight and oversized vehicle permit fees) inspection permit fees or other fees charged or required for such permits must be paid by the Contractor. These costs will be included in the bid item provided. If no bid item is included, costs will be included in the various items of work, and no additional payment will be allowed.

## 7-8.1 CLEANUP AND DUST CONTROL

Subsection 7-8.1, Cleanup and Dust Control, of the SSPWC is deleted in its entirety and replaced by the following subsections.

### 7-8.1.1 GENERAL

On any construction project requiring trenching within public streets and for which total trenching is in excess of 500 feet, the Contractor will be required

to sweep the worksite utilizing a pick-up type street sweeper a minimum of once daily.

#### 7-8.1.2 WATERING

Water for the laying of dust caused by Contractor's operations or the passage of traffic through the work will be applied as necessary or as directed by the Engineer.

#### 7-8.6 WATER POLLUTION CONTROL

This section is supplemented by the addition of the following requirements which establish storm water and urban runoff pollution prevention controls.

- (a) Storm or construction generated water containing sediment such as, construction waste, soil, slurry from concrete/asphalt concrete saw cutting operations, clean up of concrete transit mixers or other pollutants from construction sites and parking areas will be retained or controlled on site and will not be permitted to enter the storm drain system.
- (b) Temporary sediment filtering systems such as sandbags, silt fences, or gravel berms will be utilized to trap sediment so that only filtered water enters the City's storm drain system. Proper clean up and disposal of settled sediment and the filtering system will be the responsibility of the CONTRACTOR.
- (c) Discharge of concrete transit mixer wash water on to approved dirt areas (sub-grade area designated for new concrete construction for example) is acceptable. Discharge on to private property, parkway areas, or the street is not permitted.
- (d) Plastic or other impervious covering will be installed where appropriate to prevent erosion of an otherwise unprotected area, along with any other runoff control devices deemed appropriate by the City.
- (e) Excavated soil stored on the site will be covered in a manner that minimizes the amount of sediments running into the storm drain system, street or adjoining properties.
- (f) No washing of construction or other industrial vehicles and equipment will be allowed adjacent to a construction site. During the rainy season (October 15 to April 15), Contractor will keep at the construction site sufficient materials and labor to install temporary sediment filtering systems and other water pollution prevention control

measures. These control measures will be in place and maintained by the Contractor on a daily basis on days when construction is not in progress due to rain.

- (h) All costs associated with water pollution control will be borne by the Contractor. Any expense incurred by the City to expeditiously respond to storm drain contamination resulting from Contractor's failure to implement water pollution control measures will be charged to the Contractor.

## 7-9 PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS

Section 7-9 is supplemented by the following additional requirements:

Where existing traffic striping, pavement markings, and curb markings are damaged or their reflectivity reduced by the Contractor's operations, such striping or markings will also be considered as existing improvements and the Contractor will replace such improvements.

Relocations, repairs, replacements, or re-establishments will be at least equal to the existing improvements and will match such improvements in finish and dimensions unless otherwise specified.

## 7-10 PUBLIC CONVENIENCE AND SAFETY

Section 7-10 is supplemented by the following additional requirements:

Unless otherwise specified all traffic control will be performed in accordance with the Work Area Traffic Control Handbook (WATCH) Latest Edition, published by Building News, 3055 Overland Avenue, Los Angeles, CA 90034, telephone 310-474-7771.

### 7-10.1 TRAFFIC AND ACCESS

The Contractor will notify the occupants of all affected properties at least 48 hours prior to any temporary obstruction of access. Vehicular access to property line will be maintained except as required for construction for a reasonable period of time. No overnight closure of any driveway will be allowed except as permitted by the Engineer.

At least one (1) twelve (12) foot wide traffic lane will be provided for each direction of travel on all streets at all times except as permitted by the Engineer. The traffic lanes will be maintained on pavement, and will remain unobstructed. All work requiring that a lane be closed or a lane moved right or left will be noticed to the traveling public by use of City approved lighted arrow boards.

Clearances from traffic lanes will be five feet to the edge of any excavation and 2 feet to the face of any curb, pole, barricade, delineator, or other vertical obstruction.

One four (4) foot wide paved pedestrian walkway will be maintained in the parkway area on each side of all streets. The clearance from the pedestrian walkway to any traffic lane will be five (5) feet. Pedestrians and vehicles will be protected from all excavations, material storage, and/or obstructions by the placement of an adequate number of lighted barricades (minimum two (2)) at each location, one (1) at each end of the obstruction or excavation), which will have flashing lights during darkness. Barricades will be Type I or Type II per Section 7-3 and lights will be Type A per Section 7-6 of the "Work Area Traffic Control Handbook" (WATCH).

#### 7-10.2 STREET CLOSURES, DETOURS, BARRICADES

Street closures will not be allowed except as specifically permitted by the Engineer.

The Contractor will prepare any traffic control or detour plans that may be required as directed by the Engineer. Lane transitions will not be sharper than a taper of thirty (30) to one (1).

Temporary traffic channelization will be accomplished with barricades or delineators. Temporary striping will not be allowed unless specifically permitted by the Engineer. The Contractor will prepare any plans that may be required for temporary striping to the satisfaction of the Engineer. In no event will temporary striping be allowed on finish pavement surfaces, which are to remain.

Where access to driveway or street crossings need to be maintained, minimum 1 1/4 inch thick steel plating will be used to bridge the trench. All steel plating will have temporary asphalt concrete 1:12 minimum sloped ramps to assist vehicles to cross comfortably over the plates and have a non-skid surface. Plates subject to vehicle high traffic speeds and in residential areas will be secured by welding at the discretion of the Engineer.

#### 7-10.5 PROTECTION OF THE PUBLIC

It is part of the service required of the Contractor to make whatever provisions are necessary to protect the public. The Contractor will use foresight and will take such steps and precautions as his operations warrant to protect the public from danger, loss of life or loss of property, which would result from interruption or contamination of public water supply, interruption of other public service, or from the failure of partly completed work or partially

removed facilities. Unusual conditions may arise on the Project which will require that immediate and unusual provisions be made to protect the public from danger or loss of life, or damage to life and property, due directly or indirectly to prosecution of work under this contract.

Whenever, in the opinion of the Engineer, an emergency exists against which the Contractor has not taken sufficient precaution for the public safety, protection of utilities and protection of adjacent structures or property, which may be damaged by the Contractor's operations and when, in the opinion of the Engineer, immediate action will be considered necessary in order to protect the public or property due to the Contractor's operations under this contract, the Engineer will order the Contractor to provide a remedy for the unsafe condition. If the Contractor fails to act on the situation immediately, the Engineer may provide suitable protection to said interests by causing such work to be done and material to be furnished as, in the opinion of the Engineer, may seem reasonable and necessary.

The cost and expense of said labor and material, together with the cost and expense of such repairs as are deemed necessary, will be borne by the Contractor. All expenses incurred by the City for emergency repairs will be deducted from the progress payments and the final payment due to the Contractor. Such remedial measures by the City will not relieve the Contractor from full responsibility for public safety.

7-15

#### HAZARDOUS MATERIAL

The following Subsection will be added to Section 7 of the SSPWC:

For any excavation, which extends more than four feet below existing grade, the Contractor will promptly, and before the conditions are disturbed, notify the Engineer, in writing, of 1) any material that the Contractor believes may be hazardous waste, as defined in Health and Safety Code § 25117, which is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law, 2) subsurface or latent physical conditions at the site differing from those indicated, or 3) 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 Documents.

After receiving notice from the Contractor, the Engineer will promptly investigate any condition identified by the Contractor as being hazardous. The rights and obligations of the City and the Contractor with regard to such conditions (including, without limitation, the procedures for procuring change orders and filing claims) will be specified by the provisions of Subsection 3-4 (Changed Conditions) of the SSPWC.

If a dispute arises between the City and the Contractor whether the conditions materially differ, involve hazardous waste, or cause a change in the Contractor's cost or time required for performance of the work, the Contractor will not be excused from any scheduled completion date provided for by the contract, but will proceed with all work to be performed under the contract. The Contractor will retain all rights provided by Subsection 3-5, Disputed Work, of the SSPWC.

If the Engineer determines that material called to the Engineer's attention by the Contractor is hazardous waste, or if the Engineer otherwise discovers the existence of hazardous waste, the Contractor will be responsible for removal and disposal of the hazardous waste by qualified personnel and appropriate equipment in the manner required by law as directed by the Engineer, subject to the provisions of Section 3 (Changes in Work) of the SSPWC.

## 9-2 LUMP SUM WORK

Subsection 9-2, Lump Sum Work, of the SSPWC is deleted in its entirety and replaced by the following:

Items for which quantities are indicated as "Lump Sum," "L.S.," or "Job" will be paid for at the price indicated in the Proposal. Such payment will be full compensation for all costs for labor, equipment, materials and plant necessary to furnish, construct and install the lump sum item of work, complete, in place, and for all necessary appurtenant work, including, but not limited to, all necessary cutting, patching, repair and modification of existing facilities, and clean up of site.

Contractor will furnish three copies of a detailed schedule, which breaks down the lump sum work into its component parts and cost for each part, in a form and sufficiently detailed as to satisfy Engineer that it correctly represents a reasonable apportionment of the lump sum. This schedule is subject to approval by Engineer as to both the components into which the lump sum item is broken down, and the proportion of cost attributable to each component.

This schedule will be the basis for progress payments for the lump sum work.

## 9-3.2 PARTIAL AND FINAL PAYMENTS

The text of Subsection 9-3.2 of the Standard Specifications is hereby deleted and replaced with the following:

The closure date for the purpose of making partial progress payments will be the last working day of each month. The Contractor will prepare the partial payment invoice with measurement of the work performed through the

closure date and submit it to the CITY for approval.

When work is complete, the Contractor will determine the final quantities of the work performed and prepare the final progress payment, and submit it to the Engineer for approval.

It will take a minimum of thirty-five (35) calendar days from the date of approving the Contractor's invoice to make the payment to the Contractor. However, payments will be withheld pending receipt of any outstanding reports required by the contract documents, or legal release of filed Stop Payment Notices against the Contractor. In addition, the final progress payment will not be released until the Contractor returns the control set of Plans and Specifications showing the as-built conditions.

The full ten percent (10%) retention will be deducted from all progress payments. The Contractor will make a payment request for the retained amount, for approval by the City, upon field acceptance of the work by the City Engineer. The City Engineer upon field acceptance and receipt of the final as-built plans and any other reports or documents required to be provided by the Contractor will process a recommendation to the City Council for acceptance of the work. Not less than thirty-five (35) calendar days from the City Council acceptance of the work, the Contractor's final payment will be made provided Stop Payment Notices or other claims have not been filed against the Contractor and/or the City by material suppliers, sub-contractors, other governmental agencies, and private property owners. Until these Stop Payment Notices are released and claims are resolved the stop payment/claim amount will be withheld from the final payment.

The Contractor, however, may receive interest on the retention for the length of construction, or receive the retention itself as long as the retention is substituted with escrow holder surety or equal value.

At the request and expense of the Contractor, surety equivalent to the retention may be deposited with the State Treasurer, or a State or Federally chartered bank, as the escrow agent, who will pay such surety to the Contractor upon satisfactory completion of the contract.

Pursuant to PCC § 22300, the Contractor may substitute securities for retention monies held by the City or request that the City place such monies into an escrow account. The Contractor is notified, pursuant to PCC § 22300, that any such election will be at the Contractor's own expense and will include costs incurred by the City to accommodate the Contractor's request.

Progress payment paid by the City as contemplated herein, will be contingent upon the Contractor submitting, in addition to any additional documents, an

updated Contract Schedule in the form prescribed by these Contract Documents. Failure of the Contractor to submit an acceptable updated Contract Schedule will result in the City withholding partial payment, without liability to the City, until such an acceptable updated Contract Schedule is submitted. Nothing herein will allow the Contractor to suspend or slow progress of the Work.

9-3.3 DELIVERED MATERIALS

Materials and equipment delivered or stored, but not incorporated into the work, will not be approved for progress payments.

100-1 TERMINATION OF AGENCY LIABILITY

Before receiving final payment, the Contractor will execute a Release on Contract" form which will operate as, and will be a release to the City, the City Council, and each member of the City Council and their agencies, from all claims and liability to the Contractor for anything done or furnished for, or relating to, the work or for any act of neglect of the City of any person relating to or affecting the work, except the claim against the City for the remainder, if any there be, of the amounts kept or retained as provided in Subsections 9-3 of the Standard Specifications and except for any unsettled claims listed on said form which have been filed in compliance with the requirements for making claims.

# **SPECIAL PROVISIONS**

**SECTION 01 1000**

**SUMMARY**

**PART 1 GENERAL**

**1.01 PROJECT**

- A. Project Name: El Segundo Beach Lifeguard Facility.
- B. Owner's Name: City of El Segundo.
- C. Architect's Name: RRM Design Group.
- D. The Project consists of the construction of a new lifeguard facility, junior lifeguard storage and public restrooms and associated site improvements.

**1.02 CONTRACT DESCRIPTION**

- A. Contract Type: A single prime contract based on a Stipulated Price as described in the General Conditions of the Contract.

**1.03 OWNER OCCUPANCY**

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 01 2000**

**PRICE AND PAYMENT PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Price and Contract Time.
- C. Change procedures.
- D. Procedures for preparation and submittal of application for final payment.

**1.02 SCHEDULE OF VALUES**

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- B. Forms filled out by hand will not be accepted.
- C. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- D. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
- E. Revise schedule to list approved Change Orders, with each Application For Payment.

**1.03 APPLICATIONS FOR PROGRESS PAYMENTS**

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Execute certification by signature of authorized officer.
- E. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
- F. Submit three copies of each Application for Payment.
- G. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

**1.04 MODIFICATION PROCEDURES**

- A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor.
- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
  - 1. The document will describe the required changes and will designate method of determining any change in Contract Price or Contract Time.
  - 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and

specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within \_\_\_\_ days.

- D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.
- E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
- F. Substantiation of Costs: Provide full information required for evaluation.
  - 1. provide following data:
    - a. Overhead and profit.
    - b. Justification for any change in Contract Time.
    - c. Credit for deletions from Contract, similarly documented.
  - 2. Support each claim for additional costs with additional information:
    - a. Origin and date of claim.
    - b. Dates and times work was performed, and by whom.
    - c. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
  - 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

#### **1.05 APPLICATION FOR FINAL PAYMENT**

- A. Application for Final Payment will not be considered until the following have been accomplished:
  - 1. All closeout procedures specified in Section 01 7000.
  - 2. Waiver or release of lien rights for all contractors supplying work or products to the project.

#### **PART 2 PRODUCTS - NOT USED**

#### **PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 01 3000**

**ADMINISTRATIVE REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Submittals for review, information, and project closeout.
- D. Submittal procedures.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.
- B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 01 7800 - Closeout Submittals: Project record documents.

**1.03 PROJECT COORDINATION**

- A. Project Coordinator: Construction Manager.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for \_\_\_\_\_ access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
  - 1. Requests for interpretation.
  - 2. Requests for substitution.
  - 3. Shop drawings, product data, and samples.
  - 4. Test and inspection reports.
  - 5. Manufacturer's instructions and field reports.
  - 6. Applications for payment and change order requests.
  - 7. Progress schedules.
  - 8. Coordination drawings.
  - 9. Closeout submittals.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PRECONSTRUCTION MEETING**

- A. Owner will schedule a meeting after Notice of Award.
- B. Attendance Required:
  - 1. Owner.

2. Architect.
  3. Contractor.
- C. Agenda:
1. Execution of Owner-Contractor Agreement.
  2. Submission of executed bonds and insurance certificates.
  3. Distribution of Contract Documents.
  4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
  5. Designation of personnel representing the parties to Contract, Owner and Architect.
  6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  7. Scheduling.
  8. Scheduling activities of special testing and inspections.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

### **3.02 PROGRESS MEETINGS**

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
- C. Agenda:
1. Review minutes of previous meetings.
  2. Review of Work progress.
  3. Field observations, problems, and decisions.
  4. Identification of problems that impede, or will impede, planned progress.
  5. Review of submittals schedule and status of submittals.
  6. Maintenance of progress schedule.
  7. Corrective measures to regain projected schedules.
  8. Planned progress during succeeding work period.
  9. Maintenance of quality and work standards.
  10. Effect of proposed changes on progress schedule and coordination.
  11. Other business relating to Work.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

### **3.03 SUBMITTALS FOR REVIEW**

- A. When the following are specified in individual sections, submit them for review:
1. Product data.
  2. Shop drawings.
  3. Samples for selection.
  4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - CLOSEOUT SUBMITTALS.

### **3.04 SUBMITTALS FOR INFORMATION**

- A. When the following are specified in individual sections, submit them for information:
  - 1. Design data.
  - 2. Certificates.
  - 3. Test reports.
  - 4. Inspection reports.
  - 5. Manufacturer's instructions.
  - 6. Manufacturer's field reports.
  - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

### **3.05 SUBMITTALS FOR PROJECT CLOSEOUT**

- A. When the following are specified in individual sections, submit them at project closeout:
  - 1. Project record documents.
  - 2. Operation and maintenance data.
  - 3. Warranties.
  - 4. Bonds.
  - 5. Other types as indicated.
- B. Submit for Owner's benefit during and after project completion.

### **3.06 NUMBER OF COPIES OF SUBMITTALS**

- A. Documents for Review:
  - 1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches (215 x 280 mm): Submit the number of copies that Contractor requires, plus two copies that will be retained by Architect.
- B. Documents for Information: Submit two copies.
- C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.
- D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
  - 1. After review, produce duplicates.
  - 2. Retained samples will not be returned to Contractor unless specifically so stated.

### **3.07 SUBMITTAL PROCEDURES**

- A. Transmit each submittal with approved form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project, and coordinate submission of related items.
- F. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- G. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- H. Provide space for Contractor and Architect review stamps.

- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

**END OF SECTION**

**SECTION 01 3216**

**CONSTRUCTION PROGRESS SCHEDULE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Construction progress schedule, bar chart type.

**1.02 SUBMITTALS**

- A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
  - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.
- F. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

**1.03 SCHEDULE FORMAT**

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Scale and Spacing: To allow for notations and revisions.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 CONTENT**

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- D. Provide legend for symbols and abbreviations used.

**3.02 BAR CHARTS**

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

**3.03 UPDATING SCHEDULE**

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.

**3.04 DISTRIBUTION OF SCHEDULE**

- A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

**END OF SECTION**

**SECTION 01 4000**

**QUALITY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. References and standards.
- B. Mock-ups.
- C. Control of installation.
- D. Testing and inspection services.
- E. Manufacturers' field services.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 3000 - Administrative Requirements: Submittal procedures.
- B. Section 01 6000 - Product Requirements: Requirements for material and product quality.

**1.03 REFERENCES AND STANDARDS**

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

**1.04 TESTING AND INSPECTION AGENCIES**

- A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspection.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.

- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

### 3.02 MOCK-UPS

- A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

### 3.03 TESTING AND INSPECTION

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
  - 1. Test samples of mixes submitted by Contractor.
  - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 3. Perform specified sampling and testing of products in accordance with specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
  - 6. Perform additional tests and inspections required by Architect.
  - 7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
  - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Agency may not approve or accept any portion of the Work.
  - 3. Agency may not assume any duties of Contractor.
  - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
  - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
  - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
  - 3. Provide incidental labor and facilities:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    - c. To facilitate tests/inspections.

- d. To provide storage and curing of test samples.
  - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
  - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

#### **3.04 MANUFACTURERS' FIELD SERVICES**

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

#### **3.05 DEFECT ASSESSMENT**

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

**END OF SECTION**

**SECTION 01 5000**

**TEMPORARY FACILITIES AND CONTROLS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Project identification sign.
- I. Field offices.

**1.02 TEMPORARY UTILITIES - See Section 01 5100**

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Use trigger-operated nozzles for water hoses, to avoid waste of water.

**1.03 TELECOMMUNICATIONS SERVICES**

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
  - 1. Telephone Land Lines: One line, minimum; one handset per line.
  - 2. Internet Connections: Minimum of one; DSL modem or faster.
  - 3. Email: Account/address reserved for project use.
  - 4. Facsimile Service: Minimum of one dedicated fax machine/printer, with dedicated phone line.

**1.04 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

**1.05 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

**1.06 FENCING**

- A. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.
  - 1. Coordinate access requirements with Owner

**1.07 SECURITY - See Section 01 3553**

- A. Provide security and facilities to protect Work, and Owner's operations from unauthorized entry, vandalism, or theft.

**1.08 VEHICULAR ACCESS AND PARKING**

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

**1.09 WASTE REMOVAL**

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

**1.10 PROJECT IDENTIFICATION**

- A. Provide project identification sign of design and construction indicated on Drawings.
- B. Erect on site at location indicated.
- C. No other signs are allowed without Owner permission except those required by law.

**1.11 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

## SECTION 01 5713

### TEMPORARY EROSION AND SEDIMENT CONTROL

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Performance bond.
- E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

##### 1.02 REFERENCE STANDARDS

- A. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition.
- B. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 1986.

##### 1.03 PERFORMANCE REQUIREMENTS

- A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Runoff Calculation Standard for Urban Areas: USDA NRCS TR-55, Urban Hydrology for Small Watersheds.
- C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
  - 1. Obtain and pay for permits and provide security required by authority having jurisdiction.
- E. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.
- F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
  - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
  - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.
  2. Prevent development of ruts due to equipment and vehicular traffic.
  3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
1. Prevent windblown soil from leaving the project site.
  2. Prevent tracking of mud onto public roads outside site.
  3. Prevent mud and sediment from flowing onto sidewalks and pavements.
  4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
  2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- L. Open Water: Prevent standing water that could become stagnant.
- M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

#### 1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Erosion and Sedimentation Control Plan:
1. Submit not less than 30 days prior to anticipated start of clearing, grading, or other work involving disturbance of ground surface cover.
  2. Include:
    - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
    - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
    - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
    - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
    - e. Other information required by law.
    - f. Format required by law is acceptable, provided any additional information specified is also included.
  3. Obtain the approval of the Plan by authorities having jurisdiction.
  4. Obtain the approval of the Plan by Owner.
- C. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

#### PART 2 PRODUCTS

**2.01 MATERIALS**

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

**3.02 PREPARATION**

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

**3.03 INSTALLATION**

**3.04 MAINTENANCE**

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Clean out temporary sediment control structures weekly and relocate soil on site.
- D. Place sediment in appropriate locations on site; do not remove from site.

**3.05 CLEAN UP**

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

**END OF SECTION**

**SECTION 01 6000**

**PRODUCT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations and procedures.
- F. Procedures for Owner-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 4000 - Quality Requirements: Product quality monitoring.

**1.03 SUBMITTALS**

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

**PART 2 PRODUCTS**

**2.01 EXISTING PRODUCTS**

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

**2.02 NEW PRODUCTS**

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Do not use products having any of the following characteristics:
  - 1. Made using or containing CFC's or HCFC's.

**2.03 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

#### **2.04 MAINTENANCE MATERIALS**

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

### **PART 3 EXECUTION**

#### **3.01 SUBSTITUTION PROCEDURES**

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
  - 1. The burden of proof as to the equality of any material, process or article shall rest with the Contractor, and the Contractor shall submit all data substantiating a request for an 'or equal' substitution item as provided in Section 3400 of the Public Contract Code.
- B. Substitutions will not be considered when a product becomes unavailable through no fault of the Contractor.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- D. A request for substitution constitutes a representation that the submitter:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
  - 5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- E. Substitution Submittal Procedure:
  - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
  - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
  - 3. The Architect will notify Contractor in writing of decision to accept or reject request.

#### **3.02 OWNER-SUPPLIED PRODUCTS**

- A. Owner's Responsibilities:
  - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
  - 2. Arrange and pay for product delivery to site.
  - 3. On delivery, inspect products jointly with Contractor.
  - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
  - 5. Arrange for manufacturers' warranties, inspections, and service.

- B. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
  2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
  3. Handle, store, install and finish products.
  4. Repair or replace items damaged after receipt.

### **3.03 TRANSPORTATION AND HANDLING**

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

### **3.04 STORAGE AND PROTECTION**

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Prevent contact with material that may cause corrosion, discoloration, or staining.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

**END OF SECTION**

**SECTION 01 7000**

**EXECUTION AND CLOSEOUT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, except payment procedures.
- I. General requirements for maintenance service.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 3000 - Administrative Requirements: Submittals procedures.
- B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- C. Section 01 5100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.
- D. Section 01 5713 - Temporary Erosion and Sedimentation Control: Additional erosion and sedimentation control requirements.
- E. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
  - 1. On request, submit documentation verifying accuracy of survey work.
  - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
  - 3. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather exposed or moisture resistant element.
  - 3. Efficiency, maintenance, or safety of any operational element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of Owner or separate Contractor.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

#### 1.04 QUALIFICATIONS

- A. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.
- B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located.

#### 1.05 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

#### 1.06 COORDINATION

- A. See Section 01 1000 for occupancy-related requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.

- H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

## **PART 2 PRODUCTS**

### **2.01 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

### **3.02 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

### **3.03 PREINSTALLATION MEETINGS**

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

### 3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
  - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and \_\_\_\_\_.
  - 2. Grid or axis for structures.
  - 3. Building foundation, column locations, ground floor elevations, and \_\_\_\_\_.
- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.

### 3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

### 3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
  - 1. Complete the work.
  - 2. Fit products together to integrate with other work.
  - 3. Provide openings for penetration of mechanical, electrical, and other services.
  - 4. Match work that has been cut to adjacent work.
  - 5. Repair areas adjacent to cuts to required condition.
  - 6. Repair new work damaged by subsequent work.
  - 7. Remove samples of installed work for testing when requested.
  - 8. Remove and replace defective and non-conforming work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
- I. Patching:
  - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
  - 2. Match color, texture, and appearance.
  - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

### **3.07 PROGRESS CLEANING**

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

### **3.08 PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

### **3.09 SYSTEM STARTUP**

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

### **3.10 DEMONSTRATION AND INSTRUCTION**

- A. See Section 01 7900 - Demonstration and Training.

### **3.11 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

### **3.12 FINAL CLEANING**

- A. Execute final cleaning prior to Substantial Completion.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces,
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

### **3.13 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Owner.
- B. Notify Architect when work is considered ready for Substantial Completion.
  - 1. Substantial Completion is defined as the time the project is ready to be used for its intended purpose.
- C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.
- D. Owner will occupy all of the building as specified in Section 01 1000.
- E. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- F. Notify Architect when work is considered finally complete.
- G. Complete items of work determined by Architect's final inspection.

### **3.14 MAINTENANCE**

- A. Provide service and maintenance of components indicated in specification sections.

- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

**END OF SECTION**

**SECTION 01 7800**

**CLOSEOUT SUBMITTALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

**1.03 SUBMITTALS**

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
  - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
  - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Addenda.
  - 3. Change Orders and other modifications to the Contract.
  - 4. Reviewed shop drawings, product data, and samples.

- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
  - 1. Construction sets submitted as record documents will not be accepted.
- D. Record information concurrent with construction progress.
- E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
  - 1. Field changes of dimension and detail.
  - 2. Details not on original Contract drawings.

### **3.02 OPERATION AND MAINTENANCE DATA**

- A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### **3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. For Each Product, Applied Material, and Finish:
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

### **3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS**

- A. For Each Item of Equipment and Each System:
  - 1. Description of unit or system, and component parts.
  - 2. Identify function, normal operating characteristics, and limiting conditions.
  - 3. Include performance curves, with engineering data and tests.
  - 4. Complete nomenclature and model number of replaceable parts.
- B. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- D. Provide servicing and lubrication schedule, and list of lubricants required.
- E. Include manufacturer's printed operation and maintenance instructions.
- F. Include sequence of operation by controls manufacturer.
- G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- H. Additional Requirements: As specified in individual product specification sections.

### **3.05 OPERATION AND MAINTENANCE MANUALS**

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- B. Prepare data in the form of an instructional manual.
- C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- F. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- G. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
- H. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
  - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.
    - d. Operating instructions.
    - e. Maintenance instructions for equipment and systems.
    - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
  - 3. Part 3: Project documents and certificates, including the following:
    - a. Shop drawings and product data.
- I. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

### **3.06 WARRANTIES AND BONDS**

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.

- F. Cover: Identify each binder with typed or printed title **WARRANTIES AND BONDS**, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

**END OF SECTION**

## SECTION 01 7900

### DEMONSTRATION AND TRAINING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Demonstration of products and systems where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
  - 1. HVAC systems and equipment.
  - 2. Plumbing equipment.
  - 3. Electrical systems and equipment.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
  - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
  - 2. Items specified in individual product Sections.

##### 1.02 RELATED REQUIREMENTS

- A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

##### 1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
  - 1. Submit to Architect for transmittal to Owner.
  - 2. Submit not less than four weeks prior to start of training.
  - 3. Revise and resubmit until acceptable.
  - 4. Provide an overall schedule showing all training sessions.
  - 5. Include at least the following for each training session:
    - a. Identification, date, time, and duration.
    - b. Description of products and/or systems to be covered.
    - c. Name of firm and person conducting training; include qualifications.
    - d. Intended audience, such as job description.
    - e. Objectives of training and suggested methods of ensuring adequate training.
    - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
    - g. Media to be used, such as slides, hand-outs, etc.
    - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
  - 1. Include applicable portion of O&M manuals.
  - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
  - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.

##### 1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
  - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.

2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.01 DEMONSTRATION - GENERAL**

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstration may be combined with Owner personnel training if applicable.
- C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
  1. Perform demonstrations not less than two weeks prior to Substantial Completion.
  2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
  1. Perform demonstrations not less than two weeks prior to Substantial Completion.

### **3.02 TRAINING - GENERAL**

- A. Conduct training on-site unless otherwise indicated.
- B. Owner will provide classroom and seating at no cost to Contractor.
- C. Provide training in minimum two hour segments.
- D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
  1. The location of the O&M manuals and procedures for use and preservation; backup copies.
  2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
  3. Typical uses of the O&M manuals.
- F. Product- and System-Specific Training:
  1. Review the applicable O&M manuals.
  2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
  3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
  4. Provide hands-on training on all operational modes possible and preventive maintenance.
  5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
  6. Discuss common troubleshooting problems and solutions.
  7. Discuss any peculiarities of equipment installation or operation.
  8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
  9. Review recommended tools and spare parts inventory suggestions of manufacturers.

10. Review spare parts and tools required to be furnished by Contractor.
  11. Review spare parts suppliers and sources and procurement procedures.
- G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

**END OF SECTION**

## SECTION 01 8250

### SUPPORTING FROM BUILDING STRUCTURE

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Nonstructural components, including seismic restraints and connection to the structure shall meet all requirements of the contract documents and the 2007 California Building Code (CBC), which includes the requirements of ASCE/SEI 7-05 "Minimum Design Loads for Buildings and Structures", Section 13
- B. This section includes seismic design requirements for nonstructural components including, but not limited to, the following:
  - 1. Mechanical Equipment and Conveyances.
  - 2. Electrical Equipment and Conveyances.
  - 3. Alarms and Fire Suppression Systems.
  - 4. Communication Systems.
  - 5. Data Systems.
  - 6. Cladding.
  - 7. Glazing.
  - 8. Partitions.
  - 9. Suspended Ceilings.

##### 1.02 DESIGN CRITERIA

- A. Nonstructural components, including seismic restraints and connections to the structure shall be designed to meet seismic requirements of the 2007 CBC and ASCE/SEI 7-05, Section 13. The following seismic criteria are applicable to this project. The Contractor shall obtain any required additional seismic criteria that may not be identified within this specification.
- B. Seismic Forces: ASCE/SEI 7-05 "Minimum Design Loads for Buildings and Other Structures." Section 13, using the following parameters:
  - 1. Occupancy Category IV.
  - 2. Seismic Design Category D.
  - 3. MCE Spectral Response Acceleration,  $S_s = 1.586g$ 
    - a. MCE Spectral Response Acceleration,  $S_1 = 0.643g$
  - 4. Importance Factor (IP) = 1.0
  - 5. FP Shall be determined in accordance with ASCE/SEI 7-05, Section 13.3.
- C. The Component Amplification Factor (ap) and the Component Response Modification Factor (Rp) shall be determined by the Contractor for each individual application, unless otherwise specified in the construction documents.
- D. For applications where combination of different aP and or RP design values are intermixed, the design shall be based on the worst case within the mixture. When applicable, the following shall apply:
  - 1. Steel, copper aluminum, and ductile iron, piping systems may be designed as High Deformability Elements.
  - 2. Cast-iron and plastic piping systems may be designed as Limited Deformability Elements.
  - 3. Glass piping systems shall be designed as Low Deformability Elements.

##### 1.03 DETAILED SYSTEM REQUIREMENTS

- A. All suspended systems and components shall be seismically restrained.
- B. Request for omission of seismic restraints for a given system or component, must be submitted to the Architect for review and acceptance. Omission request must include the following:

1. Referenced code language that Contractor believes to be supportive of requested seismic restraint omission.
  2. Shop drawings indicating system or component included in omission request and any other systems and components located within 10 feet of the requested omission.
  3. An itemized statement identifying the cost savings for labor and materials the Contractor agrees to credit back to the Owner.
- C. No omission of seismic restraint shall be permitted for the following:
1. All suspended emergency, life safety, and hazardous content systems and components.
  2. All fire protection sprinkler piping. The omission of seismic restraints for certain sizes of fire protection sprinkler piping listed within NFPA, Factory Mutual, UL and other standards shall not be allowed.
  3. All suspended vibration isolated systems and components.
  4. All suspended equipment.
- D. Nonstructural components and systems shall be designed for the effects of combined horizontal and vertical earthquake forces.

#### 1.04 CONNECTIONS TO STRUCTURE

- A. The design of seismic restraint connections to the building structure shall take into account the following Point Load Limits. The restraint design at any given restraint anchorage location shall not exceed the building structure limits identified below:
1. Roof deck without structural concrete: Attachment to roof deck is not permitted, with the exception of suspended acoustic or drywall ceilings with hanger wires at 4' on center each way.
  2. Structural concrete slab-on-deck and cast-in-place concrete slabs: Loading not to exceed 250 pounds vertically and 500 pounds horizontally at any single flute within one span and no closer than 4' to any adjacent point load.
  3. Structural Steel Framing
    - a. Horizontal:
      - 1) Loading parallel to beam: Attachment shall be centered on beam web and loading shall not exceed 500 pounds.
      - 2) Loading perpendicular to beam: Attachment shall be within top 1/3 of beam and loading shall not exceed 500 pounds.
    - b. Vertical:
      - 1) Beam composite with structural concrete fill: Attachment shall be centered on beam web and loading shall not exceed 1000 pound point load, 2,000 pounds total for single beam.
      - 2) Beam not composite with structural concrete fill: Attachment shall be centered on beam web and loading shall not exceed 500 pound point load, 1000 pounds total for single beam.
  4. Other items Not identified: Consult with project Structural Engineer of Record.
- B. Beam clamps, and single and double flange mounts shall not be used to make seismic restraint support connections.
- C. When shallow expansion anchors, shallow chemical anchors, or shallow (low deformability) cast-in-place anchors are used, the value of the component response modification factor (RP) shall be 1.5 when determining the forces in the connected part.
- D. Designs for drilled-in anchors to concrete shall use the manufacturer's ICC evaluation report without capacity increases that may be indicated for special inspection allowable tension values. Installation shall be per the ICC evaluation report requirements.
- E. Design values for anchors tested in lightweight concrete may be used for anchors installed in normal-weight concrete, provided the specified compressive strength of the normal-weight

concrete is equal to or greater than the specified compressive strength of the lightweight concrete in which the anchor was tested.

- F. Concrete screws and large diameter screw type concrete anchors shall not be used for connections to concrete filled metal decking.
- G. Cast-in-place inserts shall be constructed entirely of steel. Inserts that contain plastic, cast-iron, etc., shall not be allowed for any seismic restraint connections to the building structure.
- H. Seismic restraint connections to the building structure for fire protection sprinkler piping shall be engineered, sealed and signed by a California registered Structural Engineer hired by Contractor.
  - 1. Use of, reference of, reproduction of, etc., building structure details, designs, assemblies, load rating, design capacities, etc., from NFPA shall not be considered compliance or qualification with the Design Responsibility and Quality Assurance requirements identified in 1.5, "SEISMIC RESTRAINTS".
- I. When computing the embedment depth to diameter ratio for anchors and/or cast-in-place inserts, the outside dimension of the anchor or insert shall be used as the diameter.

#### 1.05 SEISMIC RESTRAINTS

- A. Design Responsibility
  - 1. The Contractor is responsible for compliance with all seismic requirements for nonstructural components in this contract. The Contractor shall provide seismic restraint and gravity support designs engineered (sealed and signed) by a California registered Structural Engineer (hired by Contractor) to meet the specified requirements identified within these project construction documents and required by the 2007 CBC.
  - 2. Where conflicts are identified within this specifications section and/or between this and other parts of the project specifications and/or governing code requirements, the more stringent shall apply.
- B. Quality Assurance
  - 1. The Contractor shall not install any seismic restraints prior to review and acceptance by the Architect.
  - 2. The Contractor shall only submit and install seismic restraint designs that use engineered seismic hardware brackets, as defined below in 1.5C, "Definitions".
  - 3. For non-vibration isolated supported systems, the contractor shall only submit and install seismic restraint designs that use captive or vibration resistant engineered seismic hardware brackets, as defined below in 1.5C, "Definitions"
  - 4. For vibration isolated supported systems, the Contractor shall only submit and install seismic restraint designs that use vibration resistant, engineered seismic hardware brackets, as defined below in 1.5C, "Definitions".
    - a. Contractor shall not submit or install any seismic restraint designs that use non-captive, and/or non-compliant seismic hardware brackets, as defined below in 1.5C, "Definitions".
    - b. Pre-approvals, approvals, listings, evaluation reports, pre-engineered manuals, trade standards, etc., from entities such as, but not limited to, Factory Mutual, ICC, NFPA, SMACNA, OSHPD, UL, Etc., shall not be considered qualification of, or substitutions for, compliance with the Design Responsibility and Quality Assurance requirements identified within this specification.
      - 1) Exception - Anchorage capacity designs for seismic restraints, vertical supports, and other connections to concrete, metal decking, structural steel, and other building structure connection points, may be derived from appropriate ICC evaluation report data.

- c. Contractor shall reimburse the project for all costs incurred for the review of, inspection of, removal of, seismic restraint designs and/or installations that do not comply with the Design Responsibility and Quality Assurance requirements identified above.

C. Definitions

1. Engineered - Seismic Hardware Brackets: Those that have manufacturer identified load capacities signed and sealed by a California registered Structural Engineer. Service load capacities shall be derived from independent lab testing of a seismic hardware bracket as an assembly.
2. Captive - Seismic Hardware Brackets: Those that completely enclose or encircle the rod, anchor, bolt, fastener, etc.
3. Vibration Resistant - Seismic Hardware Brackets: Captive seismic brackets that have been designed and manufactured with a vibration resistance feature that provides resistance against the hex nut that is securing the seismic bracket from becoming loose due to system vibrations
4. Captive seismic hardware brackets such as those listed above in Part 1.3B.2 can be submitted for review and acceptance as vibration resistant seismic hardware brackets, provided the submitted design is engineered and detailed to include the use of lock washers or locking hex nuts.
5. Non-Captive - Seismic Hardware Brackets: Those that do not completely enclose or encircle the rod, anchor, bolt fastener, etc. Under NO circumstance shall the non-captive seismic hardware brackets be allowed.
6. Non-Compliant - Seismic Hardware Brackets: those that are designed to allow for more than one brace arm member to be attached to the same seismic hardware bracket. Under NO circumstance shall the non-compliant seismic hardware brackets be allowed.

D. Design Requirements

1. The overall seismic restraint system design shall provide restraint in all directions, including vertical.
2. In addition to any other limits on spacing, including those based on design loads, seismic restraints shall not exceed the maximum spacing identified below, provided the restraint connection force does not exceed that of the Point Load Limits in 1.4A
  - a. Single Hanger or Trapeze Supported Steel Piping and Conduit - Transversely 40 feet, Longitudinally 80 feet.
  - b. Single Hanger Supported Copper Tubing and Cast-Iron Piping - Transversely 20 feet, Longitudinally 40 feet.
  - c. Trapeze Supported Copper Tubing - Transversely 40 feet, Longitudinally 80 feet.
  - d. Sheet Metal Ducting - Transversely 40 feet, Longitudinally 80 feet.
  - e. Trapeze Supported Metal Cable Tray or Bus Duct - Transversely 40 feet, Longitudinally 80 feet.
  - f. Center Hung or Single Hanger Supported Metal Cable Tray or Bus Duct - Transversely 40 feet, Longitudinally 80 feet
  - g. Systems with hazardous content including but not limited to natural gas, fuel, and toxic or combustible substances shall have maximum restraint spacings limited to - Transversely 20 feet, Longitudinally 40 feet.
  - h. Plastic piping, glass piping, fiberglass ducts, wire type trays, and other items not identified above shall have maximum restraint spacings limited to that identified in writing by the manufacturer of the item to be braced.
3. Seismic restraints shall not be installed with brace angles greater than 45 degrees from the horizontal.

4. The connection and assembly configuration of seismic restraint to system / item(s) being restrained, shall provide for adequate load transfer. (Example: do not attach seismic restraint over pipe insulation - if pipe insulation is not rated to adequately transfer seismic design loads to restraint.)
  5. Seismic restraints shall not transmit gravity loads, induce uplift, and/or misalignment to the system or item being restrained.
  6. Seismic restraints shall be installed at, or within 4 inches of, a vertical support for that equipment or conveyance. The vertical support shall be designed as part of the seismic restraint assembly.
  7. Longitudinal restraints may also act as transverse restraints if the restraint is installed within 24 inches of a 90-degree change in direction, if shown adequate by engineering design or testing.
  8. Conduits, pipes, cable trays, ducts, etc., shall be properly attached to each braced or non-braced trapeze support.
  9. Multiple tiered or layered trapeze support configurations shall be seismically restrained at each individual tier or layer.
  10. Single hanger supported piping, tubing, conduits and fire protection sprinkler piping shall be supported at seismic restraint locations by standard duty, clevis hangers, J-hangers or seismic hanger clamps. Under no circumstance shall the use of other type hangers (e.g. band, ring, loop, light duty, extended, etc.) be allowed.
  11. Vertical support rod(s) at seismic restraint locations shall pass through the trapeze or hanger support and shall have hex nuts installed on both the bottom and the top side of the support.
  12. Vertical support rods and connections to the building structure at the seismic restraint location shall be sized to address calculated seismic tension and compression design loads.
  13. All vertical support rod(s) at seismic restraint locations including fire protection sprinkler piping shall be installed with rod stiffeners. Rod stiffeners may be omitted if the vertical support rod(s) at a given seismic restraint location have individual hanger rod lengths equal to / or less than 45 times the rod diameter.
  14. Seismic restraint designs and installations for non-vibration isolated systems can use either rigid or flexible brace arm members. Do not mix rigid and flexible brace arms at a given restraint location.
  15. Vibration isolation devices for suspended applications shall be connected directly to the underside of the building structure, (e.g. not from hanger rod).
  16. Vertical supports suspended from the vibration isolation device shall include limit stops, designed by the vibration isolation device manufacturer to prevent over-travel.
  17. Do not design, install, or use, seismic restraints on systems or items that are subject to hydrodynamic / thermal expansion and contraction, without properly providing for those required movements.
  18. Provide appropriately sized openings in walls, floors, and ceilings for anticipated seismic movement. Maintain specified fire rating at penetrations through fire rated surfaces.
  19. Systems crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow for differential displacements without damaging the system, its restraints, or support connections.
- E. Systems Components
1. Seismic Hardware Manufacturers
    - a. The manufacturer's seismic hardware brackets shall fully comply with the Quality Assurance requirements of this specification.
  2. Seismic Bracing Components

- a. Seismic restraint components shall include, but shall not be limited to: Seismic Brackets, Rod Stiffener Clamps / Brackets, Strut, Strut Nuts, Aircraft Cable, Cable Clamps / Fittings, Anchors, Bolts, Hex Nuts, Washers, Threaded Rod, Hangers, Strut Clamps.
  - b. For interior applications components shall be commercial grade steel with a minimum electro galvanized zinc coating thickness of 0.5 mils. Exterior and special interior environment applications seismic restraint components shall be 316 Stainless Steel.
- F. Installation
1. Contractor shall install seismic restraints per the engineered designs reviewed and accepted by the Architect and when applicable, the Authority Having Jurisdiction (AHJ).
  2. Contractor shall coordinate and resolve seismic restraint conflicts with other trades at the Contractors expense. Conflicts shall be resolved in a timely manor, so as not to delay the project construction time schedule.
  3. Contractor shall upon completion of installation of seismic restraints, give written notice to the Architect AHJ and inspector of Record that the work has been completed and is ready for inspection.
  4. See the vibration isolation section of the project specifications for the design and installation requirements of vibration isolated devices for system and/or components, which are to be suspended from, attached to, and/or installed as part of this project.
  5. See the vibration isolation section of the project specifications for the design and installation connection requirements for vibration and non-vibration isolated equipment.
  6. Support and hanger requirements for non-seismic, gravity-only supports and hanger configurations are to be installed per their appropriate support specification section and shall meet the requirements of the 2007 CBC.

#### 1.06 SUBMITTALS

- A. These submittal requirements are in addition to other submittal requirements stated elsewhere in the contract documents. One reproducible submittal copy will be returned.
- B. Contractor shall submit engineered seismic restraint designs to the Architect for the non-structural components including but not limited to, the items listed in 1.1B. Documents shall be prepared in accordance with ASCE/SEI 7-05 Section 13 signed and sealed by the Contractor's California registered Structural Engineer responsible for their preparation. Calculations will be reviewed for compliance with design criteria only.
- C. Submit applicable engineered seismic restraint to structure connection anchorage detail sheets with calculations and corresponding ICC evaluation report data sheets, signed and sealed by a California registered Structural Engineer.
- D. Submit applicable manufacturer's, engineered seismic hardware data and installation detail sheets, signed and sealed by a California registered Structural Engineer.
- E. Submit shop drawings with layout of seismic restraint locations for review and acceptance as follows:
  1. Layout drawings shall accurately represent the intended systems, size,
    - a. routing and seismic restraint locations.
  2. Layout drawings shall provide a minimum of 2 transverse and 1 longitudinal seismic restraints per system run. Seismic restraint layout shall account for system changes in direction, off sets, material type, joint / assembly method, etc.
  3. Layout drawings shall include coordinated reflected ceiling plans, showing all seismic restraint locations.
  4. Any conflicts shall be addressed before starting installation of restraints.

- F. Submittals for fire protection sprinkler piping systems must first be submitted to the Architect for review and acceptance. Once accepted, the approved submittal shall then be submitted to the local Fire Protection Authority Having Jurisdiction (AHJ), for their review and approval.
1. Contractor shall include with the submittal to the AHJ a cover letter stating that the:
    - a. Fire protection sprinkler piping system has been engineered, sealed, and signed by a California registered Structural Engineer to meet the specified requirements of the approved and permitted construction documents.
    - b. Review of the fire protection sprinkler piping system by the Architect is limited to the design of the seismic restraints and the effects these seismic restraints will impart to the supporting building structure and components.
  2. Once approved by the AHJ the Contractor shall provide the Architect a complete set of the AHJ approved documents, clearly identifying all seismic restraint related changes.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 02 1500**

**SHORING AND UNDERPINNING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Shoring of slopes and retaining walls as required.

**1.02 REFERENCE STANDARDS**

- A. Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply):
  1. California Building Code (CBC), 2007 Edition.
  2. American Society of Testing Materials (ASTM).
  3. American Concrete Institute's 'Specifications for Structural Concrete for Buildings' (ACI 301).

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Submit to the Architect for record only the information on methods, sequences, drawings, and calculations for accomplishing this Work. Employ a Structural Engineer registered in the State of California to provide such. Obtain approval from building official before proceeding. Submit according to the requirements of Section 01 3000 - Administrative Requirements.
- C. The Contractor shall be solely responsible for the design, adequacy, and satisfactory performance of the methods and means employed.

**1.04 QUALITY ASSURANCE**

- A. The installation of underpinning shall be observed by the Owner's Soil Engineer.
- B. All underpinning, bracing and shoring systems shall be designed in accordance with applicable local codes.
- C. Inspection and testing of formwork, cast-in-place concrete, and concrete reinforcements required herein shall be similar to that called ou in Sections 03 1000, 03 2000, and 03 3000.

**PART 2 PRODUCTS - AS NECESSARY**

**PART 3 EXECUTION**

**3.01 DESIGN OF UNDERPINNING**

- A. As directed by Contractor's Structural Engineer.

**END OF SECTION**

**SECTION 02 3200**

**SUBSURFACE INVESTIGATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Soils investigation at the site and use of data resulting from that investigation.

**1.02 RELATED REQUIREMENTS**

**1.03 SOILS INVESTIGATION REPORT**

- A. General:
1. A soils investigation report has been prepared for the site of this Work by Geocon West, Inc. Geocon West Project Number A8718-06-01, dated March 11, 2010.
  2. The soils investigation report is included for reference only.
- B. Use of Data:
1. This report was obtained only for the Architect's use in design and is not a part of the Contract Documents.
  2. The report is available for bidder's information only, but is not a warranty of subsurface conditions.
  3. Bidders should visit the site and acquaint themselves with existing conditions.
  4. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but such investigations may be performed only under time schedule and arrangements approved in advance by the Owner.

**1.04 QUALITY ASSURANCE**

- A. A construction soil engineer will be retained by the Owner to observe performance of work in connection with excavating, trenching, filling, backfilling and grading and to perform compaction tests.

**END OF SECTION**

## SECTION 03 1000

### FORMWORK

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. Work includes: Provision of formwork for cast-in-place concrete and installation of embedded items.
- B. Related Sections:
  - 1. Section 03 20 00 - Concrete Reinforcement
  - 2. Section 03 30 00 - Cast-in-Place Concrete

##### 1.02 REFERENCES

- A. Requirements of General Conditions and Division No. 1 apply to all Work in this Section.
- B. Published specification, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).
  - 1. California Building Code (CBC), 2007 Edition.
  - 2. American Society for Testing and Materials (ASTM).
  - 3. Federal Specifications (FS).
  - 4. American Concrete Institute's "Recommended Practice for Concrete Formwork," (ACI 347).
  - 5. United States Voluntary Product Standard for Construction and Industrial Plywood, (PS1).
  - 6. American Plywood Association's "Guide to Plywood Grades" (APA).
  - 7. West Coast Lumber Inspection Bureau's "Standard Grading Rules No. 16" (WCLIB).

##### 1.03 QUALITY ASSURANCE

- A. Design Criteria: Formwork shall conform to ACI 347.
  - 1. Formwork:
    - a. Shall prevent leakage or washing out of cement mortar.
    - b. Shall resist spread, shifting, and settling.
    - c. Shall reproduce accurately required lines, grades, and surfaces within tolerances specified.
    - d. Safety: The Contractor shall be responsible for adequate strength and safety of all formwork including falsework and shoring.
- B. Allowable Tolerances: Formwork shall produce concrete within tolerance limits recommended in ACI 347, unless otherwise noted.

##### 1.04 SUBMITTALS

- A. Samples: Only as requested by the Architect.

##### 1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

##### 1.06 JOB CONDITIONS

- A. Sequencing Schedule:
  - 1. Ensure timely delivery of embedded items. Be responsible for cutting and patching necessitated by failure to place embedded items.
  - 2. Plan erection and removal to permit proper sequence of concrete placing without damage to concrete.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Forming Materials:
1. Panel or board forms at the Contractor's option.
    - a. Panel Forms: Minimum 5/8-inch thick exterior grade plywood with sealed edges, PS 1 grade Plyform Class I and II B-B Exterior or HDO Exterior.
    - b. Board Forms: Shiplap or tongue and groove lined with PS 1 grade Plyform Class I and II Exterior 1/2-inch or HDO Exterior 1/2-inch or 3/16-inch thick fiberboard conforming to FS LLL-B-810a(1), type I.
    - c. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings.
      - 1) Use Plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, with each piece bearing legible inspection trademark. Panels to receive specified form sealer to ensure uniform finish of exposed surfaces.
      - 2) Designated "Architectural Concrete" Surfaces: Use overlaid plywood complying with U.S. Product Standards PS-1 "A-C or B-B High Density Overlaid Concrete Form", Class 1.
    - d. Pan Joist forms: Provide removable forms, Ceco Corporation or equal. Forms shall have adequate strength to maintain their shape during placing of concrete and shall permit easy removal without damage to concrete surfaces. Forms shall be true to shape, free from bulges, tears or other damage, and shall be free from oil, grease, paint, dirt or other deleterious coatings. Forms shall fit close, tight and straight. Forms shall be cleaned up before reuse.
    - e. Chamfer Strips: Burke Concrete Accessories' PVC type CSF 1/2-inch, all exposed corners.
  - B. Wood Framing: WCLIB standard grade or better Douglas Fir.
  - C. Form Ties and Spreaders: Metal type acting as spreaders, leaving no metal within one-inch of concrete face and no fractures, spalls, depressions or other surface disfigurements greater than 3/4-inch in diameter.
  - D. Expansion Joint Filler:
    1. Fiber Type: Premolded asphalt-impregnated fiber, ASTM D1751, 1/4-inch thick unless otherwise noted. Same as W. R. Meadows, Inc.'s "Sealtight Fiber Expansion Joint"; Grace Construction Materials "Serviced Fiber Expansion Joint Filler, Code 1390"; National Expansion Joint Co.'s "Fiber Joint Filler No. 12"; Burke Concrete Accessories, Inc.'s "Burke Fiber Expansion Joint"; or equal.
    2. Cork Type: Preformed cork, ASTM D1752, Type II, 1/4-inch size unless otherwise noted. Same as W. R. Meadows, Inc.'s "Sealtight Cork Expansion Joint"; Sonneborn-Contech's "Sonoflex Cork"; Grace Construction Materials' "Serviced Standard Cork Expansion Joint Filler, Code 4323; or equal.
  - E. Form Sealer: Same as Grace Construction Material's "Formfilm"; or approved equal.
  - F. Release Agent: Must not stain or otherwise adversely affect architectural concrete surfaces. Same as The Nox-Crete Co.'s "Nox-Crete Form Coating"; Industrial Synthetics Corp.'s "Synthex;" or equal.

- G. Foam Board: Extruded close cell polystyrene foam, channeled for drainage, with a minimum compressive strength of 60 psi at 0.1-inch deformation when tested in accordance with ASTM D1621-73, and meeting requirements of FS-HH-I-524b, Type II, Class B. Same as The Dow Chemical Co.'s "Styroform PD Brand" or equal.

## 2.02 SOURCE QUALITY CONTROL

- A. Plywood shall bear APA grade-trademark.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Examine areas where formwork will be constructed and verify that:
  - 1. Excavations are sufficient to permit placement, inspection and removal of forms.
  - 2. Excavations for earth forms have been neatly and accurately cut.
  - 3. Conditions are otherwise proper for formwork construction.
- B. Do not start Work until unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Obtain necessary information for coordination of formwork with items to be embedded in concrete and other related work.

### 3.03 CONSTRUCTION

- A. General:
  - 1. Design, erect, support, brace and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are correct size, shape, alignment, elevation and position. Maintain formwork construction tolerances complying with ACI 347.
  - 2. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb Work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in Work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
  - 3. Frame openings where indicated on Architectural, Structural, Mechanical, Plumbing or Electrical drawings.
- B. Earth Forms:
  - 1. Construct wood edge strips at top sides of excavations.
  - 2. Provide forms for footings wherever concrete cannot be placed against solid earth excavation.
  - 3. Remove loose dirt and debris prior to concrete pours.
  - 4. Walls and Other Formed Elements:
    - a. Erect outside forms for exposed exterior walls first and obtain the Architect's approval before reinforcement is placed. Obtain Architect's approval of the reinforcement before interior form is erected.
    - b. Carefully align inside and outside forms before tightening ties.
    - c. Plywood Forms: Insure vertical joints are plumb and horizontal joints are level; arrange joints and ties in geometrical pattern as approved by the Architect.
    - d. Form inside corners at exposed conditions with mitered boards or plywood so that no concrete is placed against form ends.
    - e. After erection, seal all cracks, holes, slits, gaps, and apertures in forms so that they will withstand the pressure and will remain completely watertight.

- f. Provide a means to seal the bottom of forms at construction joints such as foam tape or other gasket devices.
  - g. Apply a coating of release agent prior to the erection of formwork. Follow approved manufacturer's recommendations.
- C. Slab Forms:
- 1. Establish levels and set screeds.
  - 2. Depress slabs where required to receive special floor finishes.
- D. Beam or Joist Forms:
- 1. Provide cambers as noted on Contract Drawings.
- E. Cleanouts and Openings: Provide on interior face of wall forms as required for effective removal of loose dirt, debris and waste material, for inspection of reinforcing and for introduction of vibrators where the Architect deems necessary.
- F. Expansion Joints:
- 1. Provide in exterior concrete paving on grade at maximum 20-feet on center or as noted and at intersections with vertical surfaces, curbs, manholes or other penetrations through paving.
  - 2. Use fiber type expansion joint fillers typically and depress 1/4-inch unless otherwise noted.
  - 3. Use cork type expansion joint fillers at conditions with non-bituminous waterproofing, liquid waterproofing or sealant systems.
- G. Construction Joints:
- 1. Provide where shown on the drawings or as directed by the Architect.
  - 2. Provide key indentations at all joints.
  - 3. Provide pour strips on inside face of forms at horizontal joints, but remove strips and thoroughly clean out reglets before placing subsequent portions of wall.
  - 4. Prevent formations of shoulders and ledges.
  - 5. Provide means for drawing forms into firm contact with concrete before placing additional concrete over previous pours where shrinking and warping has separated concrete from forms.
- H. Embedded Items:
- 1. Properly locate, unless locating is specified elsewhere, and place inserts and embedded items required by other trades prior to casting concrete.
- I. Shoring:
- 1. Adequately brace and maintain shoring to safely support vertical, lateral, and asymmetrical loads until completed structure has attained design strength.
  - 2. Distribute shoring loads over area where shoring is erected and protect against undermining or settlement.
  - 3. Provide means for making vertical adjustments to compensate for settlement either before or during placing of concrete.
  - 4. Construct shores for soffits of beams to permit removal of forms without removing shores.
  - 5. Reshoring will be permitted. Shores and reshores shall be designed by a Civil Engineer registered in the State of California and installed under this direction. This Civil Engineer shall be employed by the Contractor.

### 3.04 REMOVAL

- A. Secure the Architect's approval for time and sequence of removal.
- B. Form Removal: Forms shall be removed without damage to the concrete, and in no case shall they be removed prior to the concrete member attaining the specified strength.

MEMBER	STRENGTH	MINIMUM TIME*
Vertical surfaces of	0.60 f'c	7 days

walls, columns, beams,  
girders  
Beams, soffits, slab,                    0.75 f'c                    14 days  
girder

\*Estimated curing time required to obtain desired strength. Results of the 7-day test cylinder break shall be presented to the Architect to demonstrate compliance with above specified strength requirements prior to form removal. If a 7-day test cylinder break demonstrates strength that is less than that specified, the Contractor may elect to take additional cylinders at the time of next pour to demonstrate strength requirements. The Contractor shall bear the cost of taking and testing the additional samples.

- C. Forms:
1. Remove forms carefully to avoid damaging corners and edges of exposed concrete.
  2. Reuse:
    - a. The Architect will approve reuse of forms provided they are straight, clean, free from nails, dirt, hardened concrete, or other injurious matter and edges and surfaces are in good condition.
    - b. Clean and repair any damage caused by placing, removal, or storage. Reuse of formwork with repairs or patches which would result in adverse effects to architectural concrete finish will not be permitted.
    - c. Store formwork in manner to prevent damage or distortion.
    - d. Reseal as required to achieve concrete of specified quality.
- D. Shoring and Reshoring
1. Two levels of shoring or one level of shores over one level of reshores shall be maintained below any newly cast level until it has attained design strength and is at least 28 days old.

**END OF SECTION**

## SECTION 03 2000

### CONCRETE REINFORCEMENT

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. Section Includes: Provision of reinforcement for all concrete unless specifically noted otherwise.
- B. Related Sections:
  - 1. Section 03 10 00 - Formwork
  - 2. Section 03 30 00 - Cast-in-Place Concrete

##### 1.02 REFERENCES

- A. Requirements of the General Conditions and Division No. 1 apply to all Work in this Section.
- B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).
  - 1. California Building Code (CBC), 2007 Edition.
  - 2. American Society for Testing and Materials (ASTM).
  - 3. American Concrete Institute's
    - a. "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI 315).
    - b. "Building Code Requirements for Reinforced Concrete" (ACI 318).
    - c. Concrete Reinforcing Steel Institute (CRSI) and/or Western Concrete Reinforcing Steel Institute (WCRSI).
      - 1) "Manual of Standard Practice."
      - 2) "Recommended Practice for Placing Reinforcing Bars."
    - d. American Welding Society's
      - 1) "Mild Steel Covered Arc-Welding Electrodes" (AWS A5.1).
      - 2) "Reinforcing Steel Welding Code: (AWS D1.4).

##### 1.03 QUALITY ASSURANCE

- A. Welders' Qualifications: Welders shall be qualified in accordance with AWS D1.4.
  - 1. Reinforcing steel shall not be permitted to rust where there is danger of staining exposed surfaces of adjacent concrete. The Contractor shall replace rust-stained concrete at his expense.
  - 2. Allowable Tolerances: Reinforcing steel shall be placed within tolerances permitted by ACI 318, Section 7.5.2 unless otherwise approved by the Architect.
- B. The Owner's Testing Agency will:
  - 1. Collect mill test reports for reinforcement.
  - 2. Provide inspection of welding, including prior fit-up, welding equipment, weld quality and welder certification in accordance with AWS D1.4 and UBC Standard No. 19-1. Chemical analysis sufficient to determine carbon equivalent and minimum preheat temperature shall be performed when reinforcement does not conform to low-alloy steel requirements of ASTM A706.

##### 1.04 SUBMITTALS

- A. Shop Drawings: Show bending and placing details, size and location of reinforcing steel. Include diagrammatic wall elevations at 1/4-inch equals one foot scale to clearly show position and erection marks of bars including marginal bars around openings with dowels, splices, etc. One reproducible copy will be returned.
- B. Mill Test reports for each heat or melt of steel.

### 1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement and accessories to site not more than 48 hours before placement.
- B. Store in manner to prevent excessive rusting and fouling with grease, dirt, or other bond-weakening coatings.
- C. Take precautions to maintain identification after bundles are broken.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Bars: New billet steel, ASTM A615 Grade 60; ASTM A706 for welded bars.
- B. Tie Wires and Spirals: ASTM A82.
- C. Welded Wire Fabric: ASTM A185.
- D. Welding Electrodes: Mild steel covered arc-welding types conforming to AWS A5.1.
- E. Bar Supports: As required for assembling and supporting reinforcement in place.
  - 1. CRSI Class 3: Where bar supports do not come in contact with exposed concrete surfaces.
  - 2. CRSI Class 1 plastic-protected; or Class 2 stainless steel wire: Interior and Exterior Soffits and Other Exposed Conditions.
  - 3. Precast Concrete Wired Block: At slabs-on-grade and as necessary at other locations.
- F. Threaded coupler: Lenton Standard coupler by ERICO or equal product substituted per Section 01 60 00. Coupler shall develop 125-percent of specified yield strength of reinforcement.
- G. Welded Deformed Bar Anchors: ASTM A-108  $f_y = 70,000$  psi, flux filled deformed bar anchors. Same as Nelson DZL or equal product substituted per Section 016800.

### 2.02 FABRICATION

- A. Shop-fabricate to comply with drawings.
- B. Conform with requirements of ACI 315 where specific details are not shown or where drawings and specifications are not more demanding.

## PART 3 - EXECUTION

### 3.01 PLACEMENT

- A. General:
  - 1. Place bars as noted.
  - 2. All reinforcement shall be continuous. See drawings for lap splice schedule. Stagger splices where possible. Contact lap splices shall be securely wired together to maintain alignment.
  - 3. Ensure placement will permit concrete protection in conformance with CRSI or to extent shown.
  - 4. Support and fasten bars securely with spacers, chairs or ties to permit their being walked upon without displacement or movement both before and during placement of concrete. Wire-tie bar intersections.
  - 5. Do not bend bars around openings or sleeves. Wherever conduits, piping, inserts, sleeves, etc. interfere with placing of reinforcement, obtain the Architect's approval of placing before concreting.
  - 6. Do not field bend bars unless expressly noted in the Contract Documents.
- B. Welding:
  - 1. Employ shielded metal-arc method and conform to AWS D1.4.

2. Ensure equipment supplies proper current and voltage and is adjustable to suit arrangement and thickness of items welded.
- C. Prior to placing concrete, verify reinforcement has been bent, positioned, and secured in accordance with drawings; ensure removal of oil, grease, dirt, or other bond-weakening coatings; replace severely rust-pitted reinforcing bars.
- D. Quality Assurance:
  1. The Owner's Testing Agency will inspect placement of reinforcement and mechanical splices and notify Architect of any discrepancies in placement
    - a. The Owner's Testing Agency will inspect shop and field welding per CBC 1704.

**END OF SECTION**

## SECTION 03 3000

### CAST-IN-PLACE CONCRETE

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. Section Includes: Provision of cast-in-place concrete unless specifically noted otherwise.
- B. Related Sections:
  - 1. Section 03 1000 - Formwork.
  - 2. Section 03 2000 - Concrete Reinforcement.
  - 3. Section 05 1200 - Structural Steel.
  - 4. Section 05 5000 - Metal Fabrications.

##### 1.02 REFERENCES

- A. Requirements of General Conditions and Division No. 1 apply to all Work in this Section.
- B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).
  - 1. California Building Code (CBC), 2007 Edition.
  - 2. American Society for Testing and Materials (ASTM).
  - 3. American Concrete Institute's:
    - a. "Standard Specifications for Tolerances for Concrete Construction and Materials" (ACI 117)
    - b. "Specification for Structural Concrete for Buildings" (ACI 301).
    - c. "Recommended Practice for Measuring, Mixing and Placing Concrete" (ACI 304).
    - d. "Recommended Practice for Hot Weather Concreting" (ACI 305).
    - e. "Recommended Practice for Cold Weather Concreting" (ACI 306)
    - f. "Building Code Requirements for Reinforced Concrete" (ACI 318).
      - 1) State of California, Business and Transportation Agency Division of Highways' "Materials Manual," (CMM).

##### 1.03 QUALITY ASSURANCE

- A. The Contractor's Testing Laboratory Qualifications: The Contractor's Testing Laboratory shall be under direction of a Civil Engineer registered in the State of California, shall have operated successfully for four years prior to this work, and shall conform to requirements of ASTM E329.
- B. Requirements of ACI 301 shall govern work, materials and equipment related to this Section; specifications herein set minimum results required, and references to procedures are intended to establish minimal guides.
- C. The Contractor shall be responsible for quality of concrete in place and shall bear burden of proof that concrete meets minimum requirements. Tolerances shall meet the requirements of ACI 117 except as modified in the Construction Documents.
- D. Placing of concrete by means of pumping will be an acceptable method of placement providing that the Contractor can demonstrate that:
  - 1. Specified concrete strengths will be met.
  - 2. Equipment has a record of satisfactory performance under similar conditions and using a similar mix.
  - 3. Trial batches have been made.

##### 1.04 SUBMITTALS

- A. The Contractor shall submit:

1. Certified copies of mix designs for each concrete class specified including compressive strength test reports.
  2. Certification that materials meet the requirements specified.
  3. Samples only as requested by the Architect.
  4. Certification from vendor that samples originate from and are representative of each lot proposed for use.
- B. The Owner's Testing Agency will submit reports on tests and inspections performed to the Owner, the Architect, the Contractor, and the City Building Department.
- C. Shop Drawings: Show construction and expansion and contraction joint locations and details.
- D. Schedule of placing concrete for the Architect's review before starting work.
- E. Product Data: Submit manufacturer's product data with installation instructions for proprietary materials including reinforcement and forming accessories, form coatings, admixtures, joint materials, hardeners, curing materials and others as requested by the Architect.

**1.05 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Ensure storage facilities are weather tight and dry.
- B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.
- C. Store bulk cement in bins capable of preventing exposure to moisture.
- D. Use sacked cement in chronological order of delivery. Store each shipment so that it may be readily distinguishable from other shipments.

**PART 2 - PRODUCTS**

**2.01 CONCRETE**

A. Concrete Properties

LOCATIO N	28-DAY STRENGT H	AGGREG ATE SIZE	WEIGHT	SLUMP	WATER/ CEMENT	% FLY ASH	Comment s
FOOTING S, GRADE BEAMS	4500	1	145	4	.45	15	
SLAB-ON- GRADE	4500	3/4	145	4	.45	0	water reducing admixture
FILL ON METAL DECK	4000	3/4	145	4	.45	0	water reducing admixture
SUSPEND ED SLABS, BEAMS AND WALLS	4500	3/4	145	4	.45	0	

- B. Strength refers to the compressive strength in psi after 28-days when tested in accordance with ASTM C39. All concrete shall develop compression strength specified in 28-days. To meet

above requirements, mix shall be designed such that average compressive strength will exceed specified 28-day strength by an amount as specified by ACI 318.

- C. Aggregate size refers to the maximum size in inches.
- D. Weight refers to pounds per cubic foot, air dry.
- E. Slump is measured in inches and tested in accordance with ASTM C143.
- F. Water/Cement Ratio is the maximum ratio of water to cementitious material by weight.

## 2.02 MATERIALS

- A. General Requirements:
  - 1. Cement and aggregates shall have proven history of successful use with one another. Sources of cement and aggregate shall remain unchanged through-out work unless the Architect approves request for change made at least 10-days prior to anticipated date of casting.
  - 2. Ready-mixed concrete shall meet requirements of ASTM C94.
  - 3. Deviations in properties of materials tested by the Owner's Testing Agency shall be cause for their rejection pending additional test results and redesign of mix by the Contractor's Testing Laboratory.
  - 4. No frozen aggregates will be permitted.
- B. Cements: ASTM C150, Type II or V as specified on plans. Use one brand of cement throughout project unless otherwise directed by the Architect.
- C. Fly Ash: ASTM C618, Type F.
- D. Aggregates:
  - 1. Coarse: ASTM C33. Coarse aggregate shall consist of a clean, hard, fine grained, sound crushed rock, or washed gravel or a combination of both. It shall be free from oil, organic matter or other deleterious substances and shall not contain more than two percent by weight of shale or cherty material. "Cleanness value shall not be less than 75 when tested per MM Test Method, 227 and conforming to CBC Section 1903.
  - 2. Fines: ASTM C33. Sand equivalent shall be not less than 75 when tested as per ASTM D2419.
  - 3. Light Weight Aggregates: ASTM C330; expanded shale type uniformly graded from 3/4-inch to No. 200 Mesh. Cleanliness value and sand equivalent not less than 75.
  - 4. Provide aggregates from a single source for exposed concrete.
- E. Water: Clean and potable, free from impurities detrimental to concrete.
- F. Admixtures:
  - 1. Water-Reducing Admixture: ASTM C494, Type A, non-lignini sulfonate. Same as Grace Construction Materials' "WRDA with Hycol"; Master Builders "Pozzolith 322N"; Sika Corp.'s "Plastocrete 161"; or equal.
  - 2. Air Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other products. Same as W.R. Grace's "Daravair", Master Builders' "Micro-Air", Sika Corp.'s "Sika Aer", or equal.
  - 3. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C494, Type F or Type G. Same as W.R. Grace's "Daracem 19", Master Builders' "Rheobuild", Sika Corp.'s "Sikament", or equal.
  - 4. Water Reducing, Accelerator Admixture: ASTM C494, Type E. Same as W.R. Grace's "Polarset", Master Builder's "Pozzutec 20", Sika's "Sikaset NC", or equal product substituted per Section 01 6000.

5. Water Reducing, Retarding Admixture: ASTM C494, Type D. Same as W.R. Grace's "Daratard-17", Master Builders' "Pozzoliith R", Sika's "Plastiment", or equal product substituted per Section 01 6000.
  6. Other Admixtures: Only as approved by the Architect.
- G. Wax Sealer: Heavy penetrating type as manufactured by approved manufacturer of clear hardener.
- H. Non-Shrink Grout: Premixed high strength grout requiring only addition of water at the site. Same as Master Builder's "Masterflow 928 Grout"; "Masterflow 713 Grout", Burke's "Non-Ferrous, Non-Shrink Grout", or equal product substituted per Section 01 6000.
- I. Curing Materials:
1. Waterproof Paper: ASTM C171, Type 1, regular. Same as Sisalkraft Division of St. Regis Paper Co.'s "Orange Label"; or equal product substituted per Section 01 6000.
  2. Sheet Plastic: Polyethylene, four mils thick, fungus-resistant.
  3. Curing Compound: ASTM C309. Same as Curecrete Chemical Company's "Ashford Formula"; Master Builders' "Masterkure N-Seal-W", or equal.
- J. Penetrating Liquid Floor Treatment (Sealer/Hardener): Chemically reactive, waterborne solution of inorganic silicate, potassium silicate, or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, densifies and seals concrete surfaces.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Titan Hard; Burke Group, LLC.
    - b. Chemisil Plus; ChemMasters.
    - c. Intraseal; Conspec Marketing & Manufacturing Co., Inc.
    - d. Ashford Formula; Curecrete Chemical Co., Inc.
    - e. Day-Chem Sure Hard; Dayton Superior Corporation.
    - f. Euco Diamond Hard; Euclid Chemical Co.
    - g. Seal Hard; L&M Construction Chemicals, Inc.
    - h. Elite-HS: Atlas Tech Products
- K. Hardener, Clear Liquid Type: Grace construction Materials' "Hornstone Crystal Chemical Hardener"; Master Builder's "Mastercron"; Sonneborn-Contech's "Lapidolith"; Upco Co.'s "Vitrox 4701"; or equal.
- L. Liquid Curing Compound: ASTM C 309, Type 1, Class B, approved standard product resin type.
1. Gray Cement: Free of wax or oil, compatible with subsequently applied finishes or coverings, delivered in unopened labeled container.
    - a. Integrally Colored Concrete: Compound recommended by manufacturer of color admixture
- M. Epoxy Adhesive: Two component material suitable for anchoring rebar into dry or damp concrete. Same as Covert's "CIA-Gel 7000", Hilti's "HIT HY-150" or equal.
- N. Fibrous Reinforcement: ASTM C1116, Type 3, collated, fillibrated  $\frac{3}{4}$ " (20mm) polypropylene fibers designed for secondary reinforcement of concrete slabs. Same as W.R. Grace's "Grace Fibers", Buckeye's "UltraFiber 500", Euclids "Fiberstrand 100" or Fibermesh's "Fibermesh". Add 1  $\frac{1}{2}$  lbs. of fibers per cubic yard of concrete. Use in strict accordance with fiber supplier's recommendation.
- O. Joint Materials:
1. Preformed Fiber Joint Filler: ASTM D 1751 non-extruding preformed bituminous saturated fiberboard units. Plain or punched for dowels as required.
  2. Joint Sealing Compound: Refer to Section 07 9200.
- P. Under Slab Vapor Retarder:

1. Provide vapor retarder sheet over prepared base material where shown. Use only materials resistant to decay when tested in accordance with ASTM E 154.
2. Vapor Retarder: ASTM E 1745, Class A, minimum water vapor permeance of 0.3 perms per ASTM E 154. Minimum 15 mils thick. Do not use visqueen or polyethylene.
  - a. Available Products: Subject to compliance with specified requirements, products that may be incorporated into the Work include, but are not limited to:
    - 1) "Griffolyn Type 65G" by Reef Industries Inc.
    - 2) "Moistop Ultra A" by Fortifiber.
    - 3) "Stego Wrap" 15 mil, Class A Vapor Barrier by Stego Industries.
    - 4) "Vapor-Mat" 15 mil by W.R. Meadows, Inc.
      - (a) Sand Cushion (under floor slabs): Clean, screened "Manufactured" Sand (not natural sand), graded and passing the following sieve analysis: 4/100%, 8/75%, 16/51%, 30/36%, 50-27%, 100/14%, and 200/17%. Materials shall be compactible at optimum moisture content. 2.5% absorption when tested per ASTM C 127.
3. Color Additive for integral colored exterior cove paving

### 2.03 MIXES

- A. General Requirements:
  1. The Contractor shall perform tests or assemble the necessary data indicating conformance with specifications.
  2. For each mix submit data showing that proposed mix will attain the required strength in accordance with requirements of CBC Section 1905.3.
  3. If sufficient test results are not available, the contractor shall produce trial mixes in accordance with requirements of CBC Section 1905.4, Method "C".
  4. The Contractor shall instruct Laboratory to base mix design on use of materials tested and approved by the Owner's Testing Agency.
  5. Mix design shall include compression strength test reports per CBC Section 1905.3.
  6. Mix shall be designed, tested, and adjusted if necessary in ample time before first concrete is scheduled to be placed. Laboratory data and strength test results for revised mix design shall be submitted to Architect prior to using in project.
  7. Ensure mix designs will produce concrete to strengths specified and of uniform density without segregation.
  8. If mix yield exceeds 1-cubic yard, modify mix design to no more than one cubic yard without changing cement content.
  9. The Contractor's mix designs shall be subject to review by the Architect and by the Owner's Testing Agency.
    - a. Introduction of calcium chloride will not be permitted.
    - b. Unspecified admixtures will not be permitted unless the Architect reviews, the Contractor modifies mix designs as necessary, and modifications are accepted by the Owner's Testing Agency.
- B. Slab-on-Grade Mix requirements: Use of Water-Reducing admixture is required. High Range Water-Reducing admixture (super plasticizer) shall be used when required to maintain workability and pumpability.
- C. Patching Mortar: Mix in proportions by volume of one part cement to two parts fine sand.
- D. Concrete Fill at Stairs: Mix in proportions by volume of one part cement, two parts fine aggregate, one part coarse aggregate (3/8- inch); with as little water as necessary to make stiff workable plastic mix.
- E. Non-Shrink Grout: Follow approved manufacturer's printed instructions and recommendations.

### 2.04 MIXING

- A. **Batching Plant Conditions:**
  - 1. Batch plant shall be certified to comply with the requirements of the National Concrete Ready Mix Association.
  - 2. Ensure equipment and plant will afford accurate weighing, minimize segregation and will efficiently handle all materials to satisfaction of the Architect and the Owner's Testing Agency.
  - 3. Replace at no additional expense equipment the Architect and the Owner's Testing Agency deem inadequate or unsuitable.
  - 4. Use approved moisture meter capable of determining moisture content of sand.
- B. **General Requirements:**
  - 1. Thoroughly clean concrete equipment before use for architectural concrete mixes to avoid contamination.
  - 2. Mix cement, fine and coarse aggregates, admixtures and water to exact proportions of mix designs.
  - 3. Measure fine and coarse aggregates separately according to approved method that provides accurate control and easy checking.
  - 4. Adjust grading to improve workability; do not add water unless otherwise directed.
  - 5. Maintain proportions, values, or factors of approved mixes throughout work.
  - 6. Mix concrete in transit mixers five minutes immediately prior to discharge in addition to mixing as called for by ACI 304 and ASTM C94.
- C. **Admixtures:** Use automatic metering dispenser to introduce admixture into mix. Dispenser shall be recommended and calibrated by admixture manufacturer.
- D. **Transit-Mixed Concrete: ASTM C 94.** Provide from established commercial plant.
  - 1. **Truck Mixers:** Minimum 2 cu. yd. capacity, equipped with accurate revolution counter. Operate at rated speed. Discontinue use of mixers producing unsatisfactory concrete or showing more than 10% difference in sand-cement or water-cement ratios in samples taken from front, center and back of mixer.
  - 2. **Mixing Time:** Total at least 15 minutes, with at least 5 minutes immediately after addition of water, and at least 10 minutes just before discharging.
  - 3. **Mixing Water:** Withhold 2-1/2 gallons per cubic yard from predetermined water content. All or part thereof may be added at site, as directed.
  - 4. **Retempered Concrete:** Do not use concrete not placed within 90 minutes after water is introduced into mix or which has stood for 30 minutes after leaving mixer.

## **2.05 SOURCE QUALITY CONTROL**

- A. **The Owner's Testing Agency will:**
  - 1. Review mix designs, certificates of compliance, and samples of materials the Contractor proposes to use.
  - 2. Test and inspect materials, as necessary, in accordance with ACI 318.
  - 3. Take samples as required from the Contractor's designated sources.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. **Examine units of work to be cast and verify that:**
  - 1. Construction of formwork is complete.
  - 2. Required reinforcement, inserts, and embedded items are in place.
  - 3. Form ties at construction joints are tight.
  - 4. Concrete-receiving places are free of debris.
  - 5. Dampen subgrade or sand course for slabs-on-grade. Do not saturate.
  - 6. Depths of depressed slab conditions are correct for delayed finish noted and for its proper bonding to concrete.

7. Conveying equipment is clean and properly operating.
  8. The Architect has reviewed formwork and reinforcing steel and that preparations have been checked with the Project Inspector.
- B. Do not begin casting before unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Ensure availability of sufficient labor, equipment and materials to place concrete correctly in accordance with scheduled casting.
- B. Protect finished surfaces adjacent to concrete-receiving places.
- C. Clean transportation and handling equipment at frequent intervals and flush thoroughly with water before each day's run. Do not discharge wash water into concrete form.

### 3.03 PLACING

- A. The Inspector of Record, Architect, Structural Engineer, and Testing Laboratory shall be notified at least 48 hours before placing concrete.
- B. Place concrete in accordance with CBC Section 1905.
- C. Place concrete in cycles as a continuous operation to permit proper and thorough integration and to complete scheduled placement. Place no concrete where sun, wind, heat, or facilities prevent proper finishing and curing.
- D. Convey concrete as rapidly and directly as practicable to preserve quality and to prevent separation from rehandling and flowing; do not deposit concrete initially set. Complete placement of concrete within ninety (90) minutes after adding water unless otherwise noted. Retempering of concrete which has partially set will not be permitted.
- E. Take precautions to avoid damage to under-slab moisture barrier and displacement of reinforcement and formwork.
- F. Deposit concrete vertically in its final position. Avoid free falls in excess of six feet where reinforcement will cause segregation and in typical conditions unless the Architect approves otherwise.
- G. Keep forms and reinforcement clean above pour line by removing clinging concrete with wire brush before casting next lift. Also remove leakage through forms.
- H. Interruption in casting longer than 60-minutes shall be cause for discontinuing casting for remainder of day. In this event, cut back concrete and provide construction joints as the Architect directs; clean forms and reinforcement as necessary to receive concrete at a later time.
- I. Hot Weather Concreting: Conform to ACI 305 and following requirements when mean daily temperature rises above 75 degrees Fahrenheit.
  1. An upper temperature limit of concrete mixes shall be established by the Contractor for each class of concrete. Concrete temperature during placing shall not be so high as to cause difficulty from loss of slump, flash set, or cold joints, and shall not exceed 90°F. Other project climatic conditions detrimental to concrete quality such as relative humidity, wind velocity, and solar radiation shall also be considered.
  2. Trial batches of concrete for each mix design shall be made at the limiting mix temperature selected. In lieu of trial batches, compression strength test reports (20 minimum) at the limiting temperature for each proposed mix shall be submitted to the Owner's testing laboratory for review.

3. Practices to maintain concrete below maximum limiting temperature shall be in accordance with ACI 305. Concrete ingredients may be cooled before mixing, or flake ice or well-crushed ice of a size that will melt completely during mixing may be substituted for part of the mixing water.
  4. Practices to avoid the potential problems of hot weather concreting shall be employed by the Contractor in accordance with ACI 305.
  5. When the temperature of the reinforcing steel or steel deck forms is greater than 120°F, reinforcing and forms shall be sprayed with water just prior to placing the concrete.
- J. Cold Weather Concreting:
1. No placement of concrete will be allowed at temperatures below 20 degrees Fahrenheit or if mean daily temperature for curing period is anticipated to be below 20 degrees Fahrenheit.
  2. Conform to ACI 306 and following requirements when mean daily temperature falls below 40 degrees Fahrenheit.
    - a. Reinforcement, forms or ground to receive concrete shall be completely free from frost.
    - b. Concrete at time of placement for footings shall have temperature no lower than 50 degrees Fahrenheit, for all other concrete this minimum temperature at time of placement shall be 60 degrees Fahrenheit. Maximum temperature shall be 90 degrees Fahrenheit.
    - c. Concrete shall be maintained at temperature no lower than 50 degrees Fahrenheit for minimum 7-day period after placement by means of blanket insulation, heaters, or other methods as approved by the Architect.
    - d. Use of calcium chloride or admixtures containing calcium chloride as accelerators will not be permitted.
    - e. The Contractor shall keep a record of concrete surface temperature for first 7-days after each pour. This record shall be open to inspection by the Architect.
- K. Consolidating:
1. Use vibrators for thorough consolidation of concrete.
  2. Provide vibrators for each location during simultaneous placing to ensure timely consolidation around reinforcement, embedded items and into corners of forms; ensure availability of spare vibrators in case of failures. Vibrate through full depth of freshly placed concrete.
  3. Do not place vibrators against reinforcement, attach to forms, or use to spread concrete.
  4. Exposed Concrete: Vibrate with rubber type heads and, in addition, spade along forms with flat strap or plate.
- L. Construction Joints:
1. Verify location and conformance with typical details; provide only where designated or approved by the Architect. Comply with CBC Section 1906.4.
  2. All horizontal and vertical construction joints to be thoroughly sandblasted to clean and roughen entire surface to minimum 1/4-inch relief exposing clean coarse aggregate solidly embedded in mortar matrix.
  3. Just prior to depositing concrete, the surface of the construction joint shall be thoroughly wetted.
- M. Contraction (Control) Joints in Slabs-on-Grade:
1. Construct contraction joints in slabs-on-ground to form panels of patterns indicated on Shop Drawings. Use "Early Entry" saw equipment. Use saw cuts 1/8" x 1/4 slab depth, unless otherwise indicated.
  2. Time saw cutting to allow sufficient curing of concrete to prevent raveled or broken edges.
  3. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
  4. If joint pattern not shown, provide joints not exceeding 15' in either direction and located to

conform to bay spacing wherever possible (at column centerlines, half bays, third-bays).

- N. Walls and Other Formed Elements:
1. Space points of deposit to eliminate need for lateral flow. Placing procedures of concrete in forms permitting escape of mortar, or flow of concrete itself, will not be permitted.
  2. Level top surface upon stopping work.
  3. Take special care to fill each part of the forms by depositing concrete directly as near final position as possible, and to force concrete under and around reinforcement, embedded items, without displacement.
  4. After concrete has taken its initial set, care shall be exercised to avoid jarring forms or placing any strain on ends of projecting reinforcement.
  5. Where backfill is placed against a wall, it shall be adequately shored until it has attained design strength.
- O. Concrete Fill at Stairs:
1. Preparation:
    - a. Remove laitance, mortar, oil, grease, paint, etc.
    - b. Mechanically chip insufficiently rough surfaces.
    - c. Remove sand, etc., with compressed air.
      - 1) Finish stairs to profiles shown with cove at base of risers and radius at top: tool grooves at edge of treads as detailed.

### 3.04 CURING

- A. General Requirements:
1. Take curing measures immediately after casting and for measures other than application of curing compound, extend for seven days. The Architect may recommend longer periods based upon prevailing temperature, wind and relative humidity. Comply with CBC Section 1905.11.
  2. Avoid alternate wetting and drying and fluctuations of concrete temperature.
  3. Protect fresh concrete from direct rays of sun, rain, freezing, drying winds, soiling, and damage.
  4. Do not permit curing method to affect adversely finishes or treatments applied to finish concrete.
- B. Curing Method, Typical: Obtain the Architect's approval of alternate measures.
1. Keep forms and concrete surfaces moist during period forms are required to remain in place.
  2. Apply curing compound per manufacturers' recommendations, except at slabs-on-grade apply curing compound at 150% of manufacturer's recommended application coverage rate.
  3. For slab on grade, provide 7 day wet cure with "Burlene" moist curing blanket.
- C. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Architect and coating manufacturer.
- D. Slab Curing: Concrete slabs shall be moisture-cured or moisture cover cured as specified above for a minimum of 7 days after installation. Construction schedule shall allow for a minimum of 7 days.
1. Unacceptable vapor emissions may be caused by excessive moisture from too high water/cement ratio in the concrete mix or curing practices or admixtures which prevent proper hydration by accelerating the curing process.
  2. For interior slabs-on-grade tested and found to have moisture vapor emission rate higher than that allowed by flooring material manufacturer, employ whatever means necessary to bring slab into compliance at no additional cost to Owner.
  3. Should it be necessary to apply a topical treatment to slabs-on-grade in order to mitigate moisture vapor emissions, comply with following:

- a. Submit proposed products to Architect for review.
- b. Obtain written confirmation from flooring material manufacturer that proposed treatment is compatible with installation adhesives.

### 3.05 CLEANING, PATCHING AND DEFECTIVE WORK

- A. Where concrete is under strength, out of line, level or plumb, or shows objectionable cracks, honeycombing, rock pockets, voids, spalling, exposed reinforcement, signs of freezing or is otherwise defective, and, in the Architect's judgement, these defects impair proper strength or appearance of the work, the Architect will require its removal and replacement at the Contractor's expense.
- B. Immediately after stripping and before concrete is thoroughly dry, patch minor defects, form-tie holes, honeycombed areas, etc., with patching mortar. Patch shall match finish of adjacent surface unless otherwise noted. Remove ledges and bulges.
- C. Compact mortar into place and neatly file defective surfaces to produce level, true planes. After initial set, dress surfaces of patches mechanically or manually to obtain same texture as surrounding surfaces.
- D. Rock Pockets:
  1. Cut out to full solid surface and form key.
  2. Thoroughly wet before casting mortar.
  3. Where the Architect deems rock pocket too large for satisfactory mortar patching as described, cut out defective section to solid surface, key and pack solid with concrete to produce firm bond and match adjacent surface.
- E. Cleaning
  1. Ensure removal of bituminous materials, form release agents, bond breakers, curing compounds if permitted and other materials employed in work of concreting which would otherwise prevent proper application of sealants, liquid waterproofing, and other delayed finishes and treatments.
  2. Where cleaning is required, take care not to damage surrounding surfaces or leave residue from cleaning agents.
  3. Remove all exposed, loose fibers from slabs to the satisfaction of the architect.

### 3.06 PROTECTION

- A. Protect concrete from injurious action of the elements and defacement of any nature during construction operations, including stairs.
- B. Protect exposed corners of concrete from traffic or use which will damage them in any way.
- C. Make provisions to keep all exposed concrete free from laitance caused by spillage or leaking forms or other contaminants. Do not allow laitances to penetrate, stain, or harden on surfaces which have been textured.

### 3.07 FIELD QUALITY CONTROL

- A. The Owner's Testing Agency will:
  1. Perform testing in accordance with ACI 318 and CBC Section 1903 and 1905.
  2. Review concrete mix designs.
  3. Inspect concrete and grout placement continuously.
  4. Test concrete to control slumps according to ASTM C143.
  5. Continuously monitor concrete temperature as it arrives on the site.
  6. Test concrete for required compressive strength in accordance with CBC Section 1905.6:
    - a. Make and cure four specimen cylinders according to ASTM C31 for not more than each 50 cubic yards, or 2000 square ft for of surface areas of slab or walls poured each day.

- b. Retain one cylinder for 7-day test, two for the 28-day test and hold one cylinder for additional testing as required.
  - c. Number each cylinder 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D etc; date each set; and keep accurate record of pour each set represents.
  - d. Transport specimen cylinders from job to laboratory after cylinders have cured for 24-hours on site. Cylinders shall be covered and kept at air temperatures between 60 and 80 degrees Fahrenheit.
  - e. Test specimen cylinders at age 7-days and age 28-days for specified strength according to ASTM C39.
  - f. Base strength value on average of two cylinders taken for 28-day test.
    - 1) Test and inspect materials, as necessary, in accordance with ACI 318, MM Test Method 227 (Coarse Aggregates) and MM Test Method 217 (Fine Aggregates), for compliance with requirements specified in this section.
- B. The Contractor shall:
- 1. Submit ticket for each batch of concrete delivered to job site. Ticket shall bear the following information:
    - a. Design mix number.
    - b. Signature or initials of ready mix representative.
    - c. Time of batching.
    - d. Weight of cement, aggregates, water and admixtures in each batch with maximum aggregate size.
    - e. Total volume of concrete in each batch.
    - f. Notation to indicate equipment was checked for contaminants prior to batching.
      - 1) Pay the Owner's Testing Agency for taking core specimens of hardened structure and testing specimen according to ASTM C88 and C42 when laboratory tests of specimen cylinders show compressive strengths below specified minimum.
      - 2) Submit Concrete Weighmaster affidavit.

### 3.08 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish Work or by other construction. Concrete surface shall have texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Architectural Concrete Finish: Integrally colored concrete, using specified color additive; smooth light sandblast surface.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed surfaces occurring 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.

### 3.09 SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

1. After placing slabs, plane surface to tolerances for floor flatness FF of 20 and floor levelness FL of 15. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.
  1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances for flatness FF of 25 and levelness FL of 20. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.
  1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance. Check and level surface plane to tolerances flatness FF of 35 and levelness FL of 25. Grind smooth surface defects which would telegraph through applied floor covering system.
  2. Floors to receive traffic topping shall have steel trowel finish.
- D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
- E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.
  1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- F. Chemical-Hardener Finish: Apply chemical-hardener finish to interior concrete floors where indicated, after complete curing and drying of the concrete surface. Follow manufacturer's printed instructions.
- G. Sealer: Apply only to slabs not receiving other floor coverings, as indicated in Finish Schedule. Apply only to surfaces that are sound, properly troweled and finished, and that are clean, dry, and free of form release agents, retarders, alkali, curing compounds, oil, grease and other contaminants.
  1. Discolored or stained slabs shall be acid-cleaned and etched before sealer is applied if, in Architect's judgment, a satisfactory uniform finish cannot be otherwise achieved.
    - a. Other Slabs: Completely and uniformly seal with the specified clear sealer applied in accordance with manufacturer's printed instructions and prescribed coverage rate. Apply uniformly, producing a coating which is smooth and free from runs and blemishes

### 3.10 CLEAN UP

- A. Perform Work under this Section to keep affected portions of building site neat, clean, and orderly. Remove, immediately upon completion of Work under this Section, surplus materials,

rubbish, and equipment associated with or used in performance. Be aware that failure to perform clean-up operations within 24 hours of notice by Architect will be considered adequate grounds for having work done by others at no added expense to the Owner.

**END OF SECTION**

**SECTION 03 3513**

**HIGH-TOLERANCE CONCRETE FLOOR FINISHING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Finishing slabs on grade and other concrete slabs.
- B. Surface treatment with concrete densifier.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Prepared concrete floors ready to receive finish.
- B. Section 07 9005 - Joint Sealers.

**1.03 REFERENCE STANDARDS**

- A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.
- B. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007) .
- C. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2009.
- D. ASTM C1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method; 2007.
- E. ASTM C 779 - Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces; 2005.
- F. ASTM C 805 - Standard Test Method for Rebound Number of Hardened Concrete; 2008.
- G. ASTM D 3359 - Standard Test Methods for Measuring Adhesion by Tape Test; 2009.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on concrete hardener, sealer, and slip resistant treatment, including information on compatibility of different products and limitations.
- C. Maintenance Data: Provide data on maintenance renewal of applied coatings.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in manufacturer's sealed packaging, including application instructions.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Concrete Floor Finishes:
  - 1. Curecrete Distribution, Inc; Product Ashford Formula: [www.ashfordformula.com](http://www.ashfordformula.com).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 COMPOUNDS - HARDENERS AND SEALERS**

- A. Chemical Densifier: Water based, liquid type.
  - 1. Color(s): Clear.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that floor surfaces are acceptable to receive the work of this section.

**3.02 FLOOR FINISHING**

- A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1R.

**3.03 FLOOR SURFACE TREATMENT**

- A. Apply hardener to scheduled floor surfaces in accordance with manufacturer's instructions.

**END OF SECTION**

## SECTION 04 2000

### CONCRETE MASONRY UNITS

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. Section Includes: Provision of concrete masonry work, including but not limited to, masonry units, mortar, grout, reinforcing steel, control joints, testing and inspection.
  - 1. Related Sections:
    - a. Section 03 2000 - Concrete Reinforcement
    - b. Section 03 3000 - Cast-in-Place Concrete
    - c. Section 05 1200 - Structural Steel

##### 1.02 REFERENCES

- A. Requirements of the General Conditions and Division No. 1 apply to all Work in this Section.
- B. Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to Work in this Section where cited by abbreviations noted below (latest editions apply).
  - 1. California Building Code (CBC), 2007 Edition.
  - 2. American Concrete Institute's "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI 315).
  - 3. American Society for Testing and Materials (ASTM).
  - 4. "Specifications for Masonry Structures", ACI 530.1/ASCE6/TMS602.

##### 1.03 QUALITY ASSURANCE

- A. All masonry work shall comply with the standards and requirements of the above references. Where discrepancies exist between the references and the Contract Documents, the requirements of the Contract Documents shall govern.
  - 1. Allowable Tolerances:
    - a. Unit masonry shall be placed within 1/8-inch of dimensions noted.
    - b. The maximum variation from plumb of walls shall be 1/8" in 20 feet.
    - c. Joints shall have a uniform thickness of 3/8" unless otherwise noted. Joints shall not vary more than 1/16" in adjacent courses within two feet and shall not be less than 5/16" thick and not greater than 7/16" thick.
  - 2. Reinforcing Steel:
    - a. Reinforcing steel shall not be permitted to rust where there is danger of staining exposed surfaces of adjacent concrete.
    - b. The Contractor shall replace rust-stained concrete and/or masonry at his expense.
- B. Examination Criteria: All examinations, selections and approval shall be for the purpose of achieving a final installation of the unit masonry with the greatest possible uniformity of appearance and structural integrity based on the following criteria:
  - 1. Testing and quality assurance measures outlined in this specification.
  - 2. Color and texture shall match the approved sample for range, random variation and finish. The quality of construction shall match the approved mock-up.
  - 3. Conformance to the contract documents and approved shop drawings within specified dimensions and tolerances.
  - 4. Only one source for concrete masonry units shall be used throughout the work.
  - 5. Other criteria as specified in this Section.
  - 6. Non-conformance with any or all of the above criteria shall be grounds for removal and replacement of the work without expense to the Owner. The Architect shall determine if the work complies with the above criteria.

#### 1.04 QUALITY ASSURANCE

- A. The Owner's Testing Agency will:
  - 1. Collect plant certificates from the Contractor for concrete masonry units, stating that all units have been properly cured before shipment and that they conform to all the requirements of these specifications. All masonry units shipped without certification will be rejected.
  - 2. Field test masonry unit moisture content prior to block installation. See Section 3.7, Field Quality Assurance.

#### 1.05 SUBMITTALS

- A. Manufacturer's literature: Submit manufacturer's literature describing products, including mix designs, history of compression tests, and mixing requirements as they apply to each different masonry unit, accessory and other manufactured product to be used in the unit masonry construction. Literature shall include, but not be limited to, preformed rubber control joints and all additives.
  - 1. Certificates:
    - a. Submit material certificates for the following signed by the manufacturer and the Contractor certifying that each material complies with requirements designated.
      - 1) Each material and grade of reinforcing bars. See Section 03 2000, Concrete Reinforcement.
      - 2) Each type and size of anchors, inserts, ties and accessories.
    - b. The Contractor shall submit a certificate of compliance with the standards designated.
    - c. Submit plant certificates for all concrete masonry units to the Owner's Testing Agency and Architect, stating that all units have been properly cured before shipment and that they conform to all requirements of these specifications, including but not limited to, requirements for moisture content per ASTM C90 Type 1 units.
  - B. Mix Designs: Submit mix designs for mortar and grout, and history of compression tests. Submit manufacturer's literature for grout admixtures.
  - C. Unit Samples: Submit sample concrete masonry units in each color and texture combination specified.
  - D. Samples: Submit samples of all accessories embedded in masonry.
  - E. Mill Test: Submit mill test reports for all reinforcing steel.
  - F. Extreme Weather Procedures: Submit cold and hot-weather construction procedures evidencing compliance with requirements specified in ACI 530.1 and these specifications.
  - G. Shop Drawings: Coordination and shop drawings for all concrete masonry unit walls. Drawings shall consist of elevations and sections indicating materials and assembly, color surface finish, courses and reinforcing.
    - 1. The shop drawings shall illustrate detailing, fabrication, bending and placement of unit masonry reinforcing bars. Comply with ACI 315 showing bar schedules, stirrup spacing, diagrams of bent bars and arrangements of masonry reinforcement. The shop drawings shall also indicate the location of all conduit, plumbing and other items embedded in unit masonry walls and coordinate this work with the placement of the unity masonry reinforcement.
    - 2. All shop drawings shall be drawn to scale.
  - H. Test Reports: Submit material test reports indicating and interpreting test results relative to compliance with the tests described in this Section and Section 3.7 Field Quality Assurance.

### 1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver and store packaged material in original containers with seals unbroken and labels intact until time of use.
- B. At the time of delivery to the site, masonry units shall conform to the moisture requirements of ASTM C90 Type I, Table 1. In addition, masonry units shall also meet the moisture requirements during laying of units and grouting until the wall is complete.
- C. Unload and inspect each masonry unit carefully and store on raised platform protected from weather so as to meet ASTM C90 Type I requirements at the time of laying and grouting. Reject and remove from the site all material not conforming to specification requirements. In addition to lack of conformance to manufacturers' specifications, masonry units shall be rejected if:
  - 1. The color or texture of the concrete masonry units deviates from the range of colors and textures displayed on approved mock-up, as determined by the Architect.
  - 2. Concrete masonry units that are chipped, crack or otherwise damaged.
  - 3. Protect cementitious materials against exposure to moisture.
    - a. Use of cementitious or other materials that have become caked and hardened from absorption of moisture will not be permitted.
- D. Prior to installation, unload concrete masonry units onto working pallets as described in Section 3.2, D.

### 1.07 JOB CONDITIONS

- A. Environmental Conditions:
  - 1. Do not place unit masonry when temperature is below 40 degrees Fahrenheit, unless the Architect approves and the Contractor provides means for preventing damage from freezing before and after placement.
- B. Protection:
  - 1. Protect surrounding work as required against damage from masonry work.
  - 2. Clean satisfactorily and correct damage to surrounding work resulting from masonry work.
  - 3. The contractor shall take all means and precautions necessary to protect masonry units from moisture absorption during shipping, storage on site, placement prior to grouting of wall, during wall construction until the masonry wall is completed and water repellant coating is applied.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Hollow Load-Bearing Concrete Masonry Units: As manufactured by Angeles, Orco, Basalite, Calstone or approved equal. Medium weight open end type concrete block conforming to ASTM C90, Type I (0.060 maximum allowable linear shrinkage with a maximum moisture of 35%, as a percentage of total absorption). Provide compressive strength indicated on drawings.
  - 1. Lifeguard Structure Walls: Angelus Block Charcoal, burnished multiple sides where exposed to the exterior.
  - 2. Shower and Retaining Walls: Angelus Block Midnight, burnished multiple sides where exposed to the exterior.
  - 3. Portland Cement: ASTM C150, Type II.
  - 4. Aggregates:
    - a. For Mortar: ASTM C144.
    - b. For Grout: ASTM C404.
  - 5. Hydrated Lime; ASTM C207, Type S.
  - 6. Quick Lime: ASTM C5.
  - 7. Reinforcing Bars:

- a. Bars: New billet steel, ASTM A615, Grade 60.
  - b. Tie Wires: ASTM A82.
  - c. Comply with the requirements of Section 03 2000, Concrete Reinforcement.
- B. Water: Clean and potable, free from impurities detrimental to mortar and grout.
- C. Control Joints: Preformed rubber in profiles required or shown. Same as Sonneborn-Contech's "Masonry Control Joints"; Dur-O-Wal National Inc.'s "Rapid Control Joint"; or equal product substituted per Section 01 6000.
- D. Mortar Coloring: Mineral oxide type.
- E. Additives and Admixtures: Required in all grout to reduce early water loss to the masonry units and produce expansive action in the plastic grout to offset the initial shrinkage and promote bonding of grout to the interior masonry unit surfaces. Use Grout Aid by W.R. Grace or approved equal. Obtain approval of admixture by Architect, Structural Engineer and Owner's Testing Agency.
- F. Water Repellant Coating: As specified in Section 07 1900, Water Repellant Coating.

## 2.02 FABRICATION

- A. Concrete Masonry Units: Blocks shall have been air cured for not less than 28 days.
- B. Reinforcement:
1. Shop-fabricate to comply with Drawings.
  2. Conform with requirements of ACI 315 where specific details are not shown or where Drawings and Specifications are not more demanding.

## 2.03 MIXES AND MIXING

- A. Mortar:
1. Conform to ASTM C270, Type M or S, per plans.
    - a. Compressive Strength: Minimum 2,500 psi after 28 days.
    - b. Proportions by Volume: One part Portland cement, one-quarter to one-third part hydrated lime, and two and three quarters parts aggregate.
  2. Use Angelus Block premixed mortar. Site mixing of mortar shall not be permitted without review and acceptance of Contractor's procedure by the Owner's Testing Agency and the Structural Engineer.
    - a. Color of mortar to match the masonry and to be selected by the Architect from all available colors.
  3. Add lime and continue mixing as long as required to secure a uniform mass.
  4. Total mixing time may not be less than 3 minutes or more than 10 minutes.
  5. Use and place mortar in final position within 2½ hours after mixing.
    - a. Mortar that have stiffened as a result of evaporation of water may be re-tempered with water as frequently as required to restore required consistency during this time period.
- B. Grout: Site mixing of grout shall not be permitted without review and acceptance by the Structural Engineer.
1. Compressive Strength: Minimum 2,000 psi after 28 days.
  2. Slump: 9- to 10-inches.
  3. Proportions by Volume: Shall be per CBC 2103.13 or Table 2103.12.
  4. Use grout aid in all grout to reduce early water loss to the masonry units and produce an expansive action in the grout sufficient to offset initial shrinkage. Mix grout admixture in accordance with the manufacturer's recommendations and requirements.
  5. Grout to comply with requirements of CBC 2103.12 for materials and mix requirements.

6. Use sufficient water to make a workable mix that will flow into all joints of the masonry units with typical rates of absorption for ASTM C90 Type I units. The slump of the grout should be approximately 9 to 10 inches depending on temperature and humidity conditions.
7. General Mixing Requirements:
  - a. Measure materials accurately.
  - b. Shovel measurements will not be permitted.
  - c. Use mechanical mixer of at least one-sack capacity.
  - d. Completely empty drum before charging succeeding batch of materials.
  - e. Exercise extreme care in measuring ingredients for partial batches.

#### **2.04 SOURCE QUALITY CONTROL**

- A. The Owner's Testing Agency will:
  1. Collect mill test reports for reinforcements under Section 1.4.
  2. Sample and test concrete masonry units for compressive strength, unit weight, absorption and moisture content in accordance with ASTM C140.
    - a. Compressive strength tests of units shall also comply with CBC 2105.2.2.1.
  3. Test for moisture content and drying shrinkage in accordance with ASTM C426.

### **PART 3 EXECUTION**

#### **3.01 INSPECTION**

- A. Examine areas to receive masonry and verify the following:
  1. Foundation surface is level to permit bed joint within range of 1/4- to 3/4-inch.
  2. Edge is true to line to permit projection of masonry to less than 1/4-inch.
  3. Projecting dowels are free from loose scale, dirt, concrete, or other bond-inhibiting substances and properly located.
  4. Do not begin before unsatisfactory conditions have been corrected.

#### **3.02 PREPARATION**

- A. Clean concrete surfaces to receive masonry.
- B. Remove laitance or other foreign material lodged in surface by sandblasting or other means as required.
- C. Ensure masonry units are clean and free from dust, dirt, or other foreign materials before laying.
- D. Roughen concrete below walls to expose aggregate; remove loose particles and in hot weather, dampen concrete surfaces before laying blocks. Contact surfaces of all foundations and floors that are to receive masonry work are to be mechanically roughened to 1/4" amplitude.

#### **3.03 REINFORCEMENT**

- A. Place bars where noted in accordance with ACI 315 and do not disturb after start of masonry placement.
  1. All horizontal reinforcement shall be laid in bond beam units.
- B. Minimum clearance between bar and CMU is 1/2-inch and between parallel bars is 1-inch.
- C. Horizontal and vertical reinforcing shall be held in position by wire positioners or spacing devices near ends and at intervals not to exceed 200 bar diameters, and as required to prevent displacement by construction loads or placement of grout beyond the tolerances allowed by CBC 2104.1.

#### **3.04 PLACEMENT**

- A. General Requirements:
  1. Ensure masonry units are sound, clean and free of cracking, chipping and broken edges at

- time of placement.
2. Accurately cut and fit units as required to accommodate other work using masonry saws.
  3. Lay masonry units plumb, true to line, with level courses accurately placed.
  4. Adjust unit to final position while mortar is soft and plastic.
  5. Align vertical cells accurately.
  6. Remove units disturbed after stiffening of mortar, clean joints, and relay unit with fresh mortar.
  7. In hot weather, moisten contact surfaces of the masonry units to receive mortar immediately before laying to prevent excessive drying of mortar.
  8. Do not lay up one tier of wall more than 16-inches ahead of other tier.
  9. Where necessary to stop longitudinal run, rack back one-half block length in each course.
  10. Do not attach construction supports to walls, except where permitted by the Architect.
  11. Install anchors, bolts, and other embedded items accurately as work progresses and prior to grouting.
  12. Masonry installer and reinforcing steel installer shall meet and coordinate placement of reinforcing steel prior to placement of concrete or grout.
- B. Joints:
1. Fill joints to thickness noted: ensure full coverage of face shells in both horizontal and vertical joints and on webs.
  2. Tool joints as specified on the drawings and achieve solid, smooth, watertight, compacted joints.
  3. Joints Exposed to Weather: Point with pointing tools making solid, smooth, watertight joint well bonded to masonry at edges.
  4. Immediately fill holes made by line pin with mortar when pin is withdrawn.
  5. Remove surplus mortar from joints.
- C. Cold Weather Requirements:
1. When daily temperature is below 40 degrees F., ensure reinforcing, masonry units, etc., contacting mortar, and grout are free of frost.
  2. Protect all mortar and grout from freezing for at least 48 hours after installation whenever temperature falls below 40 degrees F.
  3. Maintain mortar and grout at temperature no lower than 50 degrees F., while being used and until installed.
  4. In freezing or near freezing weather, provide equipment of adequate size for heating of mortar and grout.
  5. Do not add water to mix at temperature greater than 140 degrees F.
  6. Hot Weather Requirements:
    - a. Implement the requirements of approved Hot Weather construction procedures when ambient air temperature exceeds 100 degrees F or 90 degrees F with a wind velocity greater than 8 mph.
  7. Protection:
    - a. Protect face materials against staining.
    - b. Remove misplaced grout or mortar immediately.
    - c. Protect sills, ledges, offsets, and similar items from mortar drippings or other damage during construction.
  8. Requirements for Walls to be Grouted by High-Lift Method:
    - a. Lay up walls full story prior to grouting. Brace walls adequately to resist wind lateral and other forces.
    - b. Build vertical grout barriers or dam of solid masonry across grout space at no more than 25-feet on centers to control horizontal flow of grout.
    - c. Provide cleanouts by leaving out every other unit in bottom course; seal after inspection and before grouting. Face shell plugs shall have a 24 hour cure time and be adequately braced to resist grout pressure.

- d. During laying up, remove mortar fins and other foreign matter from grout space with stick and compressed air.
  - e. Grout shall be a high slump workable mix placed by pumping.
  - f. Use mechanical vibrators for consolidation.
  - g. Grout is to be reconsolidated after it has taken on a plastic consistency but prior to taking on initial set.
  - h. A "pour" is considered as the entire height of grout fill placed in one day and is composed of a number of successive placed grout lifts. A "lift" is the layer of grout placed in a single continuous operation.
  - i. Maximum height of pour will be twelve feet for eight inch walls, sixteen feet for twelve inch walls.
9. Concrete Masonry Units:
- a. Bond: Running bond, unless specifically noted otherwise.
  - b. Joint Thickness: 3/8-inch, both vertically and horizontally.
  - c. Joint Treatment:
    - 1) Where exposed, all mortar joints shall be tooled joints.
    - 2) Where concealed, cut off mortar flush with face of work using trowel.
  - d. Use proper units to provide for windows, doors, bond beams, lintels, pilaster, etc., in order to minimize cutting.
  - e. Do not wet units.
  - f. Align vertical cells to provide continuous, unobstructed opening for grouting.
  - g. Corners: Provide standard masonry bond by overlapping units.

### 3.05 GROUTING

- A. General Requirements:
1. Use high-lift or low-lift grouting, at the Contractor's option. Do not pour grout until mortar has set and cured, 36 hours minimum. Grout walls as soon as possible after mortar has cured.
  2. Grout voids between wythes and cells of concrete block.
  3. Ensure grout flows into voids and completely surrounds reinforcing steel.
  4. Stop grout approximately 1-1/2 inches below top of last course (1/2" at bond beams with horizontal steel), except at top course, bring grout flush with top of block.
  5. Grout from inside face of masonry wherever possible.
  6. Where necessary to stop longitudinal run, provide suitable dam to retain grout in place.
  7. Do not wet down grout spaces prior to grouting.
- B. Low-Lift Grouting:
1. Pour grout to a maximum height of 4-feet, stopping 1-1/2-inches below top of unit except at bond beam units with horizontal steel the grout shall be stopped 1/2-inch below top of unit.
  2. Delay 3 to 5 minutes allowing the excess of water to be absorbed by the masonry unit, then consolidate by vibrating.
  3. Layup and grout next 4-feet of walls.
- C. High Lift Grouting
1. Ensure cleanout has been sealed before grouting.
  2. Pour first lift to a depth not in excess of 4 feet, with a waiting period between subsequent lifts of thirty to sixty minutes, sufficient to permit grout to become plastic but not set.
  3. Place the first lift of grout to a uniform height, wait 3 to 5 minutes, and mechanically vibrate thoroughly to fill all voids. Subsequent lifts should be poured and alternate cells vibrated twelve inches to eighteen inches into the preceding lift.
  4. Complete pour in sequence with other lifts not in excess of 4 feet.
  5. If grout pour is 6-feet or less, it may be placed in one lift. If total pour exceeds 6-feet, the grout shall be placed in 4-foot lifts.

6. Grouting operations shall be conducted such that pours are limited to successive lifts which can be placed within one hour of the preceding lift.
7. Reconsolidate the top lift after the required waiting period to fill any space left by settlement and shrinkage.
8. Repeat the waiting, pouring, and reconsolidation steps until the top of the day's pour is reached.
9. Construction Joints: In the high lift grouting method, intermediate horizontal construction joints are not permitted. Plan the work for one continuous pour of grout to the top of the wall in four foot layers or lifts in the same working day. Should a blow-out, equipment breakdown, or any other emergency occur, cease the grouting operation. An alternate procedure may be used with the approval of the Architect or Structural Engineer.
10. The section of wall to be grouted in any one pour is limited to a length in which successive lifts can be placed within one hour of the preceding lifts. Vertical control barriers shall be placed between pour sections in locations approved by the Architect or Structural Engineer.

### **3.06 POINTING AND CLEANING**

- A. Point holes or defective mortar joints upon completion of work; where necessary, cut out and repoint defective joints.
- B. At end of work day, fiber-brush new surfaces to remove mortar splashes, clean with mild detergent or enzymes, and rinse with clean water.
- C. Do not use acid solution to remove green stain or efflorescence resulting from salts; follow recommendations of manufacturer for removal of such stains.
- D. Upon completion of work, remove from site surplus materials, rubbish, and debris resulting from this work.

### **3.07 FIELD QUALITY ASSURANCE**

- A. Special Inspection:
  1. The Owner shall employ an approved, qualified masonry inspector to perform continuous masonry inspection per CBC 1704. Acceptance by a State or Municipality having a program of examining and certifying masonry inspectors will be considered adequate qualifications. The masonry inspector shall be at the site during all masonry construction and perform the following duties:
  2. Review plans and specifications and meet with the Contractor to discuss requirements before work commences.
  3. Before masonry work commences, meet with the Contractor and the Architect in a joint meeting to review the requirements for surveillance and quality control of the masonry work.
  4. Check brand and type of cement, lime (if used) and source of sand.
  5. Inspect the foundation or slab to ascertain that it is clean and ready to receive units.
  6. Check reinforcing steel dowels for straightness, proper alignment, spacing, size and length.
  7. Observe manner in which units are laid up to ensure that joints are full of mortar and kept tight during work. Inspect cells to assure that fins will not interfere with grouting or foaming. Instruct masons to keep cells clean of mortar droppings and inspect to determine compliance.
  8. Observe placing of grout continuously.
  9. Perform or supervise performance of required sampling and field testing as specified.
  10. Keep complete record of inspection of work. Report daily to the Owner's Representative the progress of the masonry inspection.

- B. Prism Test: The Owner's Testing Agency will perform prism testing in accordance with CBC Section 2105. Prior to construction, a set of 5 masonry prisms shall be built and tested using materials taken from those specified for this project. During construction test 3 prisms for each 5,000 sq. ft. of wall area and as additionally required by the Architect.
- C. Mortar and Grout Testing: The Owner's Testing Agency shall verify that mortar complies with the requirements of CBC 2103.8 and CBC Table 2103.8. - compressive strength tests shall be performed on grout, one test for each 5,000 square feet of wall area. Test mortar and grout in accordance with CBC 2105.2.
- D. Masonry Core Tests: When required by the Owner or Architect, the Owner's Testing Agency shall take and test masonry cores in accordance with CBC. Take cores in locations designated by the Architect. Contractor shall restore walls with whole face shells or complete units as approved by the Architect. One half of the cores shall be tested for bond strength at the joint between the masonry and the grout.

**END OF SECTION**

## SECTION 05 1200

### STRUCTURAL STEEL

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. Section Includes: Provision of structural steel as indicated on the Contract Drawings. Work includes but is not necessarily limited to the following:
1. Structural steel framing, including all structural steel shown on the structural drawings and all standard shapes, plates and rods shown on the Architectural, Mechanical and Electrical drawings that connect to the building structure.
  2. Welded stud connectors for composite construction, concrete engagement, and attachment of building components.
  3. Anchor rods.
  4. Shop painting.
  5. Bent plate deck closures.
    - a. Related Sections:
      - 1) Section 03 2000 - Concrete Reinforcement
      - 2) Section 03 3000 - Concrete
      - 3) Section 05 3100 - Steel Decking
      - 4) Section 05 5000 - Metal Fabrications
      - 5) Section 05 5100 - Metal Stairs

##### 1.02 REFERENCES

- A. Requirements of General Conditions and Division No. 1 apply to all Work in this Section.
- B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).
1. California Building Code (CBC), 2007 Edition.
  2. American Society for Testing and Materials (ASTM).
  3. American Institute of Steel Construction:
    - a. "Specification for Structural Steel Buildings, March 9, 2005" (AISC 360).
    - b. "Specification for Structural Joints Using ASTM A325 or A490 Bolts, June 30, 2004" (AISC 348).
    - c. "Code of Standard Practice for Steel Buildings and Bridges, March 18, 2005" (AISC 303).
      - 1) No provision of AISC 303 shall be effective to change the duties and responsibilities of the Owner, Contractor or Structural Engineer from those set forth in these Contract Documents.
      - 2) Where discrepancies exist between the requirements of the Contract Documents and AISC 303, the requirements of the Contract Documents shall govern.
    - d. "Seismic Provisions for Structural Steel Buildings, Including Supplement Number 1, March 9, 2005" (AISC 341).
    - e. "Prequalified Connections for Special and Intermediate Moment Frames for Seismic Applications," December 13, 2005 (AISC 358).
  4. American Welding Society's:
    - a. "Structural Welding Code -- Steel" (AWS D1.1), 2002.
    - b. "Seismic Welding Supplement" (AWS D1.8), 2005.
    - c. "Standard Symbols for Welding, Brazing and Nondestructive Examination (AWS A2.4).
    - d. "Filler Metal Specifications" (AWS A5).
    - e. "Criteria for Describing Oxygen-Cut Surfaces and Oxygen Cutting Surface Roughness Gauge" (AWS C4.1).

- f. "Standard for AWS Certification of Welding Inspectors" (AWS QC1).
- 5. American National Standards Institute's:
  - a. "Plain Washers" (ANSI B18.22.1).
  - b. "Beveled Washers" (ANSI B18.22.1).
- 6. Society of Protective Coatings':
  - a. Solvent Cleaning (SSPC-SP 1).
  - b. Hand Tool Cleaning (SSPC-SP 2).
  - c. Brush-Off Blast Cleaning (SSPC-SP 7).
- 7. American Society of Non-Destructive Testing's:
  - a. ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel (ANSI/ASNT CP-189-2001).
  - b. Personnel Qualification and Certification in Nondestructive Testing, 2001 (ASNT Recommended Practice No. SNT-TC-1A).

### 1.03 DEFINITIONS

- A. Demand-Critical Welds: Demand-Critical Welds are designated on the structural drawings. All Demand-Critical Welds are part of the Seismic-Load-Resisting System.
- B. Extra Smooth: Surfaces noted herein as "Extra Smooth" require a finish with surface variation of 500 micro-inches or less (AWS C4.1-77, Sample #4).
- C. Gouge: any depression deeper than the overall surface roughness.
  - 1. Heavy Sections: Rolled and built-up sections as defined below.
    - a. ASTM A6 shapes with flanges thicker than 1 1/2".
    - b. Welded built-up members with plates exceeding 2" in thickness,
    - c. Column base plates exceeding 2" in thickness.
- D. Nondestructive Testing: Nondestructive testing (NDT) includes magnetic particle testing (MT), penetrant testing (PT), radiographic testing (RT), and ultrasonic testing (UT). The terms nondestructive examination (NDE) and nondestructive testing (NDT) are synonymous.
- E. Protected Zone: The Protected Zone is defined as structural members, or portions thereof, to which connections of structural and non-structural elements are limited. The Protected Zone is designated on the structural drawings.
- F. Quality Assurance Plan: The Quality Assurance Plan is set of the written requirements containing the set of procedures that are to be followed by the Owner's Testing Agency to confirm compliance with these requirements.
- G. Seismic-Load-Resisting System (SLRS): The Seismic-Load-Resisting System (SLRS) is defined as all items designated "SLRS" on the Structural Drawings, including columns, beams, and braces, and their connections along grid lines denoted "SLRS" on the framing plans.

### 1.04 QUALIFICATIONS

- A. Steel Fabricator's Qualifications: Fabricator shall have had not less than 5 years' experience in fabrication of structural steel and be able to furnish evidence of his ability, facilities, proficiency of his personnel and completed projects. Fabricator shall be a City of Los Angeles Approved Licensed Fabricator.
- B. Steel Erector's Qualifications: Erector shall have had not less than 5 years' experience in erection of structural steel and be able to furnish evidence of his ability, facilities, proficiency of his personnel and completed projects.
- C. Welder Qualifications: Welders, welding operators, and tackers shall be qualified in accordance with AWS D1.1.
  - 1. Welders shall have a valid Welding Performance Qualification Record (WPQR) for each welding procedure to be performed.

2. Welders whose work fails to pass inspection shall be requalified before performing further welding.
3. Supplemental Welding Personnel Testing: Welders and welding operators performing work on bottom-flange Demand-Critical Welds shall pass Supplemental Welder Qualification Testing, as required by AWS D1.8, Section 5.1. FCAWS and FCAW-G shall be considered separate processes for welding personnel qualification
4. Qualification Period: Personnel who have not welded for a period of three or more months shall be requalified. Welding personnel required to be tested using the Supplemental Welding Personnel Testing shall be qualified by test within 12 months prior to beginning welding on the project.
5. The Contractor shall pay costs of certifying qualifications and requalifications.

#### 1.05 QUALITY ASSURANCE

- A. Welding Inspector Qualifications:
  1. All Welding Inspectors shall be trained and thoroughly experienced in inspecting welding operations, and qualified as Certified Welding Inspectors (CWI) in accordance with AWS D1.1 and AWS QC1.
  2. NDT Personnel Qualifications
    - a. NDT personnel shall be qualified under one of the ASNT documents referenced in this specification. NDT performed by NDT Level I personnel shall be under the close, direct supervision of an NDT Level II.
    - b. Demand-Critical Welds: UT may be performed only by UT technicians certified as Level II by their employer, or as ASNT Level III certified by examination by the ASNT. Ultrasonic testing technicians who perform flaw detection or sizing shall be trained in applicable UT procedure and shall demonstrate their competence through testing as prescribed in AWS D1.8, Annex E.
- B. Bolting Inspector Qualifications: Competency shall be demonstrated through the administration of a written examination and through the hands-on demonstration by the Inspector of the methods to be used for bolt installation and inspection.
- C. Submittals: The Owner's Testing Agency will submit the following items:
  1. Quality Assurance Plan: The Quality Assurance Plan shall contain the Quality Assurance and Inspection items contained in this Section.
  2. Qualifications of Owner's Testing Agency management and personnel designated for the project.
  3. Qualification records for Owner's Testing Agency's Inspectors and NDT technicians designated for the project.
  4. Owner's Testing Agency's Quality Control Plan for the monitoring and control of the Agency's operations.
  5. Written Practice for Owner's Testing Agencies: The Owner's Testing Agency shall maintain a Written Practice for the selection and administration of inspection personnel, describing the training, experience and examination requirements for qualification and certification of inspection personnel, including those of subcontracting agencies. The Written Practice shall also describe the Agency's procedures for determining the acceptability of the structure in accordance with the applicable codes, standards, and specifications. The Written Practice shall also describe the Agency's inspection procedures, including general inspection, material controls, visual welding inspection, and bolting inspection.
    - a. Bolting Inspection Procedures: Comply with AISC 348 and the Quality Assurance Plan.
    - b. Welding Inspection Procedures: Meet the requirements of the AWS D1.1 and the Quality Assurance Plan.

- c. **Nondestructive Testing Procedures:** The Written Practice shall describe the responsibility of each level of certification for determining the acceptability of material and welds in accordance with the applicable codes, standards, specifications and procedures.

#### **1.06 SUBMITTALS**

- A. The following items shall be submitted to the Architect for review. One reproducible copy will be returned. Do not fabricate material prior to obtaining final review of submittals.
  1. **Manufacturer's test reports and literature** describing products, including but not limited to the following, and excluding those listed in Section 1.6B:
    - a. **Manufacturer's Certifications** for electrodes, fluxes and shielding gasses to be used. Certifications shall satisfy AWS A5 requirements. In addition submit a Certificate of Compliance from the Contractor supplying the materials. Submit certifications that the product meets any additional requirements of the project.
    - b. **Manufacturer's product data sheets** for all welding material to be used. The data sheets shall describe the product, limitations of use, recommended welding parameters, and storage and exposure requirements, including baking and rebaking.
  2. **Plans of all levels** showing dimensioned location of edge of slab, deck, and openings. Submit prior to Shop and Erection drawings.
  3. **Shop and Erection Drawings.** Prior to the start of fabrication and erection, submit detailed shop and erection drawings for all structural steel showing:
    - a. **Size and location** of all structural members and connection material.
    - b. **Type, size and location** of bolts and welds.
    - c. **Identification of high-strength bolted joints** as snug-tight, pretensioned or slip-critical, as required by the Contract Documents.
    - d. **Locations where the Construction Documents require backing bars to be removed.**
    - e. **Locations where the Construction Documents require supplemental fillet welds where backing is permitted to remain.**
    - f. **Locations where the Construction Documents require weld tabs to be removed.**
    - g. **Identification of members and connections of the Seismic-Load-Resisting System.**
    - h. **Location and dimensions of the Protected Zone.**
    - i. **Identification of welds in the Seismic-Load-Resisting System.**
    - j. **Identification of Demand-Critical Welds.**
    - k. **Shop and erection drawings shall clearly identify revisions and revision dates in accordance with AISC 303.**
    - l. **Other items as required by AISC 303 or AISC 341, Section 5.**
    - m. **Shop drawings shall include the following additional information:**
      - 1) **Complete information necessary for the fabrication of members including cuts, copes, holes, doubler plates, stiffeners, and camber.**
      - 2) **Surface preparation and finishes, including both painting and grinding.**
      - 3) **Material grades of all members, connection material, fasteners, and weld filler metal.**
      - 4) **Connection details drawn to scale for members of the Seismic-Load-Resisting System.**
      - 5) **With each set of shop drawings include corresponding erection plans or elevation drawings identifying pieces.**
    - n. **Erection drawings shall include the following additional information:**
      - 1) **Identification mark of members.**
      - 2) **Orientation and relation of members to appropriate grid lines.**
      - 3) **Setting elevations for column bases.**
      - 4) **Standard and special details for field connections.**
      - 5) **Identification of joints or groups of joints in which a specific assembly order, welding sequence, welding technique, or other special precautions are required.**



3. **Welding Performance Qualification Records (WPQRs):** Written Welding Performance Qualification Records (WPQRs), in accordance with AWS D1.1, for all welders on the project. Submit documentation that the welder has passed all designated supplemental welder qualification testing required for the types of welding to be performed. Submit documentation showing that the welder continued to use the applicable welding process on an ongoing basis since the WPQR test was conducted.

#### **1.07 STRUCTURAL STEEL PRE-CONSTRUCTION CONFERENCE**

- A. When requested by structural engineer and prior to performing any fabrication or erection work, the Owner's Representative, Architect, Structural Engineer, and Owner's Testing Agency, together with Steel Fabricator personnel and Steel Erector personnel supervising the shop, field and Quality Control work shall hold a Pre-construction Conference to review submittal requirements, welding procedures, bolting procedures, fabrication and erection issues, and inspection requirements for all structural steel operations.

#### **1.08 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver, store, and handle packaged materials in original containers with seals unbroken and labels intact until time of use.
- B. Structural steel shall be stored and handled in a manner that prevents damage or distortion. Discharge materials carefully; do not dump onto ground.
- C. Do not store materials on the structure in a manner that might cause distortion or damage to members of the supporting structure.
- D. Store structural steel members, whether on or off site, above ground on platforms, skids, or other support; store other materials in weather-tight, dry place until use.
- E. Store materials to permit easy access for inspection and identification.
- F. **Electrode Requirements:**
  1. Packaging of weld filler metals shall conform to the requirements of AWS D.1.1. FCAW electrodes shall be received in undamaged moisture-resistant containers. They shall be protected against contamination and injury during shipment and storage. When removed from protective packaging and installed on machines, care shall be taken to protect the electrodes and coatings from deterioration or damage.
  2. Modification or lubrication of an electrode after manufacture is not permitted, except that drying shall be permitted when recommended by the manufacturer.
  3. **Electrode Storage and Exposure Limits for Demand-Critical Welds:** The exposure time limit for electrodes shall be in conformance with AWS D1.8 Section 6.4.
- G. Fasteners shall be stored in a protected place. Except for ASTM F1852 "twist-off" type assemblies, clean and relubricate bolts, nuts and washers that become dry or rusty before use. F1852 fastener components may be relubricated following the manufacturer's written instructions, and must be retested after relubrication and prior to use to verify suitability for installation.

#### **1.09 JOB CONDITIONS**

- A. Provide the Owner's Testing Agency with free access to places on and off job site where materials are stored or fabricated, to places where equipment is stored or serviced, and to job site.
- B. **Sequencing, Scheduling:**
  1. Notify the Architect and Owner's Testing Agency in sufficient time prior to shop or field fabrication and erection to permit testing and inspection without delaying Work.

2. Ensure timely delivery of items to be embedded in work of other sections; furnish setting drawings and directions for installation
3. Provide templates for setting of anchor rods, one per location.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Steel Shapes, Plates, Tube, Pipe, and other sections: As noted on drawings.
  1. All HSS shapes shall be manufactured (rolled and seam welded) in the United States. Alternatively, HSS shapes from outside the United States shall have all seam welds tested by ultrasonic examination. Costs of tests and repairs, if any, shall be borne by the contractor.
- B. Heavy Sections:
  1. Heavy Sections in the Seismic-Load-Resisting System shall be supplied with Charpy V-notch (CVN) testing in accordance with AISC 341 requirements.
  2. Plates and Flanges in Heavy Sections shall be free of laminations within 3" of areas to be welded with complete-joint-penetration welds.
- C. Standard Threaded Fasteners:
  1. Machine Bolts and Nuts: ASTM A307, Grade A.
  2. Plain Washers: ASTM F844.
  3. Beveled Washers: ANSI B18.23.1.
- D. High Strength Bolts:
  1. ASTM A325-N, snug-tight, unless otherwise noted.
  2. Bolted joints in the Seismic-Load-Resisting System shall be Slip-Critical, with pretensioned high-strength bolts and a Class A faying surface or better.
  3. Twist-off-Type Tension-Control Bolt Assemblies: ASTM F1852.
  4. Direct Tension Indicators: Load Indicator Washers: ASTM F959
  5. Nuts for High Strength Bolts: ASTM A563.
  6. Washers for High Strength Bolts: ASTM F436.
- E. Welding materials:
  1. Comply with AWS D1.1 with a nominal 70 ksi tensile strength.
  2. Supplemental Requirements for the Seismic-Load-Resisting System: Welds shall meet the requirements of AWS D1.8, Section 6.
- F. Welded Stud Connectors:
  1. Headed Shear Studs: AWS D1.1 "Type B" automatic end-welded headed studs made from ASTM A108, Grade 1015 or 1020.
  2. Threaded Studs: Automatic end-welded threaded studs made from ASTM A108, Grades 1010 through 1020.
- G. Anchor Rods and Nuts: ASTM F1554; Grade as noted on drawings.
  1. Grade 55 shall be weldable per supplement S1.
  2. Grades 55 shall have a minimum CVN toughness of 15 ft-lbs at 40o F per supplement S4.
  3. Grade 105 shall have a minimum CVN toughness of 15 ft-lbs at -20o F per supplement S5.
- H. Threaded Rods: As noted on drawings.
- I. Clevises and Turnbuckles: AISI C-1035; in addition clevises and turnbuckles shall have design strengths corresponding to the 2005 AISC Steel Construction Manual with ultimate capacities at least 200% of the tabulated LRFD values.
- J. Primer
  1. Interior steel: primer shall conform to SSPC Paint Specification No. 13.

2. Exterior steel: primer shall conform to SSPC Paint Specification No. 20 (Zinc-Rich Primer)
  3. Primers shall contain no lead or chromates.
  4. Contractor shall verify compatibility with finish paint where applicable.
- K. Zinc-Rich Coating for Repair of Galvanized Surfaces: Zinc-rich coatings shall meet the requirements of ASTM A780.

## 2.02 FABRICATION

- A. General Requirements:
1. Fabricate structural steel in accordance with AISC 360 (Chapter M and Section J2), AISC 303, and AWS D1.1 as applicable to Statically Loaded Structures, except as otherwise noted herein.
    - a. Assume all thermally cut edges are subject to tension stresses.
    - b. Delete paragraphs M4.6 and M5.1 from Chapter M of AISC 360.
  2. Fabricate and assemble work in shop to greatest extent possible.
  3. Where possible, use procedures that do not require Architect's approval. Such approval may not be given in some circumstances.
  4. Coordinate as required for attachment of other work to structural steel.
  5. Drill or punch holes for passage of reinforcing steel shapes, sections, plates, or bars as indicated on Contract Drawings. Notify Architect of conditions not shown or noted.
  6. Allowable Tolerances: Comply with AISC 360, Chapter M, and AISC 303, Section 6. Where more
  7. restrictive tolerances are necessary to properly install other building systems and components then adopt the more restrictive tolerances.
  8. Holes and attachments to structural steel in areas designated as the Protected Zone are not allowed except as explicitly shown or noted on structural drawings.
- B. Connections:
1. Shop Connections: Bolted or welded as noted.
  2. Field Connections: Locate splices only where noted or approved by Architect.
  3. To the extent possible, assemble structural steel in the shop prior to galvanization.
- C. Bolted Joints:
1. Punch or drill holes 1/16" larger than bolt size. Material having thickness in excess of connector diameter plus 1/8" shall be drilled rather than punched.
  2. Ream unfair holes, but only up to next larger bolt size and install a bolt corresponding to the new hole size. Where unfairness exceeds maximum, weld hole in base material solid and drill hole of proper size.
  3. Remove burrs that would prohibit solid seating of connected parts.
  4. Mark completely tightened bolts with identifying symbol.
  5. Provide hardened washers over slotted holes.
  6. Draw up tight, check threads with chisel or provide approved lock washers where bolts are not pretensioned.
  7. Assembly with Standard Threaded Fasteners: Provide beveled washers under bolt heads or nuts resting surfaces exceeding five percent slope with respect to head or nut.
  8. Assembly of High-Strength Structural Bolted Joints:
    - a. Meet requirements of AISC 348.
    - b. Seismic-Load Resisting System joints shall be slip-critical (friction-type) as defined in AISC 348 with Class A or better faying surfaces.
    - c. Provide hardened washers under provided under the element turned in the tightening procedure of high strength bolts.
    - d. Direct tension indicator washers, where used, shall be provided under the head of slip-critical high strength bolts.
- D. Welded Construction: (shop and field)

1. Weld in accordance with AISC 360, AWS D1.1, and CBC Chapter 22.
2. Welding shall be performed in accordance with the WPS for the joint.
3. Welds that will be permanently exposed to view shall have burrs, flux, welding oxide air spots, and discolorations removed. Surfaces of such welds shall be reasonably smooth and uniform.
4. Exterior welds shall be watertight.
5. Each welder working on the project shall be assigned an identification symbol or mark. Each welder shall mark or stamp this identification symbol at each weld completed. Stamps, if used, shall be the low-stress type.
6. Before testing, all welds to be subjected to ultrasonic testing (UT) shall be given a visible mark, "for UT," accurately placed on the steel a distance of 4" away from the root of the edge preparation.
7. Groove welds shall be complete-joint-penetration welds, unless specifically designated otherwise.
8. WPSs shall be available to welders and inspectors prior to and during the welding process. Prior to welding, joint fit-up shall be verified by the welder for conformance with the WPS and AWS D1.1.
9. Supplemental Welding Requirements
  - a. Maximum Preheat and Interpass Temperature: The maximum preheat and maximum interpass temperature permitted is 550° F, measured at a distance of 1" from the point of arc initiation. This maximum temperature may not be increased by the WPS, regardless of qualification testing.
  - b. Nonfusible Backing: The use of nonfusible backing materials, including ceramic and copper, is permitted only with satisfactory welder qualification testing performed using the type of backing proposed for use and using the test plate shown in AWS D1.1, Figure 4.21, except that groove dimensions shall be as provided in the WPS and PQR. For nonfusible weld tabs and short segments of nonfusible backing bars used at the ends of welds between shear plates and column faces, or at the ends of continuity plate welds, special welding personnel and welding procedure qualification testing is not required.
  - c. Peening, Controlled Cooling, and Post-Weld Heat Treatment (PWHT): If peening, controlled cooling, or PWHT are used, they shall be performed in accordance with AWS D1.1 and a written procedure for their performance shall be incorporated into the appropriate WPS.
    - 1) If insulating blankets are used to control cooling a written procedure and temperature measurements are not required.
    - 2) The application of heat immediately following completion of a joint to maintain a nominal temperature at or below 550° F is not considered PWHT.
  - d. Intermix of Filler Metals: For Demand-Critical Welds in which different weld filler metals are used, supplemental toughness testing shall be conducted as prescribed in FEMA 353, Part I, Appendix C.
  - e. Wind Velocity Limits: In the Seismic-Load-Resisting-System, in lieu of the wind speed limitations in AWS D1.1, welds using GMAW, FCAW-G, GTAW and EGW methods shall not be performed when the wind velocity in the immediate vicinity of the weld exceeds three miles per hour. Welding performed within an enclosed area, and not subject to drafts may be deemed to satisfy this requirement. For SMAW, FCAW-S, and SAW processes wind shall not affect the appearance of the molten weld puddle.
10. Welded joints of the Seismic-Load-Resisting-System shall conform to AWS D1.8, Section 6.
11. Welded Joint Details:
  - a. Backing bars: The use of backing bars shall be in accordance with AWS D1.1. Backing bars shall be removed where required by the Contract Documents or AWS D1.1.

- 1) Heavy Section Splices Requiring Removal of Backing Bars: All welded splices of Heavy Sections, shall have the backing bars removed. Where fusible backing material is used, the root pass area shall be backgouged after backing bar removal, and backwelded until flush or with slight reinforcement. The surface shall then be ground Extra Smooth.
  - 2) Beam-Column Connection Joints Requiring Removal of Backing Bars: Following removal of backing, remove un-sound weld metal at the root area and any excessive weld discontinuities, and backweld. Minimize gouging and removal of base metal. A reinforcing fillet weld with a minimum leg size of 5/16" or the root opening plus 1/16", whichever is larger, shall be provided. Perform MT on the fillet weld and the immediately adjacent area.
  - 3) If groove weld backing is permitted to remain, the backing shall not exceed 3/8" thickness. For connections of the seismic-load-resisting system in which backing is not removed, backing shall be attached to the member or plate that does not have its surface prepared for the groove weld. Attachment shall be by either a 1/4" fillet or 1/8" groove weld along the complete bar length on the side of the bar opposite the groove weld.
- b. Weld dams are not allowed.
- c. Weld Tabs:
- 1) Use of Weld Tabs: Welds shall be terminated at the end of a joint in a manner that will ensure sound welds. Whenever necessary, this shall be done by use of weld tabs.
    - (a) Weld tabs shall extend beyond the edge of the joint a distance equal to a minimum of the part thickness, but not less than 1".
    - (b) Weld tabs shall be oriented parallel to the joint preparation and to the weld direction.
    - (c) Nonfusible weld tabs may be used in applications and locations where qualified in accordance with AWS D1.1, Section 4.
  - 2) Heavy Section Joint Weld Tab Removal and Finish: All welded tension splices in Heavy Sections, shall have the weld tabs removed and ground Extra Smooth.
  - 3) SLRS Beam-Column Connection Weld Tab Removal and Finish:
    - (a) Weld tabs of SLRS connections shall be removed. Removal may be performed by air carbon arc cutting (CAC-A), grinding, chipping, or thermal cutting to within 1/8" of the base metal surface. For continuity plate weld tabs, removal within 1/4" of the plate edge is adequate. The process shall be controlled to minimize removal of base metal except for that material immediately adjacent to the weld. The edges where the weld tabs have been removed shall be finished Extra Smooth.
    - (b) In SLRS connections, gouges deeper than 1/16" at locations of removal of weld tabs shall be repaired by welding according to the requirements of this Specification for Deep Gouges. Weld filler metal requirements for Demand-Critical Welds apply. The contour of the weld at the ends shall provide a smooth transition, free of gouges and sharp corners. A minimum radius at the corner need not be provided.
    - (c) Following weld tab removal, finishing, and completion of any necessary repairs, the exposed ends of the weld shall be inspected using magnetic particle testing (MT).
- d. Weld toes: Weld toes, whether for groove welds or fillet welds, shall provide a smooth transition between the weld and base metal. The as-welded profile is adequate provided it satisfies the criteria of AWS D1.1, Section 5.24.
- e. Weld access holes:
- 1) Weld access holes shall meet the dimensional, surface finish, and testing requirements of AISC 360 Chapter J1.6 and AWS D1.1, except as otherwise

- required by the Contract Documents.
- 2) Where the height of the weld access hole exceeds the quantity  $k-tf+1\frac{1}{2}$ " or where the length of the weld access hole exceeds  $4\ t_f$  (where  $k$  and  $t_f$  are defined in AISC 360), welded reinforcement is required. Notify the Architect for specific instruction.
  - 3) At welded flange joints that are part of the Seismic Load Resisting System, the weld access hole detail shown in Figure 6.2 of the AWS D1.8 shall be used unless the section is a Heavy Section.
  - 4) The SLRS access hole shall conform to AWS D1.8, Section 6.9.2.
  - 5) SLRS weld access holes shall be inspected using magnetic particle testing (MT) or liquid penetrant testing (PT) and shall be free of cracks. If a welded gouge repair has been performed, magnetic particle testing (MT) shall be performed.
- f. Web weld details: A minimum clear distance of  $\frac{1}{2}$ " shall be provided between the weld access hole and fillet welds connecting the shear plate and beam web.
- g. Welding for Moment Connection of Bottom Beam Flange shall be sequenced so as to minimize residual stresses in the joint
- h. Weave Passes: Weave passes are not permitted in groove welds in the SLRS.Column continuity plate details:
- i. Column continuity plate details:
- 1) If backing bars are used and remain in place, they shall receive a reinforcing fillet weld between the backing bar and column flange. No fillet weld should be placed between backing bar and continuity plate.
  - 2) Weld terminations near the end of the column flange tips may be completed using weld tabs. Weld tabs shall be removed. Conform to AWS D1.8 Sections 6.10.3 and 6.10.4. Following finishing, the edge shall be inspected using MT. Fillet weld terminations between the continuity plate and column web shall be approximately  $\frac{1}{4}$ " from each end of the joint.
- j. Tack Welds in the SLRS Protected Zones: Tack welds in the SLRS Protected Zones are permitted only if they are incorporated into a required weld.
- E. Heavy Sections:
1. General: See AISC 360 Chapter A3.1c for materials requirements.
  2. Applicability of Provisions: All requirements of AISC 360 for Group 4 and 5 shapes shall apply to Heavy Sections as defined in this Specification.
  3. Access Hole Requirements: Access holes shall conform to the requirements of AISC 360, Chapter J1.6. Weld access holes must be preheated to a minimum of  $150^{\circ}$  F prior to thermal cutting, ground to an Extra Smooth finish. Inspect holes for cracks using either penetrant testing (PT) or magnetic particle testing (MT). Optionally, weld access holes may be made by drilling and saw-cutting without grinding, but PT or MT of the cut surface is still required.
  4. Welding: The minimum preheat and interpass temperature shall be as specified by AISC 360, Chapter J2. Weld tabs and backing bars shall be removed, ground to an Extra Smooth finish, with reinforcement not to exceed  $\frac{1}{8}$ ", at a transition slope not to exceed 1:10. See AISC 360 J2 for preheat requirements and J1.5 for weld tab and backing bar removal requirements.
  5. Splices shall conform to the requirements of AISC 360, Chapter J1.5
- F. Camber: Provide camber as indicated on contract drawings in accordance with AISC 360 Chapter M2.1.
- G. Welded Connectors: Install in accordance with AWS D1.1 and manufacturer's recommendations. There shall be no porosity or evidence of lack of fusion between the end of the stud and the steel member.
- H. Repair of Discontinuities in Protected Zone of Seismic-Load-Resisting System.

1. Tack Welds: Tack welds are permitted only if they are incorporated into a required weld.
  2. Repair of Discontinuities: If erection aids within the Protected Zone cannot be avoided, the Structural Engineer's approval of the aid's placement, use, and the repair method is required. Conform to AWS D1.8 Section 6.15.4.
  3. Air Carbon Arc Cutting and Thermal Cutting: Air carbon arc cutting (CAC-A) and thermal cutting is permitted in the Protected Zone with the prior approval of the Structural Engineer for the removal of backing bars and weld tabs, as specified in these documents.
  4. Gouges in members and connections in the Seismic-Load-Resisting System shall be repaired according to the requirements of this Specification. Weld filler metal requirements for the Seismic-Load-Resisting System apply, unless otherwise noted.
- I. Surface Finish
1. Flush Surfaces: Welds in butt joints required to be flush shall be finished so as to reduce the thickness of the thinner base metal or weld metal by more than 1/16", or 5% of the material thickness, whichever is less. Remaining reinforcement shall not exceed 1/32" in height. However, all reinforcement shall be removed where the weld forms part of a faying or contact surface. All reinforcement shall blend smoothly into the plate surfaces with the transition areas free from undercut.
  2. Finish Methods and Values: Chipping and gouging may be used, provided these methods are followed by grinding. Where surface finishing is required, surface shall be Extra Smooth, unless otherwise noted or specified in this document. Measurement of surface finish values by visual appearance or tactile comparison is acceptable.
- J. Repair of Gouges: Gouges are not permitted in areas requiring an Extra Smooth finish surface, or where specifically prohibited by AWS D1.1 or this Specification. Repair of gouges meet the following requirements, unless otherwise noted:
1. Shallow Gouges: Gouges up to 3/16" deep shall be removed by grinding as per D1.1, or to a radius of not less than 3/8".
  2. Deep Gouges: Gouges deeper than 3/16" shall be repaired by welding. Prior to welding, gouges shall be ground to provide an Extra Smooth contour with a radius not less than 3/8". The repair area shall be preheated to a temperature between 400° F and 550° F, measured at the point of welding approximately one minute after removal of the heating source, or shall be preheated in accordance with AWS D1.1 Annex XI for high restraint. A written repair WPS for the application shall be followed. Following completion of welding, the area shall be ground Extra Smooth, with fairing of the welded surface to adjoining surfaces where applicable, and shall be inspected using magnetic particle testing (MT).
  3. The transitional slope after gouge removal shall not exceed 1:5.
- K. Weld Acceptance Criteria shall be in accordance with AWS D1.1. Regions of welds that cannot be inspected shall be identified and recorded, and the Structural Engineer shall be notified.

### 2.03 FINISHES

- A. Prime Painting
1. Surfaces to be painted:
    - a. Apply one coat of exterior primer to structural steel surfaces permanently exposed to weather.
    - b. Apply one coat of primer to interior structural steel surfaces.
    - c. Do not prime paint following surfaces:
      - 1) Surfaces to be encased in concrete except initial 2".
      - 2) Surface to be field welded.
      - 3) Surface to receive sprayed-on fireproofing.
      - 4) Contact surfaces joined by high-strength bolts.
  2. Preparation of Surfaces:
    - a. Thoroughly clean mill scale, rust, dirt, grease, and other foreign matter from steel prior to painting.

- b. Where hand-cleaning methods are inadequate, clean in accordance with SSPC-SP1, SSPC-SP 2, or SSPC-SP 7, as required.
  3. Painting:
    - a. Apply primer in accordance with manufacturer's specifications to provide minimum dry film thickness of 1.0 mils per coat.
    - b. Permit thorough drying before shipment.
    - c. Do not prime in temperatures lower than 45 degrees Fahrenheit.
- B. Galvanization
  1. Galvanize steel where required by the Drawings or by other sections of the Specification.
  2. Galvanize Shapes in accordance with ASTM A153, ASTM A123 / A123M.
  3. Galvanize Fasteners in accordance with ASTM B695, Class 40 minimum.

#### 2.04 SOURCE QUALITY ASSURANCE

- A. The Owner's Testing Agency will:
  1. Review ladle analysis and certificates of compliance. Where certification is questionable, test material to verify compliance.
  2. Inspect shop fabrication.
  3. Provide the management, personnel, equipment, and services required to perform the quality assurance functions required below.
  4. Verify that no improper attachments to the Protected Zone have been made.
  5. Inspect Heavy Sections:
    - a. Heavy Section flanges shall be ultrasonically examined at locations to be groove-welded, for evidence of laminations, inclusions, or other discontinuities, in accordance with ASTM A898, Straight Beam Ultrasonic Examination of Rolled Steel Structural Shapes. Examination shall include entire area within 3" of such joints.
    - b. For plates, ultrasonically examine in accordance with ASTM A435, Straight Beam Ultrasonic Examination of Steel Plates. Any discontinuity causing a total loss of back reflection that cannot be contained within a circle with a diameter of the greater of 3" or one-half the plate thickness, shall be rejected.
  6. Forward copies of all product and procedure certificates, data sheets, and test and inspection reports to the Owner, Architect, Structural Engineer, and Contractor, and the Building Department.
- B. Welding Inspection: The Welding Inspector shall perform the tasks indicated in the following list. This list shall not be considered exclusive of any additional inspection tasks that may be necessary to meet the requirements of AWS D1.1, CBC, and the Quality Assurance Plan
  1. Review and understand the applicable portions of the specifications, the Contract Documents and the shop drawings for the project.
  2. Verify that all applicable welder qualifications, welding operator qualifications and tack welder qualifications are available, current, accurate, and in compliance with these specifications.
  3. Verify welder identification and qualification. Verify that any required supplemental welder qualification testing, if required for the joint, has been executed and that the welder has passed.
  4. Verify that each welder has a unique identification mark or die stamp to identify welds.
  5. Verify that all applicable Welding Procedure Specifications (WPSs), with Procedure Qualification Records (PQRs) as needed, are available, current and accurate, and comply with AWS D1.1 and this specification.
  6. Verify that an approved Welding Procedure Specification (WPS) has been provided and that each welder performing the weld has reviewed the WPS. A copy of the appropriate WPS shall be available for each joint, although need not be present at each joint location.
  7. Review mill test reports for all main member and designated connection base material for

- compliance with the project requirements.
8. Verify base material identification with the contract documents.
  9. Verify the electrode, flux and shielding gas certifications for compliance with the Contract Documents.
  10. Verify welding consumables with the approved WPSs.
  11. Verify that electrodes are used only in the permitted positions and within the welding parameters specified in the WPS.
  12. Verify that electrodes and fluxes are properly stored, and that exposure limits for the welding materials are satisfied.
  13. At suitable intervals, observe joint preparation, assembly practice, preheat temperatures, interpass temperatures, welding techniques, welder performance and any post-weld controlled cooling and heat treatment to ensure that the requirements of the WPS and AWS D1.1 are satisfied.
  14. At suitable intervals, verify current and voltage of the welding equipment in application of the WPS, if needed, by a calibrated amp and voltmeter. Current and voltage shall be measured near the arc with this equipment.
  15. Inspect the work to ensure compliance with AWS D1.1 and the specified weld acceptance criteria.
  16. Schedule NDT technicians in a timely manner, after the visual inspection is complete and the assembly has cooled. The final NDT on a specific weld shall be performed at least 24 hours after the welding has been completed.
  17. Mark the welds, parts, and joints that have been inspected, and accepted, with a distinguishing mark or die stamp, or maintain records indicating the specific welds inspected and accepted by each inspector.
  18. Document the accepted and rejected items in a written report. Transmit the report to the designated recipients in a timely manner.
- C. Nondestructive Testing of Welded Joints
1. Magnetic Particle Testing: Magnetic Particle Testing (MT) shall be conducted by the Owner's Testing Agency at the frequency designated in Table 2-1. MT shall be performed in accordance with AWS D1.1, and AWS D1.8 Annex F.
  2. Ultrasonic Testing: Ultrasonic testing (UT) shall be conducted by the Owner's Testing Agency for the percentage of joints designated in Table 2-1. UT shall be performed in accordance with AWS D1.1.
  3. Weld Acceptance Criteria shall be in accordance with AWS D1.1. Regions of welds that cannot be inspected shall be identified and recorded, and the Structural Engineer shall be notified.
  4. K-Area Welding Inspection: After welds of continuity plates and doubler plates have cooled to ambient temperature, test column webs for cracking using liquid penetrant (PT) or magnetic particle testing (MT) over a zone 3" above and below each weld.

**Table 2-1. Nondestructive Testing Requirements**

Weld Category	Complete-Joint-Penetration Welds (1)	Partial-Joint-Penetration Welds and Fillet Welds
Welds not described below	No NDT required unless otherwise noted	No NDT required unless otherwise noted
SLRS welds not described below	MT 25% of joints, full length (2)	MT 25% of joints
Top-flange joints at cantilever beam connections (3)	UT 25% of joints, full length (2) MT 100% of joints, full length UT 100% of joints, full length	6" spot at random (2) MT 100% of joints, full length

Demand-critical welds	MT 100% of joints, full length	MT 100% of joints, full length
Butt joints in column splices	UT 100% of joints, full length (4)	

D. Notes:

1. UT is required only when the weld thickness is 5/16" or greater.
2. If any joint fails testing, test 100% of joints until 40 consecutive welds pass. The testing rate may then be reduced to 25%.
3. Test joint on each side of cantilever beam support.
4. Reduce the rate of UT to 25% if after 40 welds have been inspected, an individual welder's reject rate is less than 5%.

**PART 3 EXECUTION**

**3.01 INSPECTION**

- A. Examine units of Work to be placed and verify that all anchor rods have been installed properly and have sufficient bolt and thread elevation.
- B. Do not begin erection before unsatisfactory conditions have been corrected.

**3.02 ERECTION**

- A. General Requirements:
  1. Erect structural steel in accordance with AISC 360 Chapter M, AISC 303, and AWS D1.1 Structural Steel Welding Code as applicable to Statically Loaded Structures.
  2. Requirements for bolted and welded joints specified in Part 2 of this Specification shall also apply to field connections unless otherwise noted.
  3. Erection Tolerances: Do not exceed the erection tolerances specified in AISC 303, Section 7. Where more restrictive tolerances are necessary to properly install other building systems and components then adopt the more restrictive tolerances.
  4. Where erection requires performing work of fabrication on site, conform to applicable standards for fabrication.
- B. Field Cutting or Alteration: There shall be no field cutting, alteration, or repair of structural steel members or of connections without prior review and approval by the Structural Engineer. Structural elements with fabrication errors or that do not satisfy tolerance limits shall be repaired. Submit drawings showing reasons for, and details of, proposed corrective work.
- C. Anchor rods shall be set in conformance with Section 7.5 of AISC 303.
- D. Temporary Shoring and Bracing: Provide shoring and bracing as needed until permanent lateral-support is in place and complete. Contractor is responsible for identifying the need for temporary shoring and bracing.
- E. Erection Procedures: Control erection procedures and sequences to avoid problems caused by temperature differentials and weld shrinkage, and other sources of expansion and contraction.
- F. Field Assembly:
  1. Clean bearing surfaces and surfaces to be in permanent contact before assembling members.
  2. Do not fasten splices of columns and other members with bearing joints designated on the drawings before abutting surfaces have been brought completely into contact.
  3. Bolted Construction:

- a. Installation of high-strength bolts shall conform to ASTM A325 for slip-critical or snug-tightened type joints, as applicable, in accordance with AISC 348. Provide washer under head or nut of high strength bolts. Washer shall be provided under the element being turned during tightening. Bolts in welded connections shall be tensioned after completion of welding.
  - b. At bolted joints designated as Slip-Critical or that require Pretension, use Twist-off-Type Tension-Control bolt assemblies or Direct Tension Indicators.
  - c. Do not use flame cutting to align bolt holes except as permitted by AISC 348 specifications. Ream holes that must be enlarged to admit bolts. Do not enlarge holes to a diameter greater than 1". When reaming beyond 1/32", drill or ream to the next larger hole size and use the next larger size bolt.
4. Mill scale shall be removed from the column in the area where the beam flanges will be welded to the column.
- G. Gas Cutting: Use of flame cutting torch will be permitted only after the Architect's prior written approval and only where metal cut will not carry stress during cutting, and cut surfaces will not be visible. When thermal cutting is permitted, cutting shall be done with a mechanically guided torch or a torch controlled using a guide bar.
- H. Field Touch-Up Painting: After erection, touch-up paint field connections and abrasions resulting from the Work of this Section with same paint used for shop prime painting.
- I. Remove and repair galvanized surface as required for field welding in accordance with ASTM-A780, A2; required thickness is 100 micro-inches. Touch up with zinc-rich coating. Repair material shall extend at least three inches beyond edges of damaged areas.
- J. Protected Zone: Attachments to structural steel in the Protected Zone, other than spot welding of metal deck to beams and welding of metal studs to braces as shown on structural drawings, are not allowed

### 3.03 CLEANING

- A. After erection, thoroughly clean surfaces of foreign or deleterious matter such as dirt, mud, oil, or grease that would impair bonding of fireproofing, concrete, or other finishes as applicable.

### 3.04 FIELD QUALITY ASSURANCE

- A. The Owner's Testing Agency shall:
1. Verify proper anchor rod group location, elevation, and orientation prior to placement of concrete foundations.
  2. Verify proper anchor rod group location, elevation, and orientation subsequent to placement of concrete foundations prior to arrival of structural steel.
  3. Perform field welding inspection and testing in accordance with the requirements in Part 2 of this Specification for shop fabrication, unless otherwise noted.
  4. Inspect and test high strength bolted joints in accordance with AISC 348.
  5. Sample and test bolt assemblies that include direct tension indicators, on a daily basis to verify proper indication of deformation with required bolt tension for each size and lot.
  6. Inspect erected structural steel as required to establish conformity of Work with reviewed shop drawings and Contract Drawings.
  7. Perform testing and inspection of welded stud connectors in accordance with requirements of AWS D1.1. After the bend test, the weld section shall not exhibit any tearing or cracking.
  8. Inspect structural steel to verify that the Protected Zones of members of the Seismic-Load-Resisting System are free of damage and attachments not approved by the Structural Engineer.
  9. Forward copies of all test and inspection reports to the Owner, Architect, Structural Engineer, and, Contractor, and the Building Department.

**END OF SECTION**

**SECTION 05 3100**

**STEEL DECKING**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. Section Includes: Provision of steel decking as indicated in Contract Drawings with directly attached accessory items as noted or required for complete installation. Accessory items include but are not necessarily limited to following:
  - 1. Closure strips.
  - 2. Gauge metal and reinforcing items.
  - 3. All accessories associated with metal deck.
  - 4. Shoring of the decking as needed.
  - 5. Metal decking at trash enclosure roof.
- B. Related Sections:
  - 1. Section 03 3000 - Cast-in-Place Concrete
  - 2. Section 05 1200 - Structural Steel
  - 3. Section 05 4000 - Cold Formed Metal Framing

**1.02 REFERENCES**

- A. Requirements of General Conditions and Division No. 1 apply to all Work in this Section.
- B. Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to Work of this Section where cited by abbreviations noted below.
  - 1. California Building Code (CBC), 2007 Edition.
  - 2. American Society for Testing and Materials (ASTM).
  - 3. American Iron and Steel Institute's "Specifications for the Design of Cold Formed Steel Structural Members" (AISI).
  - 4. Steel Deck Institute's "Steel Roof Deck Design Manual" (SDI).
  - 5. American Welding Society's "Structural Welding Code-Sheet Steel" (AWS D1.3).

**1.03 QUALITY ASSURANCE**

- A. Welder's Qualifications:
  - 1. Welders shall be qualified for horizontal, vertical, and overhead positions in accordance with AWS D1.3.
- B. Testing Agency Qualifications: Testing Agency for fire-resistive rating shall have approval of ultimate enforcing authority and provide re-examination services.
- C. Requirements of Regulatory Agencies:
  - 1. Decking shall have been tested and approved by testing agency as component in composite construction having two-hour fire-resistive rating without applied fireproofing.

**1.04 SUBMITTALS**

- A. Manufacturer's literature describing products.
- B. Samples: Only as requested.
- C. Shop Drawings:
  - 1. Show deck type, location, orientation and laps. Show type, location and sequence of welds. Show large scale details of connections, methods of attachment and accessory items. One reproducible copy will be returned.

2. Prior to submission of structural steel erection plans, submit deck plans showing dimensioned locations of edge of deck and deck openings.
- D. Certificates:
1. Certify that materials meet requirements specified.

#### **1.05 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver, store and handle decking in manner to prevent damage or deformation.
- B. Discharge materials carefully, store on platform or pallets, and cover with tarpaulins or other suitable weathertight covering. Do not dump onto ground.
- C. Do not overload decking during construction period and do not use decking for storage or working platform prior to welding in position.

#### **1.06 JOB CONDITIONS**

- A. Provide the Owner's Testing Agency with free access to places whether on or off the job site where materials are stored or fabricated, to places where equipment is stored or serviced, and to job site during times of installation.
- B. Sequencing, Scheduling: Notify the Architect in sufficient time prior to fabrication, field welding or installation to permit testing and inspection without delaying work.

### **PART 2 PRODUCTS**

#### **2.01 STEEL DECKING TYPES**

- A. General Requirements:
  1. Steel decking shall be designed in accordance with SDI unless specifically noted otherwise.
  2. Section design properties shall be computed in accordance with applicable requirements of AISI.
  3. Steel decking shall be ICBO-approved for lateral shear resistance.
- B. By Verco Manufacturing Company or equal product substituted per Section 01600. See Contract Drawings for gauge, configuration and section properties.

#### **2.02 MATERIALS**

- A. Sheet Steel: ASTM A653, Grade A (min.  $F_y = 38$  ksi), zinc galvanized coating in accordance with ASTM A653, Coating Designation G90.
- B. Miscellaneous Steel Shapes: ASTM A36.
- C. Touch-Up Paint: For Abraded Galvanizing: Zinc oxide or zinc dust primer for galvanized metal.
- D. Welding Electrodes: Low-hydrogen electrodes in accordance with AWS D1.1 and D1.3.

#### **2.03 FABRICATION**

- A. Preparation:
  1. Coordinate with other work supporting, contacting or adjoining metal decking and verify requirements for cutting out, fitting, and attaching.
  2. Verify dimensions and locations at site whenever construction progress permits.
- B. General Requirements:
  1. Fabricate in accordance with SDI unless specifically noted otherwise.
  2. Shop- or field-cut units to fit around openings, along building perimeter, and around columns.
  3. Provide in lengths to be continuous for not less than three spans and to rest on minimum of four supports where structural steel layout permits.

- C. Closure Strips: Provide for installation at ends, edges and round openings as required to prevent leakage of concrete.
- D. Vents: Provide venting at decks with insulating and conventional concrete fills.

#### **2.04 FINISHES**

- A. Galvanizing: Where items have not been fabricated from galvanized steel sheet, hot-dip galvanize after fabrication in accordance with ASTM A153, A385 or A123 as applicable.

#### **2.05 SOURCE QUALITY CONTROL**

- A. The Owner's Testing Agency will:
  - 1. Review mill analysis and certificates of compliance.
  - 2. Test samples of thickness of base metal and thickness of galvanized coating as required by applicable ASTM Standards.

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### **PART 3 EXECUTION**

#### **3.01 INSPECTION**

- A. Examine construction to support decking and verify that:
  - 1. Dimensions are correct.
  - 2. Setting conditions are proper.
  - 3. Means of attachment integral with support is correct.
- B. Do not start installation until unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION**

- A. General Requirements:
  - 1. Install decking in accordance with contract documents.
  - 2. Provide flashings, closure strips, closure plates, reinforcing and fastenings as required.
  - 3. Perform shaping, cutting, drilling and fitting in manner to equal workmanship of shop fabrication.
  - 4. Button-punching or crimping in lieu of welding will not be permitted.
- B. Layout:
  - 1. Place and adjust units in final position prior to permanent fastening.
  - 2. Install in straight, continuous rows with ribs at right angles to supporting members.
  - 3. Align ribs to be straight within 1/4 inch in overall length of decking.
  - 4. Locate butted ends tight at center line of structural support with positive, solid, complete bearing over full width of panel without deforming units. Ensure not less than one-inch bearing on support.
  - 5. Locate extreme ends and edges over structural supports with positive, solid complete bearing over full width of support for full width or length of panel without deforming units.
- C. Welding Procedure:
  - 1. Perform welding in accordance with AISI and AWS D1.3.
  - 2. Ensure surfaces to receive weld metal are clean and dry.
  - 3. Weight units with sand bags near welding points to secure firm contact of surfaces welded.
  - 4. Surfaces with temperature Below 32 Degrees Fahrenheit: Preheat to minimum 70 degrees Fahrenheit and maintain during welding.
  - 5. Maintain long arc while electrode is moved in circular direction until proper hole size is burned in sheet metal. Shorten arc and deposit weld metal around complete circumference of hole.
  - 6. Clean all welds immediately by wire brushing and touch-up with paint before covering with succeeding panel.

7. Take special care to secure solid welds where unit is warped or curved or meets supporting member at angle.
- D. Reinforcing:
1. Reinforce opening as shown on drawings:
  2. Provide reinforcing wherever else structurally required.
- E. Closure Strips: Attach to decking with tack welds.

### **3.03 CLEANING AND PAINTING**

- A. Touch-Up Painting
1. Galvanized Surfaces and Field Welds: At field welds and at galvanized surfaces that have been damaged in handling or burned off in welding, repair in accordance with ASTM A780.
  2. Prime-Coated Structural Steel Framing: Where welding metal decking to structural steel has burned off prime-coat or resulted in other damage, apply paint as required to restore coverage.
- B. Prepare surfaces as necessary for proper application of structural concrete.

### **3.04 FIELD QUALITY CONTROL**

- A. The Owner's Testing Agency will:
1. Provide continuous inspection of welding, including prior fit-up, welding equipment, weld quality and welder certification.
  2. Provide continuous inspection during installation as required to establish conformity of work with requirements.

**END OF SECTION**

## SECTION 05 4000

### COLD-FORMED METAL FRAMING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Section Includes: Provision of lightgauge steel stud and joist framing. Work includes, but is not necessarily limited to the following:
1. Load-bearing steel stud framing at exterior walls.
  2. Framing accessories.
  3. Bracing and attachments.
  4. Gauge metal backing.
- B. Related Sections:
1. Section 01 8250 - Supporting from Building Structure
  2. Section 05 1200 - Structural Steel
  3. Section 05 5000 - Metal Fabrications
  4. Section 09 2116 - Gypsum Board Assemblies

##### 1.02 REFERENCES

- A. Requirements of the General Conditions and Division No. 1 apply to all Work in this Section.
- B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).
1. California Building Code (CBC), 2007 Edition.
  2. American Society for Testing and Materials (ASTM).
  3. Federal Specifications (FS).
  4. American Welding Society (AWS) D1.3: "Structural Welding Code - Sheet Steel".
  5. American Iron and Steel Institute (AISI): "Specifications for the Design of Cold-Formed Steel Structural Members".
  6. Metal Lath Association (MLA): "Specifications for Metal Lath and Furring".
  7. Steel Structures Painting Council (SSPC): "Painting Manual".

##### 1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. Comply with fire-resistance ratings as indicated and as required by governing authorities and codes.
  2. Provide materials, accessories, and application procedures which have been listed by an approved testing agency or tested according to ASTM E119 for the type of construction shown.
  3. Comply with requirements of CBC Section 2202.2.3 for design and identification of cold-formed steel.
  4. Framing system shall conform to ICBO Report for stud gauge and spacing for all wall conditions.
- B. Steel stud system shall conform to referenced AISI documents.
- C. Installer: Company specializing in performing the work of this Section with minimum 5 years documented experience.
- D. Welders: Qualified in accordance with AWS D1.3 for welding process, position, type of weld and type of steel.

##### 1.04 SUBMITTALS

- A. Submit the following items in accordance with provisions of Section 01 3000 - Administrative Requirements. One reproducible copy will be returned.
  - 1. Shop Drawings: Include plans and elevations at not less than 1/4 inch to 1'0" scale, and details at not less than 3-inches to 1'0" scale. Drawings shall be signed and sealed by Contractor's California registered Structural Engineer. (The structural wall stud and floor joist framing shown on structural plans for Mezzanines 120M, 122M and 132M are excluded from this requirement.)
    - a. Indicate complete exterior wall cladding layouts incorporating all conditions, and connection details as described in the construction documents by the performance criteria specified.
    - b. Indicate wall stud and ceiling joist layout.
    - c. Indicate component details, framed openings, bearing, anchorage to structure, type and location of fasteners and accessories, and items required of related work for complete installation of cold formed metal framing system.
  - 2. Engineered Designs: Structural calculations and documentation, signed and sealed by Contractor's California registered Structural Engineer. Review will be only for compliance with the performance criteria specified.
  - 3. Product Data: Manufacturer's ICC report, specifications and installation instructions for steel studs, fasteners, and accessories.
  - 4. Experience of installer if requested by Architect.

#### **1.05 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Procedures: In accordance with Section 01 6000 - Product Requirements.
- B. Protect framing from rusting and damage.
- C. Deliver in manufacturer's unopened containers or bundles fully identified with name, brand, type and grade.
- D. Store inside a dry, ventilated space, and protect framing from rust and damage.

#### **1.06 JOB CONDITIONS**

- A. Coordinate stud sizes and layouts with the work of the various trades. Where ductwork, conduit, piping, casework, and other such items exceed indicated available space, increase stud sizes or make other minor modifications as necessary to accommodate the work at no change in cost of the Work.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturers: Angeles Metal Systems, Knorr Steel Framing, Dietrich Industries, Inc. or other member of Steel Stud Manufacturer's Association (ICC #ER-4943P).

#### **2.02 MATERIALS**

- A. Sheet Steel: ASTM A570, Grade 50.
- B. Studs: Cee studs with punched web, unless otherwise noted, formed of gauge as specified on the Drawings. If no gauge on drawings, use 16 gauge.
  - 1. Provide ASTM A570, Grade 50 and 33, shop-coat with manufacturer's standard rust-inhibitive primer after fabrication unless specified as galvanized. All exterior cladding shall be G90 (Z275) galvanized complying with ASTM A1003/A1003M.
  - 2. Minimum properties for each size stud shall be as follows, unless otherwise indicated on Drawings.

Size (Inches)	Gauge	Flange Width (Inches)	Moment of Inertia (Inches)	Section Modulus (Inches)	Grade (ksi)
3-5/8	16	1-5/8	0.873	0.481	50
3-5/8	18	1-5/8	0.710	0.392	30
6	16	2	3.319	1.106	50
6	18	2	2.683	0.894	33
8	16	2	6.573	1.643	50
8	18	2	5.302	1.325	33

3. Metal framing at exterior wall systems shall satisfy the following out-of plane deflection criteria:
  - a. Plaster, masonry veneer - L/720
  - b. Metal panel and glazing systems - L/480
- C. Floor Tracks: Formed from same gauge and grade of steel as used for studs: 1-1/4-inch legs.
  1. Provide ASTM A653, Grade D, or shop-coat with rust-inhibitive primer after fabrication.
- D. Ceiling Tracks: Formed from 16-gauge steel, 2-inch legs.
  1. Provide ASTM A653, Grade D, or shop-coat with rust-inhibitive primer after fabrication.
- E. Cold-Rolled Furring Channels: As specified in Section 09100, "Metal Framing".
- F. Partition Stiffeners or Bridging: Unpunched channel shape, formed of 16-gauge steel to required dimensions.
- G. Powder-Driven Fasteners:
  1. Tempered-steel pins with special corrosive-resistant plating or coating.
  2. Pins shall have guide washers to accurately control penetration, minimum 1-1/4 inch.
  3. Fastening shall be accomplished by low-velocity, piston-driven, powder-accentuated tool.
  4. Pins and tool shall be Hilti Fastening Systems (ICC ESR-2269) or equal product substituted per Section 01 6000.
- H. Expansion Bolts: Hilti Fastening Systems "Kwik Bolt TZ Concrete Anchors" (ICC ESR-1917), or equal product substituted per Section 01600.
- I. Welding Electrodes: AWS low hydrogen, rod number and diameter as approved by the Owner's Testing Agency.
- J. Bracing: Provide cross diagonal 3-inch wide by 14-gauge straps, welded as indicated on the Drawings and per stud manufacturer's specifications for frame stability.
- K. Touch-up Primer for Galvanized Surfaces: SSPC Paint 20 zinc rich.
- L. Metal Screws: Self-drilling and self-tapping; No. 8 pan head and larger as noted on Drawings.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Coordinate details and requirements of other Work which adjoins or fastens to studs and requires backing or special support framing included in this Section.
  1. Items requiring backing or support include, but are not necessarily limited to casework, wall-specialties, and similar items.
  2. Obtain Architect's approval of backing method proposed to satisfy requirements of this Section which differs from methods noted or shown.

**3.02 EXAMINATION**

- A. Examine all parts of the supporting structure and the conditions under which studs will be installed.
- B. Notify the Architect, in writing, of any conditions detrimental to the proper and timely completion of the Work.
- C. Do not proceed with the installation of steel studs until unsatisfactory conditions have been corrected.

### **3.03 INSTALLATION**

- A. Tracks shall be securely anchored to supporting structure, with fasteners specified at not more than 24 inches on center.
- B. Complete, uniform, and level bearing support shall be provided for the bottom track at each bearing/stud location. Install full metal shims below bottom track at stud locations as needed, or set bottom track in high-strength grout.
- C. Abutting or intersecting pieces of track shall be securely anchored to a common structural element or spliced together.
  - 1. Splices or butt welds shall be used at all butt joints in the runner track.
  - 2. Do not splice studs.
- D. Studs shall sit squarely in the top and bottom runner track with firm abutment against track webs.
  - 1. Studs shall be aligned or plumbed and securely fastened to the flanges of both top and bottom track.
  - 2. Space studs 16 inches on center maximum unless otherwise noted on Drawings.
- E. Framed wall openings shall include a header and multiple studs at each edge of opening as indicated on Drawings.
- F. Diagonal bracing shall be installed at locations indicated for frame stability.
- G. Install bridging as indicated on Drawings where studs are to be finished on one side only.
- H. Form corners and intersections of partitions with three studs. Provide additional studs as indicated or required.
- I. Joining of members shall be made with welding; wire tying of framing members shall not be permitted.
- J. Welded connections shall be made by resistance spot fusion welding, fillet welding, or plug welding and shall be done in accordance with the latest recommended procedures and practices of the American Welding Society.
- K. Do not cut or notch stud flanges or cut additional opening in stud web.
- L. Field abrasions and welds shall be touched up with zinc rich primer.
- M. Tolerance: Install members to provide surface plane with maximum variation of 1/4 inch in 10 feet in any direction.

### **3.04 INSTALLATION OF FIRE-RATED ASSEMBLIES**

- A. Install studs which are components of fire-rated wall assemblies as indicated.

### **3.05 BACKING IN STUD PARTITIONS**

- A. Securely weld or screw cut sections of unpunched stud to at least three stud or furring supports, leaving flat surface of backing stud web to receive attachment of object to be secured.

- B. Verify that any predrilling of backing and attachment of spacers to prevent crushing of collateral material is done prior to application of collateral material.
- C. If it is determined by the Architect that backing was not provided for any items as required, the Contractor shall remove the finish material and install backing. The Contractor shall patch and refinish surface to match adjacent area and finish.

**3.06 FIELD QUALITY CONTROL**

- A. The Owner's Testing Agency will:
  - 1. Provide continuous inspection of welding, including prior fit-up, welding equipment, weld quality, and welder certification in accordance with CBC Section 1704.3.
  - 2. Provide continuous inspection during installation as required to establish conformity of Work requirements.

**END OF SECTION**

**SECTION 05 5000**

**METAL FABRICATIONS**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. Section Includes: Provision of all items of miscellaneous metal and related accessories and fasteners as indicated in Contract Drawings including but not necessarily limited to the following:
  - 1. Steel pipe railing, handrails, guardrails and brackets.
  - 2. Steel stairs.
  - 3. Continuous inserts for pipe and conduit supports.
  - 4. Ladders.
  - 5. Backing and mounting plates for equipment items.
  - 6. Ceiling support system.
  - 7. Metal grating with frames and ledger angles.
  - 8. Anchor bolts.
  - 9. Sun shade framing.
  - 10. Seismic joints.
  - 11. Auxiliary angles brackets.
- B. Related Sections:
  - 1. Section 05 1200 - Structural Steel
  - 2. Section 05 5100 - Metal Stairs

**1.02 REFERENCES**

- A. Requirements of General Conditions and Division No. 1 apply to all Work in this area.
- B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest additions apply).
  - 1. California Building Code (CBC), 2007 Edition.
  - 2. American Society for Testing and Materials (ASTM).
  - 3. Federal Specifications (FS).
  - 4. American Institute of Steel Construction's "Specification for Structural Steel Buildings."
  - 5. American Welding Society's "Structural Welding code" (AWS D1.1).
  - 6. American Iron and Steel Institute's "Specifications for Design of Light Gauge Cold-Formed Stainless Steel Structural Members".
  - 7. National Association of Architectural Metal Manufacturer's: "Metal Stairs" (NAAMM-MS).
  - 8. Steel Structures Painting Council's "Painting Manual":
    - a. Solvent Cleaning (SSPCC-SP 1).
    - b. Hand Tool Cleaning (SSPC-SP 2).
    - c. Brush-Off Blast Cleaning (SSPC-SP 7).
    - d. Hot Phosphate Surface treatment (SSPC-PT 4).
  - 9. American Hot Dip Galvanizers Association, Inc. (AHDGA):
    - a. Inspection manual for hot dip galvanized products.

**1.03 QUALITY ASSURANCE**

- A. Welded Qualifications: Welders shall be qualified in accordance with AWS D1.1.
- B. Design criteria:
  - 1. Work shall be designed to support normally imposed loads and conform to AISC requirements.
  - 2. Built-up parts shall not exhibit warp.

#### 1.04 SUBMITTALS

- A. Manufacturer's literature describing products including details and dimensions.
- B. Shop Drawings (one reproducible copy will be returned):
  - 1. Show a large scale construction of various parts, methods of joining, thickness of metals, profiles of surfaces, reinforcing, anchorage, and structural supports. Include information regarding concealed and exposed joints, welds, and fastenings.
  - 2. Where welded connectors and concrete inserts are required to receive work, show size and locations required.
- C. Samples: Only as requested by the Architect.

#### 1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle packaged materials in original containers with seals unbroken and labels intact until time of use.
- B. Discharge materials carefully and store on clean concrete surface or raised platform in safe, dry area.

#### 1.06 JOB CONDITIONS

- A. Scheduling, Sequencing:
  - 1. Ensure timely fabrication of items to be embedded or enclosed by other work.
  - 2. Furnish information and assistance required for locating embedded items and be responsible for proper locations.

### PART 2 PRODUCTS

#### 2.01 BASIC MATERIALS AND ACCESSORIES

- A. Ferrous Metals:
  - 1. Structural Steel Shapes:
    - a. WF and WT Shapes: ASTM A992
    - b. Channels, Angles: ASTM A36
  - 2. Architectural and Miscellaneous Steel Items: ASTM A283.
  - 3. Steel Sheets: ASTM A446, Grade A.
  - 4. Steel Pipe: ASTM A53.
  - 5. Steel Bars: ASTM A36.
  - 6. Steel Tubing: ASTM A500, Grade A.
  - 7. Steel Plate: ASTM A36.
  - 8. Checker Plate: FS QQ-F461c, flat back carbon steel, Pattern 15 or 16.
  - 9. Zinc for galvanizing: ASTM B06 as specified in ASTM A123.
  - 10. Welding electrodes: E-70XX.
  - 11. Grout: Embeco "636" or equal product substituted per Section 01630.
  - 12. Stair Treads: Irving, Reliance, or equal with abrasive metal nosing.
  - 13. Grating: Irving, Reliance or equal typical 1-inch X 3/16-inch beaming bars at 1-3/6-inch centers with 1/4-inch twisted cross bars welded at 4-inch centers, galvanized with bolted anchorage.
- B. Fastenings:
  - 1. Typical Unfinished Bolts, Nuts, and Washers: Low carbon steel standard fasteners, externally and internally threaded, ASTM A307 Grade A; malleable washers.
  - 2. Expansion Bolts: Same as Hilti's "Kwik-Bolt Concrete Anchors"; Wej-It Expansion Products, Inc.'s "Wej-It Concrete Anchors"; or equal product substituted per Section 01630.
- C. Primer: Zinc-chromate type. Same as manufactured by Fuller-O'Brien Corp.'s Ne. 121-00; The Glidden Co.'s No. 4570; Sinclair paint Co.'s 20; or equal product substituted per Section 01630.

## 2.02 SPECIALTY FABRICATED PRODUCTS

- A. Preparation:
  - 1. Coordinate with other work supporting or adjoining miscellaneous metal and verify requirements for cutting out, fitting, and attaching.
  - 2. Verify sizes, designs, and locations of items; do so at site whenever construction progress permits.
- B. General Requirements
  - 1. Fabricate items from materials noted and make true to profiles shown. Obtain the Architect's approval of proposed variations.
  - 2. Miter corners and angles of frames and moldings unless otherwise noted.
  - 3. Perform cutting, shearing, drilling, punching, threading, tapping as required for items or their adjacent work.
  - 4. Drill or punch holes; do not use cutting torch.
  - 5. Ensure shearing and punching leaves true lines and surfaces.
  - 6. Items to be Galvanized: Fabricate in accordance with recommended practices of ASTM A385 and A386 unless specifically noted otherwise.
  - 7. Fabricate exterior items for assembly and installation on site without field-welding of joint.
  - 8. Ensure metal thickness and assembly details provide ample strength and stiffness.
  - 9. Size sleeves for approximately 1/4-inch clearance all around.
- C. Fastening:
  - 1. Provide fasteners and anchor assemblies required for complete fabrication, field assembly, and erection.
  - 2. Conceal fastenings wherever practicable.
  - 3. Size internally threaded diameters to accommodate galvanized threaded bolts where galvanizing is required.
  - 4. Permanent connections in Ferrous Metal Items: Employ welding wherever practicable; avoid bolts and screws.
- D. Welding:
  - 1. Use electric shielded-arc process according to AWS D1.1.
  - 2. Maintain shape and profile of item welded.
  - 3. Prevent heat blisters, run-throughs, and surface distortions.
  - 4. Welds Normally Exposed to View in Finished Work: Make uniform and grind smooth.
  - 5. Exposed Welds: Remove burrs, flux, welding oxide, air spots and discoloration; grind smooth, polish, or otherwise finish to match material welded.
- E. Bolted and Screwed Connections:
  - 1. Use bolts for field connections only, and then only as noted. Countersink heads; finish smooth and flush.
    - a. Provide washers under heads and nuts bearing on wood.
    - b. Draw nuts tight and prevent loosening of permanent connections by nicking threads.
    - c. Use beveled washers where bearing is on sloped surfaces.
  - 2. Where necessary to use screws for permanent connections in ferrous metal, use flat head type, countersink, fill screw slots, and finish smooth and flush.
  - 3. Evenly space exposed heads.
- F. Steel Stairs: Fabricate in accordance with NAAMM-MS standards from steel sections as noted.
- G. Ferrous metal Pipe Railings:
  - 1. Fabricate in largest sections practicable.
  - 2. Weld shop joints; fit field joints with concealed pins and sleeves.
  - 3. Flush fittings may be used for crosses and tees.
  - 4. Return rails to wall as noted.
  - 5. Close ends with welded cap and ease edges.

- H. Handrail Bracket for Pipe Railings: Fabricate according to details.

### 2.03 FINISHES

- A. Preparations of Surfaces:
1. Thoroughly clean mill scale, rust, dirt, grease, and other foreign matter from ferrous metal prior to galvanizing, hot phosphate treatment or painting.
  2. Where hand cleaning methods are not adequate, clean in accordance with SSPC-SP 1, SSPC-SP 2, or SSPC-SP 7 as required.
  3. Completely eliminate burrs, rough spots and pitting from normally exposed ferrous metal items.
- B. Galvanizing:
1. Galvanize items after fabrication in largest sections practicable unless otherwise permitted or recommended by ASTM A384 and A385.
  2. Where galvanizing is removed by welding or other assembly procedures, touch up abraded areas with molten zinc or zinc-rich paint.
  3. Where ferrous metal item is noted to be galvanized, perform galvanizing in accordance with following standards as applicable to item:
    - a. Hardware items Including Fasteners: ASTM A153.
    - b. Items Both under 1/8-inch Thickness and Fabricated from Rolled, Pressed, and Forged Shapes, Plates, Bars, and Strips: ASTM A383.
    - c. Other Fabricated items: ASTM A123.
- C. Finish Schedule: Unless noted otherwise in Materials or Standard Catalog Products Articles.
1. Ferrous Metal, Interior Items:
    - a. Concealed: Clean, chemically etch, and shop-apply one prime coat.
    - b. Exposed: Clean, treat with hot phosphate, chemically etch, and shop-apply one prime coat.
  2. Ferrous metal, Exterior Items:
    - a. Concealed: Clean and hot-dip galvanize in accordance with galvanizing standards.
    - b. Exposed: Clean, then hot-dip galvanize in accordance with galvanizing standards, chemically etch, and shop-apply one prime coat.
  3. Special Ferrous metal Items as Noted Below: Clean and hot-dip galvanize in accordance with galvanizing standards. Do not prime coat.
    - a. Miscellaneous metal items in Penthouses such as stairs and railings.
  4. Items Noted as Chrome-Plated: Same as US26D finish.
  5. Hardware Including Fasteners (Bolts, Nuts, Washers, Etc.):
    - a. Finish to match items fastened.
    - b. Where galvanizing is required, hot-dip galvanize according to ASTM A153.

### 2.04 SOURCE QUALITY CONTROL

- A. Test and Inspections: The owner will employ testing laboratory to test welds per CBC Section 1704.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Examine areas to receive work and verify that: Setting conditions and dimensions are correct to receive items.
- B. Do not start installation until unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install work plumb, true, rigid, and neatly trimmed out.

- B. Do not tighten fastener through finish alone without spacer washers.
- C. Provide concrete inserts or predrilled expansion bolts in fastening items into concrete.
- D. Protect dissimilar metals from contact with each other or with other materials causing corrosion.
- E. Fasten work tightly to prevent rattle or vibration except where expansion-contraction tolerances are required.
- F. Use nonshrink grout mixed in accordance with manufacturer's direction for setting frames, plates, sills, bolts and similar items.
- G. Set items shown or required to be installed in sleeves with quick-setting anchor cement unless otherwise noted.
- H. Protect metal from damage to surface, profile and shape.

**3.03 CLEANING**

- A. Remove protective devices only when items will be safe from other construction operations or removal is required to permit related work.
- B. Clean prime-coated items as required for finish painting.

**END OF SECTION**

## SECTION 05 5100

### METAL STAIRS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes: Steel stairs and landings, with stair handrails, and including plates, angles, hangers and struts for securing to building structure.
  - 1. Provide additional steel as required for support of stairs and not otherwise indicated on Architectural or Structural Drawings.
- B. Related Work:
  - 1. Section 05 5000 - Metal Fabrications.

##### 1.02 SYSTEM DESCRIPTION

- A. Design Requirements: Design stairs and railings to support following minimum loads.
  - 1. Shooting Range / Classroom Building:
    - a. Stairs: 100 lbs./sq.ft. loads, with individual stair treads designed to support a 300 pound concentrated load placed in a position which would cause maximum stress.
    - b. Railings: Support a lateral force of 50 lbs./lin. ft. uniform load and 200 lbs. at any single point without permanent set or damage; ASTM E935.

##### 1.03 REFERENCES

- A. American Welding Society (AWS): D1.1, Structural Welding Code.
- B. National Association of Architectural Metal Manufacturers (NAAMM):
  - 1. Metal Stairs Manual.
  - 2. Pipe Rail Manual.
  - 3. Heavy Duty Metal Bar Grating Manual.

##### 1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's literature for products used in stair and rail fabrications, including paint, grout, and rail brackets.
- B. Shop Drawings: Submit for fabrication and erection of stairs and handrails, indicate profiles, sizes, connection, reinforcing, and anchorage. One reproducible copy will be returned.
  - 1. Provide templates for anchorage installation by others.

##### 1.05 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible; do not delay job progress; allow for trimming and fitting where necessary.
  - 1. Verify clearances are sufficient, including code required head height clearances.
- B. Regulatory Requirements:
  - 1. Access: Comply with California Building Code and Americans with Disabilities Act Accessibility Guidelines (ADAAG) requirements for access for persons with disabilities.
  - 2. Building Codes: Comply with requirements of applicable codes for stair and railing design, except where more restrictive codes are specified.

#### PART 2 PRODUCTS

##### 2.01 MATERIALS

- A. Steel Sections, Plates, Shapes and Bars: ASTM A36.

1. Steel Bar Grating: ASTM A36 or ASTM A1011.
- B. Structural Steel Sheet: Hot rolled, ASTM A1011; or cold rolled, ASTM A1008, Class 1; or grade required for design loading.
- C. Steel Pipe: ASTM A53, Type S seamless, grade as selected by fabricator and as required for design loading; minimum standard weight, STD or Schedule 40.
- D. Steel Tubing: Cold formed ASTM A500; or hot rolled, ASTM A501; minimum Grade B; seamless where exposed.
- E. Castings: Gray iron, ASTM A48, Class 30; malleable iron, ASTM A47.
- F. Grout: Non-shrink meeting ASTM E827, non-metallic, pre-mixed, factory-packaged, non-staining, non-corrosive; type specifically recommended by manufacturer as applicable to job condition.
  1. Manufactures:
    - a. Master Builders; Masterflow 713.
    - b. U.S. Grout Corp.; Five Star Grout.
    - c. Bostik Construction Products; Upcon Grout.
    - d. Protex Industries, Inc.; Propak.
    - e. Substitutions: Refer to Division 1.
- G. Fasteners and Rough Hardware: Type required for specific usage; provide zinc-coated fasteners for exterior use or where built into exterior walls.
- H. Welding Materials: AWS D1.1, type required for materials being welded.
- I. Paint: Provide primers as recommended by paint manufacturers for substrates and paints specified in Section 09 9000 - Painting.
  1. Galvanizing Repair Paint: High zinc-dust content paint for regalvanizing welds in galvanized steel.

## 2.02 FABRICATION

- A. Stairs: Comply with requirements of NAAMM "Metal Stair Manual", including components required for proper anchorage of metal stairs.
  1. Types of Stairs: Refer to Drawings.
  2. Stair Class: NAAMM Architectural Class.
  3. Treads and Landings: "Tread-Grip Flooring" and "Tread-Grip Stair Treads"; non-slip as manufactured by McNichols, 19226 Cabot Blvd., Hayward CA, 94545-1143. Phone: (510) 887-7778, email: .
    - a. Provide with 2" wide contrasting color (to tread) stripe on each tread and landing in locations as noted on Drawings.
  4. Form risers of minimum 12 gage sheet stock.
- B. Stair Railings: Comply with California and ADAAG access requirements and with NAAMM "Pipe Railing Manual"; welded construction; cap exposed ends.
  1. Handrail: Seamless steel tube, 1-1/2" outside diameter, continuous railings conforming with applicable code and design requirements.
  2. Wall Rail Brackets: Castings as approved by Architect.
  3. Wall Returns: 90° elbow return with 1/4" maximum clearance unless otherwise indicated.
    - a. Provide wall plates only where indicated and where required by applicable codes.
- C. Fabricate stairs, landings and component connections to support live loads specified.
  1. Provide closed riser stairs with nosing joined flush to riser.
  2. Maximum Allowable Deflection:
    - a. Standard: Maximum L/240.
  3. Stringers: As indicated on Drawings.
  4. Reinforce underside of landings.

- D. Fabricate items with joints neatly fitted and properly secured.
- E. Grind exposed welds continuous, smooth and flush with adjacent finished surfaces, and ease exposed edges to approximate 1/32" uniform radius.
- F. Exposed Mechanical Fastenings: Flush countersunk fasteners unobtrusively located, consistent with design of structure.
- G. Fit and shop assemble in largest practical sections for site delivery.
- H. Make exposed joints flush butt type, hairline joints where mechanically fastened.
  - 1. Fabricate joints exposed to weather in manner to exclude water or provide weep holes where water could accumulate.
- I. Supply components required for proper anchorage of metal stairs.
- J. Fabricate anchorage and related components of same material and finish as metal stairs and rails.
- K. Thoroughly clean surfaces of rust, scale, grease and foreign matter prior to applying finish.
- L. Supply components required for proper anchorage of metal fabrications; fabricate anchorage and related components of same material and finish as metal fabrication.
- M. Finishes: Thoroughly clean surfaces of rust, scale, grease and foreign matter prior to applying finish. Do not shop prime surfaces in contact with concrete or requiring field welding; shop prime in one coat.
  - 1. Interior Rails: Prime paint.
  - 2. Exterior Stairs and Rails: Hot dip galvanize and prime paint.
    - a. Provide minimum ASTM A123 or A924 and A653 G90 galvanized coating; iron and steel hardware galvanized conforming with ASTM A153.
  - 3. Prime Painting: Comply with requirements of Section 09 9000 - Paints and Coatings for preparation and priming.

### **PART 3 - EXECUTION**

#### **3.01 ERECTION**

- A. Obtain Architect's review prior to site cutting or making adjustments which are not part of scheduled work.
  - 1. Perform necessary cutting and altering for installation of work of other sections.
- B. Install steel stairs and railings square and level, plumb and free from distortion or defects detrimental to appearance and performance.
- C. Make provision for erection stresses by temporary bracing; keep work in alignment.
- D. Ensure alignment with adjacent construction; coordinate with related work to ensure no interruption in installation.
- E. Field bolt and weld to match standard of shop bolting and welding; hide bolts and screws whenever possible, where not hidden, use flush countersunk fastenings.
  - 1. Perform field welding in accordance with AWS D1.1.
- F. After installation, touch-up field welds and scratched and damaged surfaces; use primer consistent with shop coat or recommended for galvanized surfaces, as applicable.
- G. Replace items damaged in course of installation and construction.

**END OF SECTION**

## SECTION 06 1000

### ROUGH CARPENTRY

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. Section Includes: Provision of all lumber framing, rough hardware and blocking as indicated in the contract drawings.
- B. Related Sections:
  - 1. Section 03 1000 - Concrete Framework

##### 1.02 REFERENCES

- A. Requirements of General Conditions and Division No. 1 apply to all Work in this Section.
- B. The following published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work in this Section (latest editions apply).
  - 1. California Code of Regulations. Title 24, 2007 edition, also known as California Building Code (CBC).
  - 2. (APA) - American Plywood Association, "Guide to Plywood Grades".
  - 3. (PS) - United States Product Standard, PS-1 and PS-2 "Construction and Industrial Plywood".
  - 4. (UL) - Underwriters' Laboratories, Inc., "Fire Hazard Classification, FR-S".
  - 5. (WCLIB) - West Coast Lumber Inspection Bureau, "Standard Grading Rules No. 16".
  - 6. (WWPA) - Western Wood Products Association, "Grading Rules for Lumber".
  - 7. (AWPA) - American Wood Preservers' Association Standards.
  - 8. (AF&PA) - American Forest and Paper Association.
  - 9. (ASTM) - American Society of Testing and Materials.

##### 1.03 SUBMITTALS

- A. Shop Drawings of all specially fabricated rough hardware.
- B. Samples only as requested by the Architect.

##### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Provide proper facilities for handling and storage of materials to prevent damage to edges, ends, and surfaces.
- B. Keep materials dry. Where necessary, stack materials off ground on level flat forms, fully protected from weather.

##### 1.05 JOB CONDITIONS

- A. Environmental Requirements: Maintain uniform moisture content of lumber at not more than 19-percent during and after installation.
- B. Sequencing, Scheduling: Coordinate details with other Work supporting, adjoining or fastening to rough carpentry Work.

#### PART 2 PRODUCTS

##### 2.01 MATERIAL

- A. Rough Carpentry:
  - 1. Sills on Concrete: Pressure treated Douglas Fir.
  - 2. Lumber (Wood Framing): Meet requirements of following minimum grades.
    - a. Item

- b. Studs D.F. No. 2
  - c. Plates D.F. No. 2
  - d. Beams D.F. No. 1
  - e. Joists D.F. No. 1
  - f. Posts D.F. No. 1
  - g. Blocking D.F. No. 2
3. Plywood: Provide thickness, grade, and panel identification index shown on drawings. For plywood thickness 15/32 or greater provide minimum of 5 ply.
- B. Rough Hardware: All exterior hardware shall be hot-dipped galvanized.
- 1. Nails: Common wire, typical; hot-dipped galvanized at exposed conditions and pressure-treated lumber.
  - 2. Powder Driven Fasteners: Tempered steel pins with special corrosion-resistant finish. Provide guide washers to accurately control penetration. Accomplish fastening by low-velocity piston-driven powder-actuated tool. Pins and tool: Hilti Fastening Systems.
  - 3. Expansion Bolts: Reverse cone, self-wedging, expansion type, Tightening of nut or increased tension on bolt shank shall act to force wedges outward to create positive increased resistance to withdrawal, Hilti Kwik - Bolt II or equal product substituted per Section 016 0000.
  - 4. Metal Framing Connectors: Fabricate from hot-dipped galvanized steel (G90 coating). Connectors in contact with pressure treated lumber shall have G185 hot dipped galvanized coating per ASTM A653. Connectors shall be at least 16-gauge material, 1/8-inch plate materials where welded, unless otherwise shown or specified, punched for nailing. Nails and nailing shall conform to the manufacturer's instructions, with a nail provided for each punched nail hole. Use maximum nail size listed by manufacturer. Manufactured by Simpson Company or equal product substituted per Section 01 6000.
  - 5. Miscellaneous Hardware: Provide all common screws, bolts, fastenings, washers and nuts required to complete rough carpentry Work.
  - 6. Bolts and sill bolts in wood shall be ASTM A307 with standard cut threads; full diameter bolts (no rolled or "upset" threads permitted) per ANSI/ASME standard B18.2.1.

## 2.02 TREATMENTS

- A. Fire-Retardant Treatment: Same as Koppers Co., Inc.'s "Non-Com" J.H. Baxter and Co.'s "Baco-Pyresote"; or equal product substituted per Section 01 6000.
- B. Preservative Treatment: Furnish in accordance with AWPA. Preservatives with an ammonia base, including Ammoniacal Copper Zinc Arsenate (ACZA) are not permitted.

## 2.03 FABRICATION

- A. Preparation:
  - 1. Verify measurements at job site.
  - 2. Verify details and dimensions of equipment and fixtures integral with finish carpentry for proper fit and accurate alignment.
  - 3. Coordinate details with other work supporting, adjoining, or fastening to casework.
- B. Lumber:
  - 1. Air- or kiln-dry to maximum 19-percent moisture content at time of surfacing.
  - 2. Furnish surfaced four sides, S4S, unless otherwise noted.
  - 3. Size to conform with rules of governing standard. Sizes shown are nominal unless otherwise noted.
- C. Wood Treatments:
  - 1. Fire-Retardant Treatment:

- a. Fire-retardant treat only wood blocking supporting truss joists on steel beams, unless otherwise noted.
- b. Treat in accordance with AWPA C20 and approved manufacturer's recommendations.
2. Preservative Treatment:
  - a. Treat lumber and plywood sheathing.
    - 1) In contact with concrete and masonry less than six feet above the ground.
    - 2) Exposed to weather permanently.
    - 3) Where specified in the Contract Documents.
  - b. Lumber: Treat in accordance with AWPA C2
  - c. Plywood: Treat in accordance with AWPA C9
  - d. After Treatment and prior to shipping, air- or kiln-dry lumber to maximum 12-percent moisture content.

#### **2.04 SOURCE QUALITY CONTROL**

- A. Lumber shall bear grade-trademark or be accompanied by certificate of compliance of appropriate grading agency.
- B. Plywood shall bear APA grade-trademark.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine areas to receive rough carpentry Work and verify following:
  1. Completion of installation of building components to receive rough carpentry Work.
  2. That surfaces are satisfactory to receive Work.
  3. That spacing, direction, and details of supports are correct to accommodate installation of blocking, backing, stripping, furring and nailers.
  4. That all anchor bolts and holdown bolts are properly installed.

#### **3.02 INSTALLATION**

- A. Cutting: Perform all cutting, boring, and similar Work required.
- B. Studs, Joists, Beams, and Posts: Install all members true to line. No wood shingle shims are permitted. Place joists with crown up; maximum 1/4-inch crown permitted.
- C. Nail joints in accordance with applicable requirements of the CBC Table 2304.9.1 unless otherwise shown or specified. Predrill where nails tend to split wood. Nails into pressure-treated lumber shall be hot-dipped galvanized.
- D. Bolt holes to be 1/16-inch oversize. Threads shall not bear on wood. Use standard malleable iron washers against wood unless noted otherwise on drawings. Carriage bolts require washers under the nut only.
- E. Provide blocking, nailers, stripping, and backing as shown and as required to secure other Work.
- F. Maintain 1/8-inch gap between all plywood panel edges.
- G. Do not use plywood sheets having a width smaller than 2-feet 0-inches.
- H. Plywood flooring shall be field glued with adhesive meeting APA specification applied in accordance with the manufacturer's recommendations. Apply continuous line of glue on joists and in groove of tongue and groove panels.
- I. Where wood is cut, sawed, planed, bored or marred after preservative or fire-retardant treatment, apply two heavy brush coats of compatible material used in treatment.

- J. Nail heads shall be driven flush with plywood surface. Overdriven nails (nails which fracture the outer ply layer) shall be replaced one for one.
- K. Screws (Wood or Lag): Screws shall be screwed and not driven into place. Screw holes for un-threaded portion shall be predrilled to the same diameter and depth of shank. Holes for threaded portion shall be predrilled less than or equal to the diameter of the root of the thread. Provide standard cut washers under head of lag screws.

### **3.03 CLEANING AND ADJUSTING EXPOSED TIMBER**

- A. Remove damaged or otherwise disfigured portions and replace with new prior to the Owner's acceptance.
- B. Wash finished Work in strict accordance with product manufacturer's directions and ensure that washed surfaces do not differ from clean unwashed surfaces. Any difference will be considered unsatisfactory work.

### **3.04 FIELD QUALITY CONTROL**

- A. The Owner's Testing Agency shall:
  - 1. Inspect erected timber framing as required to establish conformity of work with Drawings.
  - 2. Inspect all bolted connections.
  - 3. Inspect all timber connectors per CBC.
  - 4. Inspect roof diaphragm nailing for nail size, spacing and penetration at plywood panel edges, and special nailing at collector and drag members.
  - 5. Inspect shear wall nailing for nail size, spacing, edge distance and penetration at plywood panel edges, and nailing at holdown posts.

**END OF SECTION**

**SECTION 06 4100**

**ARCHITECTURAL CASEWORK**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Custom casework fabricated from solid phenolic materials.
- B. Hardware associated with casework.

**1.02 REFERENCES**

- A. Woodwork Institute of California, Manual of Millwork, 11th Edition.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide material specifications, manufacturer's installation and maintenance instructions.
- C. Shop Drawings: Indicate:
  - 1. Attachment details.
  - 2. Dimensions, component sizes, fabrication details and coordination requirement of adjacent work.
  - 3. List materials, sizes, sections, elevations, construction details, assembly and installation in locations indicated on the Drawings, hardware, noting all modifications to the specified W.I.C. construction types and grades as may be detailed or hereinafter specified.
  - 4. Indicated grounds, backing, blocking, steel supports, utility penetration, mechanical items, electrical work including under counter light fixture and other items required for casework installations. Coordinate with other trades and submit any information pertinent to the woodwork.
  - 5. Identify all finishes and their locations.
- D. Samples: Submit three samples, 4 x 4 inch (\_\_\_\_x\_\_\_\_ mm) in size, illustrating finish and colors selected.
  - 1. Each sample chip shall bear the manufacturer's name, color, pattern or texture designation.

**1.04 QUALITY ASSURANCE**

- A. Work Quality: All casework, shelving and countertops to be manufactured and installed by skilled craft persons in compliance with W.I.C. (Woodwork Institute of California) construction types and grades hereinafter specified and detailed on the Drawings and on the reviewed Shop Drawings. All such work to be accurately fabricated, fitted, joined and expertly finished in accordance with measurements taken on the job-site.
  - 1. Manufacturer must provide evidence demonstrating that they are a member of WIC and they can issue WIC certified compliance certificate or they have arranged for inspection by a WIC Inspector.
- B. Defective Work: All work, not true to line, not in satisfactory operating condition, improperly installed, damaged or marred will not be accepted. Remedy, remove or replace defective work as directed by the Architect subject to his approval at no cost to the City.
- C. Standards: All applicable Sections of the "Manual of Millwork" and current supplements published by the Woodwork Institute of California (W.I.C.) for the construction types and grades hereinafter specified. All modifications to such standards shown on the Contract Drawings and reviewed Shop Drawings or specified shall govern.

- D. Qualification of Manufacturer and Installers: Product shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the City. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- E. Certification: Before delivery to the job-site, Manufacturer shall issue a W.I.C. "Certified Compliance Certificate" indicating that casework to be furnished for this project will fully meet all specified requirements of W.I.C. grades.
  - 1. All work shall bear the W.I.C. Certified Compliance Label.
- F. Materials to carry the Greenguard label:

#### **1.05 DELIVERY, STORAGE, AND PROTECTION**

- A. Protection:
  - 1. Material to be stored at the job site in a safe dry place with all labels intact and legible at time of installation.
  - 2. Unload and store manufactured casework units and countertops in place where they would be protected from direct sunlight, excessive heat, rain and moisture and damage before installation.
  - 3. Store flat on level surface in clean, dry, well ventilated area protected from sunlight.
  - 4. Use all means to protect materials before, during, and after installation. Do not allow products to become wet or damp.
- B. Identification - All casework units and countertops delivered to the job-site for installation shall be properly identified as to where they are to be located in the structure.
- C. Replacements – In the event of damage, including water intrusion, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

#### **1.06 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Solid phenolic casework materials to be warranted against delamination for ten (10) years. The factory authorized cabinet fabricator, product installer and material manufacturer must sign the Warranty documents and submit a copy to the Contractor.
- C. Other materials and work quality covered in this section shall carry a one (1) year warranty from date of Substantial Completion.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. The design of the custom casework is based on solid phenolic panels manufactured by Trespa North America, Ltd. (800-487-3772) as a standard of quality. A list of approved fabricators that provide products that comply with this specification section as judged and approved by the Architect may be required from the above. Substitutions shall be considered under provision of 00 0000.
- B. Solid phenolic custom casework to contain 15% (by weight) post industrial waste.
- C. Solid phenolic custom casework to contain 70% rapidly renewable cellulose or wood fibers.
- D. All wood based materials to use no urea-formaldehyde to meet Indoor Environmental Quality.
- E. All products specified in this section to be provided by a single manufacturer.

- F. General: In compliance with Sections of the W.I.C. Manual applicable to the Custom Grade, Type I, Style A, casework construction as specified and noted on the Contract Drawings.
- G. Total applied load (or weight) uniformly dispersed on an individual shelf shall not exceed 200 lbs. on any one shelf. Load capacity, 50 lbs. per square foot for book shelving, shall be applied.
- H. Cabinet Finish Hardware:
  - 1. Hardware shall be furnished and installed as required to provide a complete casework installation.
  - 2. Interior shelving of cabinets to be manufacturer's standard black melamine cabinet liner as approved by the Architect.

## 2.02 COLOR SCHEDULE

- A. Opal Grey (E25-02/QZ, Quartz Finish)
  - 1. Casework and shelves.
- B. Anthracite Grey (A25.8.1/GL Gloss Finish)
  - 1. Countertops

## 2.03 HARDWARE

- A. Locks shall be installed where indicated and keyed in accordance with keying schedules as directed by Architect.
- B. Hardware manufacturers shall be as listed below, or shall be equivalent products by Stanley, Corbin, or equal.
- C. Miscellaneous hardware including, but not limited to the following: spikes, bolts, screws, lags, shields, straps, angles, cleats and other related items for fabrication and installation.
- D. Hinges: Blum 125, self-closing, steel arm, and nickel-plated #71T5550.
- E. Drawer Guides: Hettich #5632, ¾" extension 100 lb. rated.
- F. Pulls: Sugatsune/Lamp, #UTZ-130, integral, satin nickel.
- G. Locks: National Cabinet Lock, C8173-26D or C81179-26D.
- H. Shelf Pins: Sugatsune/Lamp #SS-323, ivory.
- I. Countertop Bracket (exposed): Sugatsune/Lamp #ST-480, stainless steel, satin finish.
- J. Grommets: 2" diameter opening, color to be black.
- K. Coat Hooks: Ives, single #581, double #582.
- L. Keying System
  - 1. Cylinder locks shall be master keyed to key system and keying schedules as directed by Architect. Cylinders shall be pinned and keys shall be cut at the lock company factory where records shall be established.
  - 2. Key Material: Provide keys of nickel silver only, stamp Keys "DO NOT DUPLICATE".
  - 3. Furnish three (3) change keys for each cylinder lock, a maximum of ten (10) change keys for keyed alike groups. Furnish five (5) master keys for each master group.
  - 4. Contractor and Hardware Supplier shall meet with the Architect to finalize keying requirements and obtain final instructions prior to starting work. Upon completion of the work, Contractor shall properly identify all keys as to the project name and locations and deliver all keys along with a duplicate copy of key listing to Architect.

## 2.04 CONSTRUCTION MATERIALS

- A. Construction and design to develop maximum strength and rigidity in each sectional unit. Each sectional unit to be completely fabricated ready for placement in the casework and equipment assembly. Each cabinet to be a complete integral rigid unit within itself to permit relocation at any subsequent time.
- B. The cabinet shall incorporate full overlay design in which posts and rails are concealed behind the doors and drawer heads. The door and drawer heads shall create a .125" horizontal reveal. There shall be a .0625" vertical reveal at the edge of each cabinet creating a .125" vertical reveal at the end of each cabinet when two cabinets are set in place next to each other.
- C. Base cabinets to be constructed to achieve an industry standard height of 30" to 36" including the countertop, and 24" deep. Refer to the Drawings for heights.
- D. Each cabinet to be assembled incorporating mortise and tendon construction or 32mm dowel construction. Vertical and horizontal members shall be keyed and then phenol seal bonded and mechanically fastened. Exposed edges on cabinet components, doors and drawer heads to be sanded and polished to a satin smooth finish. Underside of toe space shall be enclosed.
- E. Component Thickness Schedule:
  - 1. Cabinet sides and bottoms: 0.5" (12.7mm)
  - 2. Door and drawer heads: 0.5" (12.7mm)
  - 3. Horizontal rail supports: 0.5" (12.7mm)
  - 4. Cabinet backs: 0.25" (3.18mm)
  - 5. Wall cabinet backs: 0.25" (3.18mm)
  - 6. Cabinet shelves: 0.5" (12.7mm)
  - 7. Work surfaces: 0.75" (19mm)
- F. Casework:
  - 1. Each cabinet shall consist of drawers or doors or a combination thereof as shown in drawings.
  - 2. Each cabinet to be provided with an adjustable shelf. For shelves without doors, shelf clips to engage shelf in such a way as to avoid slippage and movement of shelf.
  - 3. Each base cabinet shall have 6" (101.6mm) high by 3" (76.2mm) deep toe space members, unless otherwise noted on drawings.
  - 4. Drawers shall have full box construction and be fabricated of 1/2" thick solid composite phenolic resin material. Drawer bottoms shall be matching 1/4" material. Drawer fronts shall be attached to drawer box using dual directional adjustment hardware.
- G. Wall and floor storage cabinets and cases shall match in design and construction.
- H. Cap exposed edges with material or same finish and pattern at countertops.
- I. Exposed shelving is to be finished to match cabinet face.
- J. Provide scribe trim as required to provide a complete close off.
- K. Finish all exposed surfaces with panel to match.
- L. Upper cabinets to be 15" deep unless otherwise noted.

## 2.05 SOURCE QUALITY CONTROL

- A. Panels shall be of material specifically designed for laboratory work surfaces. Fabricated work surfaces shall comply with all current codes and regulations. Tops and shelves shall have uniform thickness (+0.03") and flatness (maximum difference of 0.03") for 10-foot span.
- B. Panels to be U.L. registered and labeled for quality consistency.
- C. Chemical Resistance: Evaluation of chemical resistance is based on SEFA's (Scientific

Equipment and Fixture Association) standard list of 49 chemicals / concentrations, their required methods of testing and their minimum acceptable results as a means of establishing a minimum acceptable level of performance for all exposed and semi-exposed surfaces.

- D. Panels to have screw pull-out strength minimums per following chart (lbs.):
- | 1. Screw depth:  | #6  | #8  | #10 | #12 | 1/4" | 5/16" | 3/8"  | 7/16" | 1/2"  |
|------------------|-----|-----|-----|-----|------|-------|-------|-------|-------|
| 2. 1/4" panels:  | 120 | 150 | 170 | 200 | 230  |       |       |       |       |
| 3. 5/16" panels: | 160 | 190 | 210 | 240 | 280  | 350   |       |       |       |
| 4. 3/8" panels:  | 190 | 220 | 260 | 290 | 340  | 420   | 510   |       |       |
| 5. 1/2" panels:  | 250 | 300 | 340 | 390 | 450  | 560   | 680   | 790   | 900   |
| 6. 5/8" panels:  | 310 | 370 | 430 | 490 | 560  | 710   | 850   | 990   | 1,100 |
| 7. 3/4" panels:  |     |     | 510 | 590 | 680  | 850   | 1,000 | 1,200 | 1,400 |
- E. Uniform load to cause no more than 1/4" deflection at center of the span:
- | 1. Thickness:    | 12" x 24" | 12" x 36" | 12" x 48" | 24" x 36" |
|------------------|-----------|-----------|-----------|-----------|
| 2. 1/4" panels:  | 35        | 10        | 5         | 20        |
| 3. 5/16" panels: | 85        | 25        | 10        | 50        |
| 4. 3/8" panels:  | 170       | 50        | 20        | 100       |
| 5. 1/2" panels:  | 370       | 110       | 45        | 220       |
| 6. 5/8" panels:  | 690       | 210       | 85        | 410       |
| 7. 3/4" panels:  | 1,400     | 400       | 170       | 800       |
| 8. 1" panels:    | 2,600     | 780       | 330       | 1,500     |
- F. Performance Requirements:
1. Modulus of Elasticity: 1,500,000 psi, minimum.
  2. Shear Strength: 2,000 psi, minimum.
  3. Compressive Strength: 24,000 psi, minimum.
  4. Weight: 93 lbs. per cubic foot, maximum.
  5. Flame Spread (ASTM E-84): Class 1A (25) for 5/8" and thicker.
    - a. Class 1B (30) for 1/2"
    - b. Class 1B (50) for 1/4" through 3/8"
    - c. Non-porous surface and edges.
    - d. Will not support micro-organic growth.
    - e. Water absorption: 3% maximum.
- G. Decorative papers impregnated with melamine resin on faces with a clear protective overcoat, and integrally compression molded with a core consisting of solid phenolic impregnated kraft paper.
1. Trespa, European Wild Apple

## 2.06 OTHER MATERIALS

- A. All other materials, anchorages and accessories not specifically described but required for a complete and proper installation of solid phenolic custom casework, as recommended by the manufacturer, subject to the approval of the Architect.

## PART 3 EXECUTION

### 3.01 SURFACE CONDITIONS

- A. Inspection
  1. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
  2. Verify that solid phenolic custom casework may be installed in accordance with the approved design, all pertinent codes and regulations, and the referenced standards.
  3. Verify that substrate surfaces are smooth within a maximum variation of 1/8" in 10 feet and

are ready to receive work.

**B. Discrepancies**

1. In the event of discrepancy, immediately notify the Architect.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

**3.02 GENERAL FABRICATION**

**A. General:**

1. Work of this Section shall be fabricated in strict accordance with WIC Custom Grade, Type 1, Style A Casework Construction and details indicated on the Contract Drawings and reviewed Shop Drawings.
2. Shop fabricate casework units and countertops as complete sections of adequate size to permit easy handling, access to installation areas for assembly or required for setting in place and installing of closing pieces or components.
3. Make holes and/or cutouts necessary for mechanical and/or electrical work to be incorporated into the casework units and countertops as detailed or specified.
4. Exposed or filled fasteners through exposed solid phenolic surfaces are not allowed.
5. A color matched waterproof caulk shall be used at all square butt joints including splashes and return ends.
6. Caulking shall not exceed 1/16 inch.
7. Sink cut outs must be sealed with a water resistant sealer before sink rim is installed.

**B. Casework:**

1. Construction and design to develop maximum strength and rigidity in casework. Each unit to be completely fabricated ready for placement. Each unit to be a complete integral rigid unit within itself to permit relocation at any subsequent time.
2. Shop fabricate as complete units of adequate size to permit easy handling, access to installation areas for assembly or required setting in place and installing of countertops and closing pieces.
3. Semi-exposed casework interior to be white.
4. Casework hardware to be installed by the casework manufacturer in accordance with reviewed Shop Drawings.
5. All upper and base casework to be open at corners to provide space for storage use.

**3.03 INSTALLATION**

- A. General:** All in accordance with reviewed Shop Drawings and Contract Drawings, to be installed by casework manufacturer or by an experienced person under the casework manufacturer's supervision.
- B. Preparation Work:** All grounds, backing, blocking, furring and other anchorages required for casework installation which become an integral part of a floor, wall, partitions shall be in place ready to receive the casework and countertops. Notify Inspector for inspection prior to wall closure and casework installation.
- C. Site Condition:** Casework and countertop manufacturer or installer shall examine the areas and conditions under which work of this Section will be installed.
1. Correct conditions detrimental to timely and proper installation of casework and countertops.
  2. Do not proceed until detrimental conditions have been corrected at no added cost to the City.
  3. Start of casework and countertop installation shall imply Contractor's acceptance of job conditions.
- D. Casework Installation:**
1. All casework units delivered to the job-site shall bear W.I.C. grade stamp verifying

compliance with specified W.I.C. Construction types and grades.

2. Assembly: Joint, glue, nail or screw together casework in accordance with best practice of casework. Anchor casework to wood framing, blocking, masonry and/or concrete as detailed. Countersink and plug screw anchors as detailed. All fasteners to be concealed.
  3. Install casework units in rooms noted on the Contract Drawings, in plumb, square and in aligned position with walls.
- E. All base cabinet shall be fastened to stud walls with minimum 4 - #14x3", phillip truss head, type 17 hard, zinc plated, self-taping, full thread screws concrete or masonry walls with minimum 4-1/4"x3", slotted hex washer head, masonry/concrete screw head.
- F. Cleaning and Adjustment: See Subsection 1.3D hereinbefore specified in this Section.

#### **3.04 INSTALLATION OF CABINET HARDWARE**

- A. Fit hardware according to the manufacturer's instructions.
- B. Install hinges and drawer guides according to the recommendations of the manufacturer. Drawer pulls shall be centered on the drawers unless otherwise indicated.
- C. Installer of finish hardware shall advise Contractor of final protection and maintain conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

#### **3.05 COMPLIANCE**

- A. Performance of Work: The City reserves the right to request and pay for an inspection by a W.I.C. representative to determine that work of this Section has been performed in accordance with the specified standards.
- B. Non-Conforming Work: If the W.I.C. representative determines that work of this Section does not comply, Contractor shall immediately remove non-conforming items and replace them with complying items at no added cost to the City and reimburse the City for the cost of the inspection.

#### **3.06 CLEANING**

- A. Upon completion of the work, remove surplus materials, rubbish and debris resulting from the solid phenolic custom casework installation. Leave areas in neat, clean, and orderly condition.
- B. Repair or replace any damaged work.
- C. Use manufacturer-recommended cleaning agents.
- D. Contractor to leave all cutouts for Owner.

**END OF SECTION**

**SECTION 07 1800**

**TRAFFIC COATINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Coating for waterproofing and traffic surface

**1.02 REFERENCE STANDARDS**

- A. ASTM C 109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
- B. ASTM C 734 - Standard Test Method for Low-Temperature Flexibility of Latex Sealants After Artificial Weathering.
- C. ASTM C 794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
- D. ASTM D 2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
- E. ASTM D 4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser; 2007.
- F. ASTM D 570 - Standard Test Method for Water Absorption of Plastics.
- G. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.04 QUALITY ASSURANCE**

**1.05 DELIVERY, STORAGE, AND HANDLING**

**1.06 FIELD CONDITIONS**

**1.07 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Dual Membrane Traffic Coating:
  - 1. Mer-Ko Parex; Product Dual Pro 380.
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 TRAFFIC COATINGS**

- A. Pedestrian Traffic Coating: Multi-layer, cementitious, elastomeric decking system.
  - 1. Finished Coating Thickness: 3/4 inches

**2.03 MATERIALS**

- A. Waterproofing System:
  - 1. Waterproof Membrane Sheet: Hydro-Shield 380 Waterproof Membrane.

2. Reinforced Waterproofing Membrane: Install minimum No. 17, 2.5 inch squared, self furred, galvanized expanded metal lath.
- B. Top Coat: High solids acrylic top coat.
1. Color: To be selected by Architect from all available colors.
- C. Surfacing: To be selected by Architect.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that substrate is ready to receive work, surface is clean, dry and free of substances that could adversely affect bond.
- B. Do not begin work until concrete substrate has cured at least 28 days and moisture content is 16 percent or less.
- C. Test concrete surfaces with litmus paper for acceptable level of alkalinity.

#### **3.02 PREPARATION**

- A. Clean substrate surface free of foreign matter.
- B. Patch concrete substrate with filler to produce surface conducive to bond.
- C. Protect adjacent surfaces.

#### **3.03 INSTALLATION**

- A. Apply system materials in accordance with manufacturer's instructions.
- B. Apply surfacing to top coat before set.

**END OF SECTION**

## SECTION 07 1900

### WATER REPELLENTS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Water repellents applied to exterior masonry surfaces.

##### 1.02 RELATED REQUIREMENTS

- A. Section 09 9700 - Anti-Graffiti Coatings.

##### 1.03 REFERENCE STANDARDS

- A. ASTM D 3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005.
- B. ASTM D 5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes, and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments; 1991 (Reapproved 2007).

##### 1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Water Repellent Material: Two gallons (9 liters) of the type installed.

##### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section approved by manufacturer.

##### 1.06 MOCK-UP

- A. Prepare a representative surface 36 by 36 inch (1 by 1 m) in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.

##### 1.07 FIELD CONDITIONS

- A. Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 50 degrees F (10 degrees C) or higher than 90 degrees F (32 degrees C).
- C. Do not apply water repellent when rain is expected within 24 hours.
- D. Do not apply to surfaces with excessive moisture content. Moisture content should be 12% or less.

##### 1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard ten year warranty from date of substantial completion.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acrylic Water Repellents:
  - 1. Monopole, Inc; Product Ultra-lastic for horizontal surfaces (tops of masonry walls).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Silane/Siloxane Water Repellents:
  - 1. Monopole, Inc; Product Aquaseal ME 12 for vertical surfaces.
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

### **2.02 MATERIALS**

- A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
  - 1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
  - 2. Number of Coats: Two.
  - 3. VOC Content: Less than 100 g/L, when tested in accordance with ASTM D 3690 or D 5095.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

### **3.02 PREPARATION**

- A. Protection of Adjacent Work:
  - 1. Protect adjacent property and vehicles from drips and overspray.
  - 2. Protect adjacent surfaces not intended to receive water repellent.
- B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.
- C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.
- D. Remove loose particles and foreign matter.
- E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.
- F. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

### **3.03 APPLICATION**

- A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- B. Apply at rate recommended by manufacturer, continuously over entire surface.
- C. Apply two coats, minimum.
- D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

**END OF SECTION**

## SECTION 07 2100

### THERMAL INSULATION

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Board insulation at roof construction.
- B. Batt insulation in exterior wall and ceiling construction.

##### 1.02 RELATED REQUIREMENTS

- A. Section 05 4000 - Cold-Formed Metal Framing: Supporting construction for batt insulation.

##### 1.03 REFERENCE STANDARDS

- A. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2007.
- B. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2006.
- C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.
- D. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2004.

##### 1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Insulation:
  - 1. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com)
  - 2. Johns Manville Corporation: [www.jm.com](http://www.jm.com)
  - 3. Owens Corning Corporation: [www.owenscorning.com](http://www.owenscorning.com)

##### 2.02 APPLICATIONS

- A. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.
- B. Insulation at sloped roofing conditions: Insulation board.

##### 2.03 FOAM BOARD INSULATION MATERIALS

- A. Expanded Polystyrene Board Insulation: ASTM C 578; with the following characteristics:
  - 1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E 84.
  - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.
  - 3. Board Size: 48 x 96 inch (1220 x 2440 mm).
  - 4. Board Thickness: 3 inches (75 mm).
  - 5. Board Edges: Square.

##### 2.04 BATT INSULATION MATERIALS

- A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

- B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C 665; friction fit.
  - 1. Combustibility: Non-combustible, when tested in accordance with ASTM E 136, except for facing, if any.
  - 2. Facing: Aluminum foil, flame spread 25 rated; one side.
- C. Mineral Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C 665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E 84.
  - 1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E 84.

## **2.05 ACCESSORIES**

- A. Tape: Polyester self-adhering type, mesh reinforced, 2 inch (50 mm) wide.
- B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

### **3.02 BATT INSTALLATION**

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.
- F. Tape seal tears or cuts in vapor retarder.
- G. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

### **3.03 PROTECTION**

- A. Do not permit installed insulation to be damaged prior to its concealment.

**END OF SECTION**

**SECTION 07 2650**

**UNDER-SLAB VAPOR BARRIER**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Under slab vapor barrier, seam tape, and mastic for installation under concrete slabs.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete.

**1.03 REFERENCE STANDARDS**

- A. ACI 302.2R-06 - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
- B. ASTM E 96-05 - Standard Test Methods for Water Vapor Transmission of Materials; 2005.
- C. ASTM E 154-99 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008.
- D. ASTM E 1643-09 - Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- E. ASTM E 1745-09 - Standard Specification for Plastic Water Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs;
- F. ASTM F 1249-06 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor; 2006.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Samples: Submit two membrane samples, 4x4 inch (\_\_\_\_x\_\_\_\_ mm) in size, illustrating types proposed to be incorporated in to the work.
- C. Test Reports: Indicate compliance of ASTM E 1745 paragraph 8.3.
- D. Manufacturer's Instructions: Indicate installation methods, penetrations, horizontal and vertical surfaces and repair instructions.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Stego Industries LLC; Product: Stego Wrap Vapor Barrier (15mil); [www.stegoindustries.com](http://www.stegoindustries.com).
- B. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 MATERIALS**

- A. Vapor barrier to meet the following criteria:
  - 1. Permeance: Less than 0.01 Perms; ASTM E 1745, Section 7.
  - 2. Strength: ASTM E 1745, Class A.
  - 3. Thickness: 15 mils.

**2.03 ACCESSORIES**

- A. Seam Tape:
  - 1. Stego Tape.
- B. Vapor-Proofing Mastic:

1. Stego Mastic

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Ensure that base material is ready to receive work and has met preparation requirements of the Geotechnical Engineer.

#### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
  1. Install in accordance with ASTM E 1643.
  2. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement.
  3. Lap vapor barrier over footings and/ or seal to foundation walls.
  4. Overlap joints 6 inches and seal with manufacturer's tape.
  5. Seal all penetrations (including pipes) per manufacturer's instructions.
  6. No penetrations of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
  7. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

**END OF SECTION**

## SECTION 07 4113

### METAL ROOF PANELS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Architectural roofing system of preformed zinc panels.
- B. Fastening system.
- C. Accessories and miscellaneous components.

##### 1.02 RELATED REQUIREMENTS

- A. Section 07 4213 - Metal Wall Panels: Preformed wall panels.
- B. Section 07 9005 - Joint Sealers: Field-installed sealants.

##### 1.03 REFERENCE STANDARDS

- A. Rheinzink Application in Architecture, 2nd Updated Edition, January 2002.
- B. SMACNA - Architectural Sheet Metal Manual; 2003 Edition

##### 1.04 DESIGN REQUIREMENTS

- A. Panel roofing sheets shall be designed and erected to provide an insulated deck 'warm roof' assembly.
- B. Thermal Movement: Provide systems and connections, which allow for thermal movement resulting from ambient temperature range of 100 degrees F without causing harmful buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- C. Structural Performance: Provide panels, anchors and attachments, which resist loads required by local jurisdiction as noted on the Structural Plans to withstand positive and negative pressure resulting from wind loading.
  - 1. Panel roofing clips and fasteners shall be corrosion resistant.

##### 1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
  - 1. Shop drawings are to be reviewed by zinc manufacturer prior to submission to the Architect and be accompanied by letter stating review and/ or review stamp directly on the shop drawings.
  - 2. Show work to be field-fabricated or field-assembled.
- C. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches (305 mm) square, representing actual roofing metal, thickness, profile, color, and texture.
- D. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

##### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacture of roofing systems similar to those required for this project, with not less than 10 years of experience.
- B. Source: Provide roof panels, which are the product of one manufacturer. Provide secondary materials, which are acceptable to the zinc manufacturer.

- C. Fabricator Qualifications: Company specializing in fabricating and working with materials specified in this section with a minimum five years experience.
  - 1. Metal Tech-USA; 770 486.8825; [www.metaltech-usa.com](http://www.metaltech-usa.com)
  - 2. Morin Corporation; 800 700.6140; [www.kingspanpanels.us](http://www.kingspanpanels.us)
  - 3. Firestone Metal Products; 858 603.1186
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of experience. Installer to provide installation of panels, underlayment and attachments to substructures.
  - 1. Tinco Sheet Metal; 323 263.0511
  - 2. California Sheet Metal; 619 562.7010
  - 3. Weiss Sheet Metal; 310 354.2700
  - 4. C & J Sheet Metal; 562 634.8823

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.
- B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.
- C. Prevent contact with materials that may cause discoloration or staining of products.

#### **1.08 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Material Warranty: Provide manufacturer's 10 year warranty covering material defects as required by DIN 988 for rolled zinc.
- C. Installation Warranty: Provide 5 year warranty covering defects in installation performance resulting from faulty installation.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Zinc Alloy Sheet/ Coils
  - 1. Titanium Zinz Alloy whose base is electrolytic high grade fine zinc (DIN EN 1706) with a 99.995% Zn degree of purity and alloying additives of 1% copper and 1% titanium in accordance with DIN EN 988.
    - a. Finish: Preweathered Blue Gray, with factory applied blue backside paint coating.
      - 1) Exposed surface coatings (phosphate or others) are not acceptable.
    - b. Shape: Trapezoidal corrugated panels, 1 13/16 inch face exterior panel installed horizontally.
    - c. Minimum Panel Thickness: 0.7mm
    - d. Custom copings and related sheet metal work fabricated from zinc, copper and titanium alloy sheet.
- B. Acceptable manufacturers are:
  - 1. Rheinzink America: [www.rheinzink.com](http://www.rheinzink.com).
- C. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 ATTACHMENT SYSTEM**

- A. Concealed System: Provide manufacturer's standard stainless steel or zinc, corrosion free concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

#### **2.03 ACCESSORIES AND MISCELLANEOUS ITEMS**

- A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
- B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish, closed-cell synthetic rubber, neoprene, or PVC, or combination steel and closed-cell foam.
- C. Sealants:
  - 1. Joint Sealants: Dow 795 to match adjoining metal roofing.
  - 2. Backer Rods: Dow Ethafoam SB. Backer rods shall be placed in joints not less than 75% of its original size.
  - 3. Seam Tape: Self adhered butyl sealant tape applied to surfaces of dissimilar metals and between metals and concrete masonry and inside seams.
- D. Roof Underlayment:
  - 1. 30 mil thickness, self-adhering, composite membrane of polyethylene sheeting and a layer of rubberized asphalt or butyl rubber compound.
    - a. Vycor Ultra by WR Grace
    - b. Ice and Water Shield by WR Grace
    - c. Other manufacturer's as recommended by the roof panel manufacturer
  - 2. Ventilation Mat: Apply directly below zinc surfaces.
    - a. Enkmat 7010 by Colbond
    - b. Delta Trella
    - c. Other manufacturer's as recommended by the roof panel manufacturer
- E. Solder: Lead-tin soft solder with 40% tin and 60% lead (50/50 also acceptable) per zinc manufacturer recommendations.
  - 1. Flux: Rheinzink ZD-Pro flux Z-04-S.

## 2.04 FABRICATION

- A. Panels: Fabricate panels and accessory items at factory, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
- B. Double Lock Standing Seam Panel Roofing: Panel fabrication to be by folding brake or acceptable roll forming equipment as approved by panel manufacturer.
  - 1. Profile: 1 inch double lock standing seam panel profile.
  - 2. Seam Spacing: 16 inches on center.
- C. Panel roofing system shall be designed to be watershedding with watertightness provided by roof underlayment membrane. Sealants shall be used in isolated cases as required by Architect in low-slope applications, roof penetrations, and in conjunction with adjoining construction.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.02 PREPARATION

- A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

- B. Remove protective film from surface of roof panels immediately prior to installation. Strip film carefully, to avoid damage to prefinished surfaces.
- C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
- D. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

### **3.03 INSTALLATION**

- A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
  - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
  - 2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
- B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.
- C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
- D. Zinc 'grain' shall be in the direction of the seams.

### **3.04 CLEANING**

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

### **3.05 PROTECTION**

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before date of Substantial Completion.

**END OF SECTION**

**SECTION 07 4200**

**PHENOLIC WALL PANELS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Exterior solid phenolic cladding panel system.

**1.02 REFERENCE STANDARDS**

- A. ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2009
- B. ASTM D 635 - Standard Test Method for Small Scale Burning; 2006
- C. ASTM D 2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2009
- D. ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity; 2002
- E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010
- F. ASTM E 119 - Standard Test Method for Fire Rated or Fire Resistive Construction; 2009
- G. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads; 2010
- H. ISO 105 A02-93 - Tests for Color Fastness - Part A02: Grey scale for assessing change in color.
- I. ISO 178 - Determination of Flexural Properties.
- J. ISO 527-3 - Determination of Tensile Properties.
- K. ISO 846 - Evaluation of the Action of Organisms.
- L. NFPA 268 - Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
- M. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Loading Bearing Wall Assemblies Containing Combustible Components.
- N. Greenguard and Greenguard Children and Schools TM 947-5.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide Manufacturer's data sheets on each product to be used.
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Indicate on submittal plan, section and elevations necessary to convey the layout, profiles and product components including edge conditions, panel joints, fixture locations, anchorage, accessories, finish colors, patterns and textures.

- D. Engineering Calculations: Submit engineering calculations as required by the local building code, showing that the installed panels and attachments system meets the wind load requirements for the project.
- E. Samples: Submit three \_\_\_\_\_, 4x4 inch (\_\_\_\_x\_\_\_\_ mm) in size, illustrating colors and textures specified.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.
  - 1. Products covered under the Work listed in this section are to be manufactured in an ISO 9001 certified facility.
- B. Installer Qualifications: All products in this section are to be installed by a single installer trained and approved by the manufacture or representative.
- C. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with the manufacturer's instructions.

#### 1.06 MOCK-UP

- A. Provide a mock-up for evaluation of the product and application workmanship.
  - 1. Do not proceed with remaining work until workmanship, color and sheen are approved by the Architect.
- B. Mock-up may remain as part of the Work.

#### 1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide ten year manufacturer's limited warranty for defects in materials.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Trespa North America; Product: Meteon; [www.trespa.com/na](http://www.trespa.com/na).
- B. Substitutions: See Section 01 6000 - Product Requirements.

#### 2.02 WALL PANELS

- A. Solid panel manufactured using a combination of high pressure and temperature to create a flat panel created from thermosetting resins, homogenously reinforced with wood-based fibers and an integrated decorative surface or printed decor.
- B. Colors: Single sided black reverse.
  - 1. Color A: Midnight Blue A22.6.3/ST, Matte Finish
  - 2. Color B (Gloss): Aquamarine UNI A28.2.1/GL, Gloss
  - 3. Color B (Matte): Aquamarine UNI A28.2.1/ST, Matte
- C. Panel Thickness: 3/8 inch thick (10mm).
- D. Physical Properties:
  - 1. Modulus of Elasticity: 1,300,000psi minimum per ISO 178.
  - 2. Tensile Strength: 10,100psi minimum per ISO 527-2.
  - 3. Flexural Strength: 14,500psi minimum per ISO 178.
  - 4. Thermal Conductivity: 2.1 BTU/inch/ft.2hr. degree F, EN 12524.
  - 5. Structural Performance (ASTM E330):

- a. Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 15 pounds per square foot (psf). Wind load testing shall be done in accordance with this standard to obtain the following results:
  - 1) Normal to the plane of the wall, the maximum panel deflection shall not exceed L/175
  - 2) Normal to the plane of the wall between supports, deflection of the aluminum sub-framing members shall not exceed L/175 or 3/4 inch, whichever is less.
    - (a) At 1-1/2 times design pressure, permanent deflection of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion.
    - (b) If system tests are not available, mock ups shall be constructed and tests performed under the direction of an independent third party laboratory which show compliance to the minimum standards listed above.
- E. Fire Performance:
  1. Flame Spread: Class A, ASTM E 84.
  2. Smoke Development: Less than 450, ASTM E 84.
  3. Ignition Temperature: Greater than 650 degree F above ambient, ASTM D 1929.
  4. Burning Classification: CC1 or CC2, ASTM D 635.
- F. Finish Performance: Electron Beam Cure Resin:
  1. Humidity Resistance: No formation of blisters when subjected to condensing water fog at 100% relative humidity and 100 degrees F for 3,000 hours, ASTM D 2247.
  2. Salt Spray Resistance: Corrosion creepage from scribe line and minimum blister rating of 8 within the test specimen, ASTM B 117.
  3. Weather Exposure: Accelerated - 3,000 hours in Atlas Type Weatherometer using cycle of 90 minutes light and 30 minutes diminished light and demineralized water with a maximum color change of 5 Delta E units from the original color, ASTM D 2244.
  4. Color Stability: The decorative surface comply with, classification, 4-5 measured with the grey scale according to ISO 105 A02-93 according to test method EN 438-2:29.
  5. Microbial Characteristics: Will not support micro-organic growth, ISO 846.
- G. Mounting System:
  - 1.
- H. Secondary Framing: Aluminum substructure designed to withstand structural loading due to wind load and the dead load of the panel painted as required to conceal behind the open joinery of the attachment system.
  1. Extrusions, formed members, sheet and plate shall conform with the recommendations of the manufacturer.
- I. Extruded Aluminum Trim: Color as selected by the Architect.
- J. Fasteners: Fasteners shall be non-corrosive and as recommended by panel manufacturer. Exposed fasteners shall be colored to match panels where required by the Architect.

### 2.03 FABRICATION

- A. Panels: Solid phenolic impregnated kraft paper wall panels with no voids, air spaces or foamed insulation in the core material. Accessory items in accordance with manufacturer's recommendations and approved submittals.
- B. Panel Weight: 3lb/ft<sup>2</sup>
- C. Panel Bow: <=0.079 inches

- D. Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrications shall be done under controlled shop conditions when possible.
- E. Appearance: Panel lines, breaks and angles shall be sharp, true and surfaces free from warp and buckle.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verification of Conditions: Verify that substrates are properly prepared, dry and free from defects to receive work and substrates are plumb, level and with no deflection greater than 1/4 inch in 20 feet.

#### **3.02 INSTALLATION**

- A. Install in accordance with manufactures instructions and shop drawings.
- B. Install panels plumb and level and accurately spaced in accordance with approved shop drawings to allow for necessary movement and structural support.
- C. Fasten panels with fasteners approved for use with supporting substrate.

**END OF SECTION**

**SECTION 07 4213**

**METAL WALL PANELS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Manufactured metal panels for walls, with related flashings, and accessory components.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 4000 - Cold-Formed Metal Framing: Wall panel substrate.
- B. Section 07 9005 - Joint Sealers.

**1.03 REFERENCE STANDARDS**

- A. Rheinzink Application in Architecture, 2nd Updated Edition, January 2002.
- B. SMACNA - Architectural Sheet Metal Manual; 2003 Edition

**1.04 DESIGN REQUIREMENTS**

- A. Wind Load: Design and engineer panel assemblies, including size and spacing of attachment devices, meeting requirements of local jurisdiction.
- B. Thermal Movement: Provide systems and connections, which allow for thermal movement resulting from ambient temperature range of 120 degree F.
- C. Structural Performance: Provide panels, anchors and attachments, which resist loads required by local jurisdiction as noted on the Structural Plans without permanent deflection or permanent deformation.
  - 1. System performance, based on project conditions and compliance with applicable codes and loading requirements, shall be the responsibility of the panel fabricator and installer.
  - 2. Information on Drawings referring to specific design of attachment, panel stiffening, and structural system is intended for information only.
- D. Weep Drainage: Provide clear internal paths of drainage behind panels in order to drain any trapped moisture to the exterior.
  - 1. Discharge of weep water shall be accomplished in a manner that avoids staining of architectural finishes, ponding or formation of icicles.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.
  - 1. Details for forming sheet metal components, including seams and dimensions
  - 2. Details for joining and securing sheet metal components, including layout and number of required fasteners, clips and other attachments. Include pattern of seams and spacing of fasteners.
  - 3. Details of termination points and assemblies, including fixed points.
  - 4. Details of expansion joints, including showing direction of expansion and contraction.
  - 5. Details of window and door penetrations at head, jamb and sill conditions.
  - 6. Details of specific conditions, integrating mechanical, electrical and plumbing conditions.
  - 7. Details of connections to adjoining work.
  - 8. Details of flashing and trim locations.
- C. Samples: Submit two samples of wall panel, 24 inch (\_\_\_\_ mm) by 24 inch (\_\_\_\_ mm) in size illustrating finish color, sheen, and texture.

- D. Calculations: Provide positive and negative wind load pressure calculations and certification of the performance of this work prepared and sealed by a Professional Structural Engineer licensed in the State of California.
- E. Certification from the fabricator and installer, certifying that the installed systems meet the specified performance requirements and those of authorities having jurisdiction.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of experience.
- B. Source: Provide corrugated panels, which are the product of one manufacturer. Provide secondary materials, which are acceptable to the zinc manufacturer.
- C. Fabricator Qualifications: Company specializing in fabricating and working with materials specified in this section with a minimum five years experience.
  - 1. Metal Tech-USA; 770 486.8825; www.metaltech-usa.com
  - 2. Morin Corporation; 800 700.6140; www.kingspanpanels.us
  - 3. Firestone Metal Products; 858 603.1186
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of experience. Installer to provide installation of panels, underlayment and attachments to substructures.
  - 1. Tinco Sheet Metal; 323 263.0511
  - 2. California Sheet Metal; 619 562.7010
  - 3. Weiss Sheet Metal; 310 354.2700
  - 4. C & J Sheet Metal; 562 634.8823

#### **1.07 MOCK-UP**

- A. Construct mock-up, ten feet (\_\_\_\_ m) long by ten feet (\_\_\_\_ m) wide; include panel system,, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, related insulation in mock-up.
- B. Locate at direction of Owner.
- C. Mock-up may remain as part of the Work.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

#### **1.09 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Submit 2-part, 5-year, written, signed and sealed warranty:
  - 1. Manufacturer covering defects in zinc materials.
  - 2. Manufacturer of other components of the wall assembly for their material defects.
  - 3. Installer agreeing to repair or replace systems or components as a result of workmanship defects.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Zinc Alloy Sheet/ Coils.
  - 1. Titanium Zinz Alloy whose base is electrolytic high grade fine zinc (DIN EN 1179) with a 99.995% Zn degree of purity and alloying additives of 1% copper and 1% titanium in accordance with DIN EN 988.
    - a. Finish: Preweathered Blue Gray, backside coated with elastomeric finish as manufactured by PPG Industries.
      - 1) Exposed surface coatings (phosphate or others) are not acceptable.
    - b. Shape: Trapezoidal corrugated panels, 1 13/16 inch face exterior panel installed horizontally.
    - c. Minimum Panel Thickness: 1.0mm
    - d. Minimum Flashing Thickness: 0.7mm
    - e. Custom copings and related sheet metal work fabricated from zinc, copper and titanium alloy sheet.
- B. Manufacturers:
  - 1. Rheinzink America: [www.rheinzink.com](http://www.rheinzink.com).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

## 2.02 MANUFACTURED METAL PANELS

- A. Wall Panel System: Preformed and prefinished metal panel system of horizontal ribbed profile; site assembled.
- B. Internal and External Corners: Same material, thickness, and finish as exterior sheets; trapezoidal horizontal profile to suit system; brake formed to required angles.
- C. Expansion Joints: Same material, thickness and finish as exterior sheets; 20 gage (\_\_\_\_ mm thick); manufacturer's standard brake formed type, of profile to suit system.
- D. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
- E. Anchors: Stainless steel or zinc.

## 2.03 ACCESSORIES

- A. Provide all components necessary for a complete, functional, weatherproof assembly including, but not limited to, trims, copings, fascias, sills, flashings, counter flashings, door frame trim, corner units, clips, wall caps, copings, sealants, closures and fillers. Metal materials shall match panels and be zinc compatible.
- B. Sealants: Manufacturer's standard type suitable for use with installation of system; non-staining and non-sagging.
  - 1. Seam Sealing Tape: Pressure sensitive 100% solid polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, non-toxic tape.
  - 2. Joint Sealant: DOW 795; backer rod shall be extruded polyethylene foam such as DOW Ethafoam SB or equal.
  - 3. Color: To be selected by Architect.
- C. Non-Permeable Underlayment and Ice Dam Protection: Self adhering, high-temperature composit, butyl rubber-based, polyethylene-backed membrane.
  - 1. Vycor Ultra by WR Grace or equal.
- D. Permeable Underlayment: Permeable breather type underlayment membrane.
  - 1. Roofshield by A Proctor Group or equal.
- E. Fasteners: Manufacturer's standard type to suit application; stainless steel or zinc, corrosion free. Fastener cap same color as exterior panel.
- F. Solder: Lead-tin solder containing 40% tin and 60% lead to DIN 1707 termed L-Pb Sn 40 (Sb). Flux: Felder ZD-Pro or equal.

## 2.04 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest practicable lengths.
- C. Fabricate corners in one continuous piece with minimum 24 inch (\_\_\_\_ mm) returns.
- D. Corrugated Panels: Form corrugated panels from zinc alloy sheets, with profiles as indicated.
- E. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with substrate materials that are non-compatible or could result in corrosion or deterioration of either material or finishes.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that building framing members are ready to receive panels.
- B. Verify that water-resistive barrier has been installed over substrate completely and correctly.

### 3.02 PREPARATION

- A. Verify field dimensions prior to fabrication.
- B. Install membrane on substrate surfaces to receive metal panels.

### 3.03 INSTALLATION

- A. Install panels on walls in accordance with manufacturer's instructions.
- B. Separate non-compatible materials with a rubberized asphalt underlayment.
- C. Fasten panels to structural supports; aligned, level, and plumb.
  - 1. Fabricate and install work with lines and corners of exposed units true and accurate.
  - 2. Form exposed faces free of buckles, excessive waves, and avoidable tool marks considering temper and reflectivity of metal.
  - 3. Shim and align panel units within installed tolerance of 1/4 inch in 20 feet.
  - 4. All seams shall be of uniform appearance, dimensions and straight and level.
  - 5. Form all seams to be weatherproof, leaving room for expansion and contraction with specified and required tolerances.
- D. Locate joints over supports. Lap panel ends minimum 2 inches (50 mm).
- E. Provide minimum 3/4 inch uninterrupted ventilation at backside of corrugated panels regardless of orientation of panel corrugations. Provide base, sill, head and parapet conditions that allow for entrance and exit of ventilation air.

### 3.04 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Remove protective films from exposed surfaces of panels upon completion of installation per manufacturer's instructions.
- C. Protect installed panels from adjacent work or cleaning operations.
- D. Replace damaged panels and other components that have been damaged or have deteriorated beyond successful repair by means of finish touch-ups or similar minor repair.
- E. Clean exposed surfaces that would interfere with uniform oxidation and weathering and as recommended by manufacturer.

**END OF SECTION**

## SECTION 07 9005

### JOINT SEALERS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Sealants and joint backing.

##### 1.02 REFERENCE STANDARDS

- A. ASTM C 834 - Standard Specification for Latex Sealants; 2005.
- B. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2005.
- C. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2009.
- D. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; [www.aqmd.gov](http://www.aqmd.gov).

##### 1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics.

##### 1.04 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

##### 1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

#### PART 2 PRODUCTS

##### 2.01 SEALANTS

- A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
- B. General Purpose Exterior Sealant: Acrylic, solvent release curing; ASTM C 920, Grade NS, Class 12-1/2, Uses M, G, and A; single or multi- component.
  - 1. Color: To be selected by Architect from manufacturer's standard range.
  - 2. Applications: Use for:
    - a. Control, expansion, and soft joints in masonry.
    - b. Joints between concrete and other materials.
    - c. Joints between metal frames and other materials.
    - d. Other exterior joints for which no other sealant is indicated.
- C. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.
  - 1. Color: To be selected by Architect from manufacturer's standard range.
  - 2. Applications: Use for:
    - a. Interior wall and ceiling control joints.
    - b. Joints between door and window frames and wall surfaces.

- c. Other interior joints for which no other type of sealant is indicated.
- D. Bathtub/Tile Sealant: White silicone; ASTM C 920, Uses I, M and A; single component, mildew resistant.
  - 1. Applications: Use for:
    - a. Joints between plumbing fixtures and floor and wall surfaces.
    - b. Joints between kitchen and bath countertops and wall surfaces.
- E. Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Grade P, Class 25, Uses T, M and A; single component.
  - 1. Color: To be selected by Architect from manufacturer's standard range.
  - 2. Applications: Use for:
    - a. Expansion joints in floors.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

#### **3.02 PREPARATION**

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

#### **3.03 INSTALLATION**

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C 1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.

#### **3.04 CLEANING**

- A. Clean adjacent soiled surfaces.

#### **3.05 PROTECTION**

- A. Protect sealants until cured.

**END OF SECTION**

## SECTION 08 1113

### HOLLOW METAL DOORS AND FRAMES

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Non-fire-rated steel doors and frames.
- B. Thermally insulated steel doors.

##### 1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware.
- B. Section 09 9000 - Painting and Coating: Field painting.

##### 1.03 REFERENCE STANDARDS

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.
- B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.
- C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004).
- D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009.
- E. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.
- F. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.

##### 1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

##### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Steel Doors and Frames:
  - 1. Windsor Republic Doors: [www.republicdoor.com](http://www.republicdoor.com).
  - 2. Steelcraft: [www.steelcraft.com](http://www.steelcraft.com).
  - 3. Ceco Door Products; [www.cecodoor.com](http://www.cecodoor.com).
  - 4. Substitutions: Not permitted.

## 2.02 DOORS AND FRAMES

- A. Requirements for All Doors and Frames:
  - 1. Accessibility: Comply with ANSI/ICC A117.1.
  - 2. Door Top Closures: Flush with top of faces and edges.
  - 3. Door Texture: Smooth faces.
  - 4. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
  - 5. Finish: Factory primed, for field finishing.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

## 2.03 STEEL DOORS

- A. Exterior Doors:
  - 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
  - 2. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
  - 3.
- B. Interior Doors, Non-Fire-Rated:
  - 1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 1, full flush.

## 2.04 STEEL FRAMES

- A. General:
  - 1. Comply with the requirements of grade specified for corresponding door.
    - a. ANSI A250.8 Level 1 Doors: 16 gage frames.
    - b. ANSI A250.8 Level 3 Doors: 14 gage frames.
  - 2. Finish: Same as for door.
  - 3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
  - 4. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches (100 mm) high to fill opening without cutting masonry units.
  - 5. Anchors:
    - a. In masonry walls, provide 0.156 inch thick wire-type or with adjustable 16 gauge, A60 T-strap not less than 2 inch x 10 inch.
    - b. Floor anchors to be 14 gauge welded to inside of jamb.
- B. Exterior Door Frames: Face welded, seamless with joints filled.
  - 1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
  - 2. Weatherstripping: Separate, see Section 08 7100.
- C. Interior Door Frames, Non-Fire-Rated: Fully welded type.
  - 1. Terminated Stops: Provide at all interior doors; closed end stop terminated 6 inches (150 mm) above floor at 45 degree angle.

## 2.05 ACCESSORY MATERIALS

- A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
- B. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

- C. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

## **2.06 FINISH MATERIALS**

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

### **3.02 PREPARATION**

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

### **3.03 INSTALLATION**

- A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- B. Coordinate frame anchor placement with wall construction.
- C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- D. Coordinate installation of hardware.
- E. Touch up damaged factory finishes.

### **3.04 ADJUSTING**

- A. Adjust for smooth and balanced door movement.

**END OF SECTION**

## SECTION 08 3313

### COILING COUNTER DOORS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Non-fire-rated coiling counter doors and operating hardware.

##### 1.02 REFERENCE STANDARDS

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009.

##### 1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish.
- C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.
- D. Manufacturer's Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.
- E. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Coiling Counter Doors:
  - 1. The Cookson Company; Product XXX; [www.cooksondoor.com](http://www.cooksondoor.com).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

##### 2.02 COILING COUNTER DOORS

- A. Coiling Counter Doors, Non-Fire-Rated: Galvanized steel slat curtain.
  - 1. Mounting: Exterior face mounted.
  - 2. Nominal Slat Size: 1-1/4 inches (32 mm) wide.
  - 3. Slat Profile: Flat, perforated.
  - 4. Finish: Factory baked enamel.
  - 5. Color: As selected by Architect from manufacturer's full range.
  - 6. Guides: Formed track; same material and finish unless otherwise indicated.
  - 7. Hood: Manufacturer's standard; material and finish to match curtain.
  - 8. Operation: Manual hand crank lift operation.
    - a. Hand crank to be located in interior of Lookout Tower adjacent to door and be equipped with locking mechanism to accommodate pad or combination lock.

##### 2.03 MATERIALS

- A. Curtain Construction: Interlocking, single thickness slats.
  - 1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
  - 2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.

3. Steel Slats: ASTM A 653/A 653M galvanized steel sheet, with minimum G90/Z275 coating; minimum thickness 22 gage, 0.03 inch (0.76 mm).
- B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
- C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
- D. Latching: Inside mounted, sliding deadbolt.
- E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb (10 kg) nominal force to operate.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that opening sizes, tolerances and conditions are acceptable.

#### **3.02 INSTALLATION**

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

#### **3.03 TOLERANCES**

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch (1.5 mm).
- C. Maximum Variation From Level: 1/16 inch (1.5 mm).
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3 mm per 3 m) straight edge.

#### **3.04 ADJUSTING**

- A. Adjust operating assemblies for smooth and noiseless operation.

#### **3.05 CLEANING**

- A. Clean installed components.
- B. Remove labels and visible markings.

**END OF SECTION**

## SECTION 08 3323

### OVERHEAD COILING DOORS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Overhead coiling doors, operating hardware, exterior, manual operation.

##### 1.02 REFERENCE STANDARDS

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009.
- B. ASTM B-117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

##### 1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, component connections and details, \_\_\_\_\_.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Manufacturer's Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.

##### 1.04 QUALITY ASSURANCE

- A. Overhead coiling doors shall be designed to a standard maximum of 25 cycles per day and an overall maximum of 50,000 operating cycles for the life of the door.
- B. Overhead coiling doors are to be installed by a manufacturer's authorized representative.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Overhead Coiling Doors:
  - 1. The Cookson Company; Product FP-Push Up Service Door: [www.cooksondoor.com](http://www.cooksondoor.com).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

##### 2.02 COILING DOORS

- A. Exterior Coiling Doors: Steel slat curtain.
  - 1. Capable of withstanding positive and negative wind loads of 20 psf (940 Pa), without undue deflection or damage to components.
  - 2. Single thickness slats.
  - 3. Nominal Slat Size: 2 inches (50 mm) wide x required length.
  - 4. Finish: Factory painted, color as selected.
    - a. Provide manufacturer's standard ColorCote system consisting of the following:
      - 1) Hot dipped galvanized G-90 coating in accordance with ASTM A-653.
      - 2) Bonderized coating for prime coat adhesion.
      - 3) Factory applied Thermosetting Powder Coating applied with a minimum thickness of 2 mils.
      - 4) Exhibit no corrosion in accordance with ASTM B-117 for 1,000 hours.
    - b. Submit full color line for selection of color by Architect.
  - 5. Guides: Angles; galvanized steel.
  - 6. Hood Enclosure: Manufacturer's standard; primed steel.
  - 7. Mounting: As indicated.

8. Exterior lock and latch handle.
9. Guide and header seal with bottom astragal.

### **2.03 MATERIALS**

- A. Curtain Construction: Interlocking slats.
  1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
  2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
  3. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
- B. Steel Slats: Minimum 22 gage (\_\_\_\_\_ mm) ASTM A 653/A 653M galvanized steel sheet.
- C. Guide Construction: Continuous, of profile to retain door in place, mounting brackets of same metal.
- D. Steel Guides: 3 steel angles bolted together with 3/8 inch fasteners to form a channel with an extruded vinyl snap-on weatherstripping continuously along the exterior leg of the guide. The wall angle portion shall be continuous and fastened to the surrounding structure with either minimum 1/2 inch fasteners or welds, both on 36 inches on center.
  1. Galvanizing: Minimum G90/Z275 coating.
- E. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
  1. Minimum 24 gage (\_\_\_\_\_ mm thick).
- F. Hardware:
  1. Latching: Inside mounted, adjustable keeper, spring activated latch bar with feature to keep in locked or retracted position.
  2. Latch Handle: Interior and exterior handle.
- G. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb (10 kg) nominal force to operate.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that opening sizes, tolerances and conditions are acceptable.

#### **3.02 INSTALLATION**

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 9005.

#### **3.03 TOLERANCES**

- A. Maintain dimensional tolerances and alignment with adjacent work.

- B. Maximum Variation From Plumb: 1/16 inch (1.5 mm).
- C. Maximum Variation From Level: 1/16 inch (1.5 mm).
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3 mm per 3 m) straight edge.

**3.04 ADJUSTING**

- A. Adjust operating assemblies for smooth and noiseless operation.

**3.05 CLEANING**

- A. Clean installed components.
- B. Remove labels and visible markings.

**END OF SECTION**

**SECTION 08 4313**

**ALUMINUM-FRAMED STOREFRONTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Aluminum-framed storefront, with vision glass.

**1.02 RELATED REQUIREMENTS**

- A. Section 08 8000 - Glazing: Glass and glazing accessories.

**1.03 REFERENCE STANDARDS**

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2004.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.
- C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2008.
- D. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2007.
- E. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.
- F. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002.
- G. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit three samples 4x4 inches (\_\_\_\_x\_\_\_\_ mm) in size illustrating finished aluminum surface, glass, infill panels, glazing materials.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Handle products of this section in accordance with AAMA CW-10.

- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

#### **1.07 TESTING AND PERFORMANCE REQUIREMENTS**

- A. Storefront Window System:
  - 1. Provisions for Thermal Movements
    - a. Storefront framing systems shall be designed to provide for thermal movement of all component materials resulting from surface temperatures ranging from 110 degrees F to 50 degrees F without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or other detrimental effects. Operating windows and doors shall function normally over this temperature range.
  - 2. Test Procedures and Performance
    - a. Air Infiltration Test
      - 1) Test unit in accordance with ASTM E 283 at a static air pressure difference of 6.24psf.
      - 2) Air infiltration shall not exceed .06 cfm per square foot of fixed wall area.
    - b. Water Resistance Test
      - 1) Test unit in accordance with ASTM E 331.
      - 2) There shall be no uncontrolled water leakage at a static test pressure of 12.0psf.
    - c. Uniform Load Deflection Test
      - 1) Test in accordance with ASTM E 330.
      - 2) The system shall withstand 20 psf positive and negative design wind pressure normal to the plane of the wall.
      - 3) Deflection under design load shall not exceed L/175 of the clear span.
    - d. Uniform Load Structural Test
      - 1) Test in accordance with ASTM E 330 at a pressure of 1.5 times the design pressure for Uniform Load Test Deflection Test.
      - 2) At conclusion of the test, there shall be no glass breakage, permanent damage to fasteners, storefront parts, or any other damage that would cause the storefront to be defective.

#### **1.08 DESIGN REQUIREMENTS**

- A. Wind Load: 20psf

#### **1.09 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Five (5) year manufacturer's warranty to cover complete assembly for operation and weather tightness.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Efco; Product 402: [www.efco-corp.com](http://www.efco-corp.com).
- B. Other Acceptable Manufacturers:
  - 1. Kawneer North America: [www.kawneer.com](http://www.kawneer.com).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

#### **2.02 STOREFRONT**

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
  - 1. Glazing Position: Center.

2. Finish: Grey with manufacturer's clear coat system to finished units.

### **2.03 COMPONENTS**

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

### **2.04 MATERIALS**

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M).
- B. Fasteners: Stainless steel.
- C. Glass: As specified in Section 08 8000.

### **2.05 FINISHES**

- A. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.

### **2.06 FABRICATION**

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- E. Arrange fasteners and attachments to conceal from view.
- F. Reinforce framing members for imposed loads.
- G. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
  1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

### **3.02 INSTALLATION**

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- J. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.
- K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

### **3.03 CLEANING**

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.

### **3.04 PROTECTION**

- A. Protect installed products from damage during subsequent construction.

**END OF SECTION**

**SECTION 08 7100**

**DOOR HARDWARE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Interior and exterior finish hardware as indicated on Door Schedule and Drawings, and specified herein.
- B. Provide all labor, materials, equipment, trim, fastenings, associated attachments, and accessories necessary to provide a complete and proper installation.
- C. Coordination with other trades for complete installation.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 9005 - Joint Sealers
- B. Section 08 1113 - Hollow Metal Doors and Frames
- C. Section 08211 - Plastic Faced Wood Doors
- D. Section 08 4313 - Aluminum Framed Storefronts

**1.03 QUALITY ASSURANCE**

- A. Manufacturers – As specified in Part 2 and Part 3.
- B. Qualifications of Manufacturer – The proposed manufacturer of finish hardware shall have been successfully engaged in the manufacture of finish hardware for at least five (5) years immediately prior to the start of this work.
- C. Qualifications of Installers – Work to be performed only by workers thoroughly skilled and specially trained in the techniques of installing finish hardware, and who are completely familiar with the published recommendations of the manufacturer of the material being used. Installer to have a minimum of three (3) years experience with institutional/ commercial grade finish hardware.
- D. Hardware Supplier: Company specializing in supplying institutional door hardware with three years documented experience. Company shall employ Architectural Hardware Consultant (AHC) who shall be available for jobsite meetings and required by Architect, Owner and Contractor. Architectural Hardware Consultant to visit the jobsite at end of installation and accomplish the following:
  - 1. Re-adjust hardware as required.
    - a. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner personnel.
      - 1) Identify items that have deteriorated or failed.
      - 2) Submit written report identifying problems.
- E. Contractor is responsible for coordinating finish hardware with Doors and Frames as specified in Sections 08110, 08210 and 08410. This includes the Contractor providing templates and/or physical samples of approved finish hardware items to pertinent manufacturers of interfacing items.

**1.04 REFERENCES**

- A. ANSI 117.1 – Specifications for making buildings and facilities accessible to and usable by Physically Handicapped People.

- B. Conform to Chapter 10, California Building Code and NFPA Standard Number 80, for requirements applicable to fire rated doors and frames.
- C. Provide UL labels on all panic devices in fire-rated openings.
- D. Provide California State Fire Marshall Listing for all fire exit hardware.
- E. Comply with ADA- Americans with Disabilities Act, and as shown on Drawings.
- F. BHMA – Builder's Hardware Manufacturers Association.
- G. DHI – Door and Hardware Institute.
- H. NAAMM – National Association of Architectural Metal Manufacturer.
- I. CBC – California Building Code.
- J. SDI – Steel Door Institute.

#### **1.05 SUBMITTALS**

- A. Product Data – Submit material specifications, manufacturer's installation, and maintenance instructions under provisions of Section 01 3000.
- B. Shop Drawings under provisions of Section 01 3000. Drawings to include:
  - 1. Complete materials list of all items, including catalog cuts and keying description for each hardware group.
  - 2. Hardware schedule that is to include all door locations, sizes, materials, labels, proper handing and details.
  - 3. Indicate locations, mounting heights, quantity, and part numbers of each type of hardware.
  - 4. Include manufacturer's certification that fire-rated hardware meets specified requirements.
  - 5. Use BHMA Finish Codes per ANSI A156.18
  - 6. Explanation of abbreviations, symbols and codes contained in schedule.
  - 7. Manufacturer's technical data and installation instructions for electronic hardware.
  - 8. Provide final keying charts for Owner approval.

#### **1.06 PRODUCT HANDLING**

- A. Protection
  - 1. Hardware to be stored at the job site in a safe, secure, dry place with all labels intact and legible at time of installation.
  - 2. Use all means to protect hardware before, during, and after installation. Do not allow products to become wet or damp.
- B. Replacements – In the event of damage, including water intrusion, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.
- C. Delivery
  - 1. Package hardware items individually; group small items together, label and identify; package with door opening code to match hardware schedule. Identify location of each door opening. Deliver in strong sturdy containers.

#### **1.07 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty information
- B. Provide a two-year warranty for Contractor's installation and for all products. These warranties are to include the following language:
  - 1. "For a period of not less than two (2) years, we (Firm Name) will service and or replace, at no charge to the Owner, any part proving defective due to faulty manufacture or materials.

This guarantee does not cover abnormal operation conditions or abusive jobsite treatment after acceptance of Work by Owner."

**PART 2 PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS**

ITEM:	MANUFACTURER	ACCEPTABLE SUBSTITUTION
Hinges	(IVE) Ives	Bommer
Key System	(SCH) Schlage	Owner's Standard
Locks	(SCH) Schlage	Owner's Standard
Exit Devices	(VON) Von Duprin	Owner's Standard
Closers	(LCN) LCN	Owner's Standard
Auto Flush Bolts	(IVE) Ives	DCI
Coordinators	(IVE) Ives	DCI
Silencers	(IVE) Ives	Rockwood
Push and Pull Plates	(IVE) Ives	Rockwood
Kickplates	(IVE) Ives	Rockwood
Stops and Holders	(IVE) Ives	Rockwood
Overhead Stops	(GLY) Glynn-Johnson	ABH
Thresholds	(PEM) Pemko	Zero
Metal Access Ramps	(PEM) Pemko	None Available
Seals and Bottoms	(PEM) Pemko	Zero
Key Cabinets	(LUN) Lund	TelKee

**0**

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.
- C. Miscellaneous – All other items, tools, materials, and equipment, not specifically described but required for a complete and proper installation of finish hardware, as recommended by the manufacturer, subject to the approval of the Architect.

**2.02 GENERAL**

- A. Proprietary Products – References to specific proprietary products are used to establish minimum standards of utility and quality. Unless otherwise approved by the Architect, provide only the specific products. Design is based on the materials specified. Other materials may be considered by the Architect in accordance with the provisions of Section 01 3000.
- B. Fasteners
  - 1. Furnish all finish hardware with all necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.
  - 2. Furnish fastenings where necessary with expansion shields, toggle bolts, sex bolts, and other anchors approved by the Architect, according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer.
  - 3. All fastenings shall harmonize with the hardware as to material and finish.
- C. Finishes – All hardware shall match the finish of the locksets, unless specified otherwise. Take special care to coordinate all of the various manufactured items furnished under this Section, to ensure acceptably uniform finish.

- D. Single Source – Unless otherwise noted or approved in advance by the Architect, furnish for each item.

### 2.03 KEYING

- A. All locks and cylinders shall be keyed to an existing 6-pin grandmaster key system. Furnish 6 of each master keys. furnish 3 change keys per lock. Keyway shall be Schalgé 6 pin 'C'.
- B. Master Keying – Key all cylinders and locks as directed by the Owner and Architect.
- C. Number of Keys – Furnish three (3) keys for each level of keying, as directed by Architect.
- D. Construction Keying – Furnish a manufacturer's standard construction master key system. Furnish 3 master keys. Use only the construction keys during construction.
- E. Identification and Delivery – Factory stamp permanent keys as directed by Architect. Identify permanent keys with tags, and deliver directly to the Owner from the manufacturer (via security shipment). Factory stamp permanent keys, "DO NOT DUPLICATE". Provide key bitting chart to Architect when requested to do so in writing.
- F. Interchangeable Construction Keying: Furnish temporary keyed-alike cylinders and cores. Remove at Substantial Completion and install permanent cylinders and cores in Owner's presence. Demonstrate that construction key no longer operates.

### 2.04 KEY CONTROL SYSTEM

- A. Only provide wall-mounted key cabinet, 18 gauge construction, piano-hinged door with lock. Provide manufacturer's standard Two-Tag system including Cross Reference Binder, envelopes, labels, tags with self-locking key clips, receipt forms temporary and permanent markers. Hooks numbered 1-50.
- B. Cabinet Size: Sufficient for capacity for 150% of the locks required for the project.
- C. Internal Hooks: Number consecutively from Number 1 up to 50.
- D. Mount at direction of Owner.

### 2.05 FINISHES

- A. Finishes are identified in Schedule at end of this Section and conform to the following standards of symbols.

1. Finish/Description	US Symbol	BHMA No.
2. Prime Coat	PC	600
3. Polished Brass	3	605
4. Satin Brass	4	606
5. Polished Bronze	9	611
6. Satin Bronze	10	612
7. Oil Rubbed Bronze	10B	613
8. Satin Chromium	26D	626/652
9. Polished Chromium	26	625/651
10. Stainless Steel	32D	630
11. Polished Stainless Steel	32	629

## PART 3 EXECUTION

### 3.01 DELIVERIES

- A. Stockpile all items sufficiently in advance to ensure their availability, and make all necessary deliveries in a timely manner to ensure orderly progress of the total work.

### 3.02 SURFACE CONDITIONS

- A. Inspection
  - 1. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
  - 2. Verify that the finish hardware may be installed in accordance with the approved design.
  - 3. Verify that power supply is available to power operated devices.
  - 4. Commencement of work means acceptance of existing conditions.
- B. Discrepancies
  - 1. In the event of discrepancy, immediately notify the Architect.
  - 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

### **3.03 PREPARATION AND INSTALLATION**

- A. Field verify dimensions prior to installation.
- B. Install all finish hardware in strict accordance with the manufacturer's current recommendations, installing completely level, and anchoring firmly for long life under hard use.
- C. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the Work of this Section.
- D. Upon completion of the installation, and as a condition of its acceptance, visually inspect all finish hardware furnished under this Section and place in optimum working condition.
- E. Install hardware in accordance with Manufacturer's instructions and with CBC Section 1133B.2.5.1.
- F. Conform to ANSI A117.1 for positioning requirements for accessibility.
- G. Use the templates provided by hardware item manufacturer.
- H. Mounting heights for Hardware:
  - 1. Locate levers, key cylinders, t-turn pieces, touch bars and other operable portions of latching hardware between 30" and 44" above the finished floor per CBC Section 1133B.2.5.2.
  - 2. Hinges: 5 inches from head of opening to top of top hinge; 10 inches from finish floor to bottom of bottom hinge; intermediate hinge(s) spaced equidistant between top and bottom butts.
- I. Secure finish hardware with suitable fasteners of the same material and finish as the item being attached.
- J. Provide expansion anchors for attaching hardware items to concrete or masonry.
- K. After fitting hardware to doors remove all finish hardware except butt hinges, carefully replace in properly marked boxes and place in storage until painting and finishing is completed. After painting and finishing is completed, permanently install finish hardware.
- L. Secure finish hardware with suitable fasteners of the same material and finish as the item being attached.
- M. Mount exit devices and closers on mineral or particle core fire doors with closed head sex bolts.
- N. Install jamb applied gaskets before closers, overhead stops, rim strikes, etc. Fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.

### **3.04 FASTENERS**

- A. Screw for strikes, face plates and similar items shall be flat Phillips head, countersunk type; provide machine screws for metal and standard wood screws for wood.
- B. Screws for butt hinges shall be flat Phillips head, countersunk, full-thread type.
  - 1. Fastening of closer bases of closer shoe to doors shall be by means of sex bolts and spray painted to match closer finish.

### 3.05 BUTT HINGES

- A. Furnish 3 each 4 ½" ball or lube bearing hinges at doors up to 89" tall. Furnish one additional hinge for each additional 30" of door height.
- B. Furnish 5" extra heavy duty hinges at doors 42" and wider and where listed in the hardware groups.
- C. Provide sufficient hinge width to clear trim and allow 180 degree swing.
- D. All hinges shall be manufactured in the United States.

### 3.06 LOCKS

- A. Provide locks as scheduled with 2-¾" backset. Locks for labeled doors shall have a fusible link mechanism to prevent retraction in the event of fire.
- B. Furnish strikes with curved lip of sufficient length to clear trim and protect clothing.

### 3.07 DOOR CLOSERS

- A. Provide adjustable closers with the following maximum pressure for opening doors. Adjust closers after installation and test doors in the event of fire.
  - 1. Interior Doors: 5.0 pounds of pressure
  - 2. Exterior Doors: 8.5 pounds of pressure
  - 3. Fire Doors: 15.0 pounds of pressure
- B. Comply with CBC Section 1133B.2.5.
- C. Factory Representative shall visit project prior to acceptance of project by Owner to insure installation and adjustment of closers is correct.
- D. Furnish mounting plates and brackets as necessary to allow for a complete installation.

### 3.08 SIGNS

- A. Exit doors with dead locks (for 'B' occupancies) shall have indicating type lock hardware or appropriate signing in accordance with CBC Sections 1117B.5 and 1103.2.4, 'THIS DOOR TO REMAIN UNLOCKED WHENEVER THE BUILDING IS OCCUPIED'. Doors with panic devices are excepted from this provision.

### 3.09 PANIC DEVICES

- A. All panic devices must meet ANSI Standard 156.3 Grade 1. Panic devices must be UL Listed and California Fire Marshall Listed. Comply with CBC Section 1003.3.1.9. All Rail Assemblies shall be made of brass, bronze or stainless steel. Springs shall be manufactured of stainless steel. Push rail height shall be 40" from floor to centerline. All trim shall be thru bolted. Provide fire rated devices at labeled openings as noted in the Door Schedule.

### 3.10 AUTOMATIC FLUSH BOLTS AND COORDINATORS

- A. Shall be tested by independent lab for cycle test of 100,000 cycles minimum. Units must comply with UL specifications for use on fire rated openings up to three (3) hours for metal doors and one and one half (1 ½) hour for wood doors. Units shall work with five (5) pounds of closing force for top and bottom bolts. Auto flushbolts shall have a built-in override feature engineered

to prevent damage to door, frame, or bolt assembly should circumstances prevent normal operation.

### 3.11 THRESHOLDS AND DOOR SEALS

- A. Extruded thresholds shall be made from S6063-T5 Alloy aluminum, and/or #385 alloy bronze (brass) as noted in hardware schedule. Thresholds shall comply with CBC Section 1133B.2.4.1. Door seals and thresholds for fire labeled doors shall be tested and approved by an independent laboratory as follows:
  - 1. NFPA 105-1989
  - 2. UL-1784
  - 3. UL10B and C
- B. Provide seals and thresholds as noted in hardware schedule and/or on sill details. Provide carpet separators as necessary to comply with fire codes. All exterior thresholds shall be set in a full bed of butyl mastic.

### 3.12 SECURITY PULLS

- A. Provide 1096HA/1097HA Pulls as noted in schedule. All pulls shall be manufactured with 316SS material. Pull shall be approved for accessibility and shall furnished in finish noted. Provide stainless steel SNB fasteners for each pull..

### 3.13 PUSH, PULLS, STOPS AND KICK PLATES

- A. Push-pulls, stops and kick plates shall be provided by one manufacturer. All products shall be provided in aluminum, brass, bronze or stainless steel base metals. Kick plates to 0.50" material, beveled on four edges. Sharp edges on Push, Pull and Kick Plates will be subject to rejection and replacement. All floor stops and holders shall be mounted within 4 inches of adjacent walls and partitions per DSA Policy 99-8.

### 3.14 PROTECTING AND CLEANING

- A. Upon completion of the work, remove surplus materials, rubbish and debris resulting from the finish hardware installation. Leave areas in neat, clean, and orderly condition.
- B. Cover installed hardware and protect from paint, cleaning agents, etc. Remove prior to Substantial Completion and clean hardware for acceptance by Owner.
- C. Repair or replace any damaged work.
- D. Use manufacturer-recommended cleaning agents.

### 3.15 KEY CHANGING

- A. At the time of final acceptance of the work, void the constructin key system and, in the presence of the Owner, demonstrate that the specified keying system is operating properly.

### 3.16 SCHEDULE

DOOR	HW SET
101	01
102	07
103	02
104	03
105	03
106	03
107	01
108	07

109	05
110	05
111	06
201	04
202	04
203	07
204	07
205	07

**HW SET: 001**

4EA	HINGE	3CB1 4.5 X 4.5	630	IVE
1EA	STOREROOM LOCK	LV9480L 17A	630	SCH
1EA	CYLINDER	CYLINDER(S) AS REQUIRED	626	C-R
1EA	SURFACE CLOSER	4011 SRI	689	LCN
1EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1EA	SECURITY FLOOR STOP	FS18L	BLK	IVE
1SET	SEALS	129NSS	630	NGP
1EA	DOOR SWEEP	200NSS	630	NGP
1EA	THRESHOLD	THRESHOLD PER DETAIL	AL	NGP

**HW SET: 002**

3EA	HINGE	3CB1HW 4.5 X 4.5	630	IVE
1EA	PRIVACY LOCK	LV9496L 17A L583-363	630	SCH
1EA	CYLINDER	CYLINDER(S) AS REQUIRED	626	C-R
1EA	SURFACE CLOSER	4041T DEL SRI X ST3135	689	LCN
1EA	WALL STOP	WS407CVX X MASONRY ANCHORS	630	IVE
3EA	SILENCER	SR64/65/66 AS REQUIRED	GRY	IVE
1EA	RESTROOM SIGN	SB443/444/445 AS REQUIRED	BLU	SBH

**HW SET: 003**

3EA	HINGE	3CB1HW 4.5 X 4.5	630	IVE
1EA	PRIVACY LOCK	LV9496L 17A L583-363	630	SCH
1EA	CYLINDER	CYLINDER(S) AS REQUIRED	626	C-R
1EA	SURFACE CLOSER	4041T SRI	689	LCN
1EA	WALL STOP	WS407CVX X MASONRY ANCHORS	630	IVE
3EA	SILENCER	SR64/65/66 AS REQUIRED	GRY	IVE
1EA	RESTROOM SIGN	SB443/444/445 AS REQUIRED	BLU	SBH

**HW SET: 004**

4EA	HINGE	3CB1 4.5 X 4.5 NRP SH	630	IVE
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1EA	CLASSROOM LOCK	LV9070L 17A	630	SCH
1EA	CYLINDER	CYLINDER(S) AS REQUIRED	626	C-R
1EA	SURFACE CLOSER	4111 SHCUSH SRI	689	LCN
1EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1SET	SEALS	129NSS	630	NGP
1EA	DOOR SWEEP	200NSS	630	NGP
1EA	THRESHOLD	THRESHOLD PER DETAIL	AL	NGP
1EA	LOCK GUARD	LG12	630	IVE

**HW SET: 005**

4EA	HINGE	3CB1 4.5 X 4.5	630	IVE
1EA	CLASSROOM LOCK	L9070L 17A	630	SCH
1EA	CYLINDER	CYLINDER(S) AS REQUIRED	626	C-R
1EA	SECURITY FLOOR STOP	FS18L	BLK	IVE
1SET	SEALS	129NSS	630	NGP
1EA	DOOR SWEEP	200NSS	630	NGP
1EA	THRESHOLD	THRESHOLD PER DETAIL	AL	NGP

**HW SET: 006**

4EA	HINGE	3CB1 4.5 X 4.5	630	IVE
1EA	PRIVACY SET	L9040 17A L583-363	630	SCH
1EA	SURFACE CLOSER	4011 DEL SRI	689	LCN
1EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1EA	SECURITY FLOOR STOP	FS18L	BLK	IVE
1SET	SEALS	129NSS	630	NGP
1EA	DOOR SWEEP	200NSS	630	NGP
1EA	THRESHOLD	THRESHOLD PER DETAIL	AL	NGP
1EA	RESTROOM SIGN	SB443/444/445 AS REQUIRED	BLU	SBH

**HW SET: 007**

ALL HARDWARE BY DOOR MANUFACTURER B/O

**MISCELLANEOUS:**

6EA	CYLINDER	CYLINDER(S) AS REQUIRED FOR PADLOCKS	626	C-R
6EA	PADLOCK	KS43D3200 452 SCH		

**END OF SECTION**

## SECTION 08 8000

### GLAZING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Glass.

##### 1.02 RELATED REQUIREMENTS

- A. Section 08 4313 - Aluminum-Framed Storefronts.

##### 1.03 REFERENCE STANDARDS

- A. ASTM C 1036 - Standard Specification for Flat Glass; 2006.
- B. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 2004.
- C. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2009.
- D. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 2004.
- E. GANA (SM) - FGMA Sealant Manual; Glass Association of North America; 2008.

##### 1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Samples: Submit three samples 4 x 4 inch (\_\_\_ x \_\_\_ mm) in size of glass units.

##### 1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

##### 1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

#### PART 2 PRODUCTS

##### 2.01 GLASS MATERIALS

- A. Float Glass Manufacturers:
  - 1. PPG Industries, Inc: Product Ideascapes Azuria: [www.ppg.com](http://www.ppg.com).
  - 2. Substitutions: Refer to Section 01 6000 - Product Requirements.
- B. Float Glass: All glazing is to be float glass unless otherwise indicated.
  - 1. Annealed Type: ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
  - 2. Heat-Strengthened and Fully Tempered Types: ASTM C 1048.
  - 3. Tinted Types: Color and performance characteristics as indicated.
  - 4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.
- C. Glazing:
  - 1. Glazing at Storefronts:
    - a. Outboard: 1/4 inch, Azuria, tempered

- b. Air Space: 1/2 inch
- c. Inboard: 1/4 inch clear, tempered

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

#### **3.02 PREPARATION**

- A. Prime surfaces scheduled to receive sealant.
- B. Install sealants in accordance with ASTM C 1193 and FGMA Sealant Manual.

#### **3.03 CLEANING**

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

#### **3.04 PROTECTION**

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

**END OF SECTION**

**SECTION 08 9100**

**LOUVERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Louvers, frames, and accessories.

**1.02 REFERENCE STANDARDS**

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 1998.
- B. AMCA 511 - Certified Ratings Program for Air Control Devices; Air Movement and Control Association International, Inc.; 2007.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.
- D. Test Reports: Independent agency reports showing compliance with specified performance criteria.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

**1.05 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Wall Louvers:
  - 1. Airolite Company, LLC: [www.airolite.com](http://www.airolite.com).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 LOUVERS**

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified under AMCA 511.
  - 1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf (1.2 kPa) without damage or permanent deformation.
  - 2. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
  - 3. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

**2.03 MATERIALS**

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M),.

1. Color Anodizing: AAMA 611 Class I, AA-M12C22A42/44.
- B. Bird Screen: Interwoven wire mesh of steel, 0.063 inch (1.6 mm) diameter wire, 1/2 inch (13 mm) open weave, diagonal design.
- C. Insect Screen: 18 x 16 size aluminum mesh.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that field measurements are as indicated.

#### **3.02 INSTALLATION**

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Install louvers level and plumb.
- C. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- D. Secure louver frames in openings with concealed fasteners.

#### **3.03 CLEANING**

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

**END OF SECTION**

## SECTION 09 2116

### GYPSUM BOARD ASSEMBLIES

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Cementitious backing board.
- B. Gypsum wallboard.
- C. Joint treatment and accessories.
- D. Textured finish system.

##### 1.02 RELATED REQUIREMENTS

- A. Section 05 4000 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.
- B. Section 07 9005 - Joint Sealers: Acoustic sealant.

##### 1.03 REFERENCE STANDARDS

- A. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 1999 (R2005).
- B. ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).
- C. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 2007.
- D. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.
- E. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board; 2006a.
- F. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2007.

##### 1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.
- C. Mock-ups:
  - 1. At an area on the site where approved by the Architect, provide a mock-up panel of gypsum board wall surface.
    - a. Make mock-up panel approximately 48 inches square.
    - b. Provide one mock-up panel for each gypsum board finish to be used on the Work.
    - c. The mock-ups may be part of the Work and incorporated into the finished Work, when so approved by the Architect.
    - d. Revise as necessary to secure the Architect's approval.
  - 2. The mock-up panels, when approved by the Architect, will be used as datum points for comparison with the remainder of the Work of this Section for the purpose of acceptance or rejection.
  - 3. If the mock-up panels are not permitted to be part of the finished Work, completely demolish and remove them from the job site upon completion and acceptance of the Work of this Section.

##### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum five years of documented experience.

## **PART 2 PRODUCTS**

### **2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C 840 and GA-216.

### **2.02 BOARD MATERIALS**

- A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C 1396/C 1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
  2. Thickness:
    - a. Vertical Surfaces: 5/8 inch (16 mm).
- B. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including tub and shower surrounds, shower ceilings, and \_\_\_\_\_.

### **2.03 ACCESSORIES**

- A. Metal Cornerbead and Trim
1. All metal cornerbead and trim, and all accessory items, shall be a system recommended by the manufacturer as compatible with the gypsum panels.
  2. Outside Corners: Bullnose corner
  3. Inside Corners: Inner core
  4. J Molding: J-Stop, L-Trim and J-Trim
  5. Casings (for all face edges of exposed gypsum board): US Gypsum No. 200-4 metal trim, U-shaped and of 2 inch size.
  6. Edge Beads at perimeter of ceilings: Angle shapes with wings not less than 3/4 inch wide, with concealed wing perforated for nailing and exposed wing edge folded flat and factory finished white
- B. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
- C. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- D. Textured Finish Materials: Latex-based compound; plain.
- E. Screws for Attachment to Steel Members Less Than 0.03 inch (0.7 mm) In Thickness, to Wood Members, and to Gypsum Board: ASTM C 1002; self-piercing tapping type; cadmium-plated for exterior locations.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.

### **3.02 BOARD INSTALLATION**

- A. Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

- C. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- D. Installation on Metal Framing: Use screws for attachment of all gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

### **3.03 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

### **3.04 JOINT TREATMENT**

- A. Finish gypsum board in accordance with levels defined in ASTM C 840, as follows:
  - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 2. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
  - 3. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
  - 4. Level 0: Temporary partitions and surfaces indicated to be finished in later stage of project.
- B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
- C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

### **3.05 TEXTURE FINISH**

- A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

### **3.06 TOLERANCES**

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

**END OF SECTION**

## SECTION 09 3000

### TILING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Tile for shower receptors.
- D. Cementitious backer board as tile substrate.
- E. Stone thresholds.
- F. Ceramic trim.

##### 1.02 RELATED REQUIREMENTS

- A. Section 07 9005 - Joint Sealers.

##### 1.03 REFERENCE STANDARDS

- A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2005.
  - 1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2005.
  - 2. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar; 1999 (R2005).
  - 3. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex Portland Cement Mortar; 1999 (R2005).
  - 4. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 1999 (R2005).
  - 5. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (R2005).
  - 6. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (R2005).
  - 7. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (R2005).
  - 8. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (R2005).
  - 9. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (R2005).
  - 10. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 1999 (R2005).
  - 11. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005.
  - 12. ANSI A118.1 - American National Standard Specifications for Dry-Set Portland Cement Mortar; 1999 (R2005).
  - 13. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar; 1999 (R2005).
  - 14. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 1999 (R2005).

15. ANSI A118.7 - American National Standard Specifications for Polymer Modified Cement Grouts for Tile Installation; 1999 (R2005).
  16. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (R2005).
  17. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2008.
- B. TCA (HB) - Handbook for Ceramic Tile Installation; Tile Council of North America, Inc.; 2007/2008.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 6000 - Product Requirements, for additional provisions.
  2. Extra Tile: 5 percent percent of each size, color, and surface finish combination.

#### **1.05 QUALITY ASSURANCE**

- A. Maintain one copy of TCA Handbook and ANSI A108 Series/A118 Series on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 5 years of documented experience.
- C. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

#### **1.07 FIELD CONDITIONS**

- A. Do not install adhesives in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

### **PART 2 PRODUCTS**

#### **2.01 TILE**

- A. Manufacturers: All products by the same manufacturer.
  1. Dal-Tile Corporation: [www.daltile.com](http://www.daltile.com).
  2. Sadlerstone, Concrete Collection: [www.sadlerstone.com](http://www.sadlerstone.com).
  3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Glazed Wall Tile: ANSI A137.1, and as follows:
  1. Ceramic Natural Hues Collection manufactured by Dal Tile.
  2. Size and Shape: 8 inch square (\_\_\_\_\_).
  3. Surface Finish: High gloss.
  4. Colors: Starlight QH68.
- C. Quarry Tile: ANSI A137.1, and as follows:
  1. Colors: \_\_\_\_\_.

- D. Floor Tile: ANSI A137.1, and as follows:
  - 1. Concrete Collection manufactured by Sadlerstone.
  - 2. Size and Shape: 16 inch square.
  - 3. Thickness: 3/8 inch (9.5 mm)
  - 4. Surface Finish: Textured.
  - 5. Colors: Coal.
- E. Base Tile: ANSI A137.1 and as follows:
  - 1. Concrete Collection, manufactured by Sadlerstone.
  - 2. Size and Shape: 16 inch x 8 inch, pencil edge.
  - 3. Thickness: 5/8 inch.
  - 4. Colors: Coal.

## 2.02 TRIM AND ACCESSORIES

- A. Ceramic Trim: Matching bullnose, surface bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
  - 1. Manufacturer: Same as for tile.
- B. Thresholds: Marble, white or gray, honed finish; 2 inches (50 mm) wide by full width of wall or frame opening; 1/2 inch (12 mm) thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.
  - 1. Applications: Provide at the following locations:
    - a. At doorways where tile terminates.

## 2.03 MORTAR MATERIALS

- A. Manufacturers:
  - 1. Mapei.
  - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Mortar Bed Materials: Portland cement, sand, [ ] and water.
- C. Mortar Bond Coat Materials:
  - 1. Dry-Set Portland Cement type: ANSI A118.1.
  - 2. Latex-Portland Cement type: ANSI A118.4.

## 2.04 GROUT MATERIALS

- A. Manufacturers:
  - 1. Mapei.
  - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Standard Grout: Any type specified in ANSI A118.6 or A118.7.
  - 1. Colors at floor: 19 Pearl Gray.
  - 2. Colors at walls and wainscot: 27 Silver.

## 2.05 ACCESSORY MATERIALS

- A. Waterproofing Membrane at showers: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
  - 1. Manufacturers:
    - a. Noble Company; Chlorinated Polyethylene (CPE) membrane.
      - 1) Chloraloy shower pan liner.
      - 2) Accessories, primers and other products recommended for installation by manufacturer.
    - b. Substitutions: See Section 01 6000 - Product Requirements.

- B. Reinforcing Mesh: 2 x 2 inch (50 x 50 mm) size weave of 16/16 wire size; welded fabric, galvanized.
- C. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, 1/2 inch (13 mm) thick; 2 inch (50 mm) wide coated glass fiber tape for joints and corners.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

#### **3.02 PREPARATION**

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

#### **3.03 INSTALLATION - GENERAL**

- A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install thresholds where indicated.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- I. Allow tile to set for a minimum of 48 hours prior to grouting.
- J. Grout tile joints. Use standard grout unless otherwise indicated.
- K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

#### **3.04 INSTALLATION - FLOORS - THIN-SET METHODS**

- A. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.

### **3.05 INSTALLATION - FLOORS - MORTAR BED METHODS**

- A. Over interior concrete substrates, install in accordance with TCA Handbook Method F111, with cleavage membrane, unless otherwise indicated.
  - 1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCA Handbook Method F121.
- B. Cleavage Membrane: Lap edges and ends.
- C. Waterproofing Membrane: Install as specified in ANSI A108.13.
- D. Mortar Bed Thickness: 5/8 inch (15 mm), unless otherwise indicated.

### **3.06 INSTALLATION - SHOWERS AND BATHTUB WALLS**

- A. At tiled shower receptors install in accordance with TCA Handbook Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.
- B. Grout with standard grout as specified above.
- C. Seal joints between tile work and other work with sealant Type \_\_\_\_ specified in Section 07 9005.

### **3.07 INSTALLATION - WALL TILE**

- A. Over cementitious backer units on studs, install in accordance with TCA Handbook Method W244, using membrane at toilet rooms.
- B. Over interior concrete and masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat.

### **3.08 CLEANING**

- A. Clean tile and grout surfaces.

### **3.09 PROTECTION**

- A. Do not permit traffic over finished floor surface for 4 days after installation.

**END OF SECTION**

**SECTION 09 9000**

**PAINTING AND COATING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints, stains, varnishes, and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
- D. Do Not Paint or Finish the Following Items:
  - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
  - 2. Items indicated to receive other finishes.
  - 3. Items indicated to remain unfinished.
  - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
  - 5. Floors, unless specifically so indicated.
  - 6. Glass.
  - 7. Concealed pipes, ducts, and conduits.

**1.02 RELATED REQUIREMENTS**

- A. Section 013515 - LEED Certification Procedures: LEED rating system definition.

**1.03 REFERENCE STANDARDS**

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D 3359 - Standard Test Methods for Measuring Adhesion by Tape Test; 2009.
- C. ASTM D 4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.
- D. GreenSeal GS-11 - Paints; 1993.
- E. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on all finishing products, including VOC content.
- C. Samples: Submit three drawdown samples of selected colors for review.
- D. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
- E. Certification: By manufacturer that all paints and coatings do not contain any of the prohibited chemicals specified; GreenSeal GS-11 certification is not required but if provided shall constitute acceptable certification.
- F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Paint and Coatings: 1 gallon (4 L) of each color; store where directed.
3. Label each container with color in addition to the manufacturer's label.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified approved by manufacturer.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

#### **1.07 FIELD CONDITIONS**

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.
- E. Minimum Application Temperature for Varnish Finishes: 65 degrees F (18 degrees C) for interior or exterior, unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

#### **1.08 EXTRA MATERIALS**

- A. See Section 01 6000 - Product Requirements, for additional provisions.
- B. Supply 1 gallon (4 L) of each color; store where directed.
- C. Label each container with color in addition to the manufacturer's label.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
  1. Glidden Professional: [www.gliddenprofessional.com](http://www.gliddenprofessional.com).
- C. Substitutions: See Section 01 6000 - Product Requirements.

## 2.02 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
  - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  - 3. Supply each coating material in quantity required to complete entire project's work from a single production run.
  - 4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content:
  - 1. Provide coatings that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - b. Architectural coatings VOC limits of \_\_\_\_\_.
  - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- D. Colors: To be selected from manufacturer's full range of available colors.
  - 1. Selection to be made by Architect after award of contract.
  - 2. Color Schedules
    - a. The Architect will prepare a color schedule with samples for guidance in painting after color selection from samples submitted.
    - b. The Architect may select, allocate, and vary colors on different surfaces throughout the work, subject to the following:
      - 1) Exterior Work: A maximum of five (5) different colors will be used, with variations for trim, doors, miscellaneous work and metal work.
      - 2) Interior Work: A maximum of six (6) different pigmented colors will be used, with variations for trim and wall surfaces and wainscots.
  - 3. Paints at Wet Areas
    - a. In toilet rooms and contiguous areas, add an approved fungicide to paints.
    - b. For oil based paints, use 1% phenylmercuric or 4% tetrachlorophenol.
    - c. For water emulsion and glue size surfaces, use 4% sodium tetrachlorophenate.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Plaster and Stucco: 12 percent.
3. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
4. Exterior Wood: 15 percent, measured in accordance with ASTM D 4442.

### 3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing coatings that exhibit surface defects.
- D. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Galvanized Surfaces to be Painted: Metal etch and solvent clean per SSPC-SP1 followed by thorough water rinsing. Brush blast or sand with 80-100 grit sand paper to remove pre-treatments and produce lightly etched surface. Apply a test patch of the coating system specified. Allow product(s) to cure at least one week before testing adhesion per ASTM D3359.
- J. Ferrous Metal Surfaces to be Painted: Prepare using SSPC SP-6 (NACE No. 3 - commercial blast cleaning).
- K. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- L. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
- M. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied. Back prime concealed surfaces before installation.
- N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

### 3.03 APPLICATION

- A. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- B. Apply products in accordance with manufacturer's instructions.

- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

### 3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

### 3.05 SCHEDULE - PAINT SYSTEMS

- A. Exterior:
  - 1. Exterior metal, ferrous:
    - a. First Coat: 302H Cathacoat Reinforced Inorganic Zinc
    - b. Second Coat: 231V Bar Rust
    - c. Third Coat: 378H Devthane
    - d. Fourth Coat: 379H UVA Clear
  - 2. Exterior metal, galvanized:
    - a. First Coat: 203 Devran W/B Epoxy Primer
    - b. Second Coat: 231K Bar Rust
    - c. Third Coat: 378H Devthane S/G
- B. Interior:
  - 1. Interior semi-gloss enamel (SGE):
    - a. Ferrous metal:
      - 1) First Coat: 302H Cathacoat Reinforced Inorganic Zinc
      - 2) Second Coat: 231V Bar Rust
      - 3) Third Coat: 378H Devthane
    - b. Gypsum drywall:
      - 1) First Coat: GP1020 Wall and Woodwork Acrylic Primer
      - 2) Second Coat: GP1506 Lifemaster Oil Semi-Gloss Enamel
      - 3) Third Coat: GP1506 Lifemaster Oil Semi-Gloss Enamel
    - c. Concrete masonry:
      - 1) First Coat: GP3010 Prep and Prime Block Filler Water-Based Primer
      - 2) Second Coat: GP1506 Lifemaster Oil Eggshell Enamel
      - 3) Third Coat: GP1506 Lifemaster Oil Eggshell Enamel
  - 2. Interior egg shell enamel (ESE):
    - a. Gypsum drywall:
      - 1) First Coat: GP1000 Prep and Prime Hi hide Wall Water-Based Primer Sealer
      - 2) Second Coat: GP1403V Diamond 350 Interior Eggshell
      - 3) Third Coat: GP1403V Diamond 350 Interior Eggshell

**END OF SECTION**

**SECTION 09 7000**

**ANTI-GRAFFITI COATINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

A. \_\_\_\_\_.

**1.02 RELATED REQUIREMENTS**

**1.03 REFERENCE STANDARDS**

**1.04 ADMINISTRATIVE REQUIREMENTS**

**1.05 SUBMITTALS**

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

**1.06 QUALITY ASSURANCE**

**1.07 MOCK-UP**

**1.08 WARRANTY**

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Substitutions: See Section 01 6000 - Product Requirements.

**PART 3 EXECUTION**

**3.01 INSTALLERS**

A. Installer List:

**END OF SECTION**

**SECTION 10 2800**

**TOILET, BATH, AND LAUNDRY ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Accessories for toilet rooms and showers.
- B. Grab bars.

**1.02 REFERENCE STANDARDS**

- A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.
- B. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration; 1996.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Products listed are made by Bobrick. Provide all toilet and shower room accessories from one manufacturer.
- B. Other Acceptable Manufacturers:
  - 1. Substitutions: Section 01 6000 - Product Requirements.

**2.02 TOILET ROOM ACCESSORIES**

- A. Grab Bars: Stainless steel, 1-1/4 inches (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches (38 mm) clearance between wall and inside of grab bar.

**2.03 SHOWER AND TUB ACCESSORIES**

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.

**3.02 PREPARATION**

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

**3.03 INSTALLATION**

- A. Install accessories in accordance with manufacturers' instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.

- C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

**END OF SECTION**

## SECTION 10 5100

### LOCKERS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Locker units with hinged doors.

##### 1.02 REFERENCE STANDARDS

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009.

##### 1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on locker types, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan.
- D. Manufacturer's Installation Instructions: Indicate component installation assembly.

##### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Lockers:
  - 1. Republic Storage Systems Co: [www.republicstorage.com](http://www.republicstorage.com).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

##### 2.02 MATERIALS

- A. Sheet Steel: ASTM A 653/A 653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; to the following minimum thicknesses:
  - 1. Body and Shelf: 24 gage, 0.024 inch (0.6 mm).
  - 2. Door Outer Face: 18 gage, 0.048 inch (1.2 mm).
  - 3. Door Inner Face: 20 gage, 0.036 inch (0.9 mm).
  - 4. Door Frame: 16 gage, 0.060 inch (1.5 mm).
  - 5. Hinges: 14 gage, 0.075 inch (1.9 mm).
  - 6. Base: 20 gage, 0.036 inch (0.9 mm).
  - 7. Trim: 20 gage, 0.036 inch (0.9 mm).
- B. Accessories For Each Locker: Two single prong wall hooks, coat hanger bar.

##### 2.03 LOCKER UNITS

- A. Width: 15 inches (375 mm).
- B. Depth: 12 inches (300 mm).
- C. Height: 72 inches (1,830 mm).
- D. Configuration: double tier.
- E. Mounting: Surface mounted.
- F. Base: Metal base.

1. Base Height: 6 inch (\_\_\_\_ mm).
- G. Locking: Equipped for combination locks.
- H. Ventilation Method: Door louvers.
- I. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
- J. Locking device supplied by Owner.
- K. Provide ventilation openings at top and bottom of each locker.

#### **2.04 FINISHING**

- A. Clean, degrease, and neutralize metal; prime and finish with one coat of baked enamel.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb and square.
- C. Place and secure on prepared base.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb (445 N).
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and miscellaneous panels.
- G. Install accessories.
- H. Replace components that do not operate smoothly.

#### **3.02 CLEANING**

- A. Clean locker interiors and exterior surfaces.

**END OF SECTION**

## SECTION 10 7500

### FLAGPOLES

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Aluminum Flagpoles.

##### 1.02 REFERENCE STANDARDS

- A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; American Association of State Highway and Transportation Officials; 2003.
- B. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2008.
- C. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2007.

##### 1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pole, accessories, and configurations.
- C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

##### 1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.

##### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.
- B. Protect flagpole and accessories from damage or moisture.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Flagpoles:
  - 1. American Flagpole: [www.americanflagpole.com](http://www.americanflagpole.com).
  - 2. Pole-Tech Co., Inc; Product \_\_\_\_: [www.poletech.com](http://www.poletech.com).
  - 3. Morgan-Francis: [www.morgan-francis.com](http://www.morgan-francis.com).

##### 2.02 FLAGPOLES

- A. Flagpoles: Aluminum.
  - 1. Design: Cone tapered.
  - 2. Mounting: Ground mounted type.
  - 3. Outside Butt Diameter: 5 inches (\_\_\_\_ mm).
  - 4. Outside Tip Diameter: \_\_\_\_ inches (\_\_\_\_ mm).
  - 5. Nominal Wall Thickness: 0.125 inches (\_\_\_\_ mm).
  - 6. Nominal Height: \_\_\_\_ ft (\_\_\_\_ m); measured from nominal ground elevation.
  - 7. Halyard: External type.
- B. Performance Requirements:

1. Flagpole With Flag Flying: Resistant without permanent deformation to \_\_\_\_ miles/hr (\_\_\_\_ km/hr) wind velocity; non-resonant, safety design factor of 2.5.
2. Flagpole Without Flag: Resistant without permanent deformation to \_\_\_\_ miles/hr (\_\_\_\_ km/hr) wind velocity; non-resonant, safety design factor of 2.5.

### **2.03 POLE MATERIALS**

- A. Aluminum: ASTM B221 (ASTM B 221M), 6063 alloy, T6 temper.

### **2.04 ACCESSORIES**

- A. Finial Ball: Gold Anodized, 6 inch (150 mm) diameter.
- B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.
- C. Cleats: 9 inch (230 mm) size, aluminum with stainless steel fastenings, two per halyard.
- D. Halyard: 5/16 inch (8 mm) diameter polypropylene, braided, white.
  1. Provide two (2) chrome plated bronze snaphooks per halyard.
- E. Haylard Flag Snaps: Provide two (2) swivel snap hooks per haylard as follows:
  1. Chrome plated bronze.

### **2.05 MOUNTING COMPONENTS**

- A. Foundation Tube Sleeve: AASHTO M 36M, corrugated 16 gage (1.5 mm) steel, galvanized, depth of \_\_\_\_ inches (\_\_\_\_ mm),.
- B. Pole Base Attachment: Flush; aluminum base with base cover.

### **2.06 FINISHING**

- A. Metal Surfaces in Contact With Concrete: Asphaltic paint.
- B. Stainless Steel: No. 4 satin finish.
- C. Bronze: Dark bronze, lacquered finish.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

### **3.02 INSTALLATION**

- A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.
- B. Install foundation plate and centering wedges for flagpoles base set in concrete base and fasten.

### **3.03 TOLERANCES**

- A. Maximum Variation From Plumb: 1 inch (25 mm).

**END OF SECTION**

**SECTION 22 0503**

**PIPES AND TUBES FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Pipe and pipe fittings for the following systems:
  - 1. Domestic water piping, within 5 feet of building.
  - 2. Domestic water piping, above grade.
  - 3. Sanitary sewer piping, within 5 feet of building.
  - 4. Sanitary sewer piping, above grade.
  - 5. Unions and flanges.
  - 6. Underground pipe markers.
  - 7. Bedding and cover materials.
  
- B. Related Sections:
  - 1. Section 08 31 13 - Access Doors and Frames: Product requirements for access doors for placement by this section.
  - 2. Section 09 90 00 - Painting and Coating: Product and execution requirements for painting specified by this section.
  - 3. Section 22 05 23 - General-Duty Valves for Plumbing Piping: Product requirements for valves for placement by this section.
  - 4. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports [and firestopping] for placement by this section.
  - 5. Section 22 07 00 - Plumbing Insulation: Product requirements for piping insulation for placement by this section.
  - 6. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
  - 7. Section 31 05 16 - Aggregates for Earthwork: Aggregate for backfill in trenches.
  - 8. Section 31 23 16 - Excavation: Product and execution requirements for excavation and backfill required by this section.
  - 9. Section 31 23 17 - Trenching: Execution requirements for trenching for underground piping systems.
  - 10. Section 31 23 23 - Fill: Execution requirements for backfilling required by this section.

**1.02 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
  - 2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - 3. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).
  - 4. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
  - 5. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
  
- B. ASTM International:
  - 1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
  - 2. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
  - 3. ASTM A888 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
  - 4. ASTM B32 - Standard Specification for Solder Metal.
  - 5. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
  - 6. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV).
  - 7. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

8. ASTM D1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion Material.
- C. American Welding Society:
  1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
  2. AWS D1.1 - Structural Welding Code - Steel.
- D. American Water Works Association:
  1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
  2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
  3. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
  4. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  5. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
- E. Cast Iron Soil Pipe Institute:
  1. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
  2. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

### **1.03 SUBMITTALS**

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate layout of piping systems, including equipment, critical dimensions, and sizes. Submit shop drawings sealed by registered professional engineer.
- C. Product Data: Submit data on pipe materials and fittings. Submit manufacturers catalog information.
- D. Design Data: Indicate pipe sizes. Indicate pipe sizing methods. Indicate calculations used. Submit sizing methods and calculations sealed by registered professional engineer.
- E. Welders' Certificate: Include welders' certification of compliance with ASME Section IX.

### **1.04 QUALITY ASSURANCE**

- A. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- B. Maintain one copy of each document on site.

### **1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 5 years documented experience approved by manufacturer.
- C. Design piping systems with pipe hangers and supports under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of California.

### **1.06 PRE-INSTALLATION MEETINGS**

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

- B. Convene minimum one week prior to commencing work of this section.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

#### **1.08 ENVIRONMENTAL REQUIREMENTS**

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not install underground piping when bedding is wet or frozen.

#### **1.09 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

#### **1.10 COORDINATION**

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate installation of buried piping with trenching.

### **PART 2 PRODUCTS**

#### **2.01 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Ductile Iron Pipe: AWWA C151 with cement lining as per AWWA, C104.
  - 1. Fittings: AWWA C110, ductile iron, standard thickness.
  - 2. Joints: AWWA C111, rubber gasket with rods.
  - 3. Jackets: AWWA C105 polyethylene jacket].
- B. Copper Tubing: ASTM B88, Type K annealed.
  - 1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
  - 2. Joints: Compression connection or Brazed, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

#### **2.02 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

#### **2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Cast Iron Soil Pipe: ASTM A888 plain ends.
  - 1. Fittings: Cast iron, ASTM A888.
  - 2. Joints: CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
  - 3. Acceptable Manufacturers: ABI, Charlotte and Tyler Pipe.
- B. Cast Iron Pipe: CISPI 301, hub-less.
  - 1. Fittings: Cast iron, CISPI 301.
  - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
  - 3. Acceptable Manufacturers: ABI, Charlotte and Tyler Pipe.

- C. Polyethylene Encasement: ASTM D1248 polyethylene tube or sheet form to encase cast iron pipe, with minimum 0.008 inch (0.20 mm) thickness. Install encasement as per ASTM A74 and manufacturer's recommendations.

#### **2.04 SANITARY SEWER PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: ASTM A888, service weight.
  - 1. Fittings: Cast iron, ASTM A888.
  - 2. Joints: ASTM C564, rubber gasket joint devices or lead and oakum.
  - 3. Acceptable Manufacturers: ABI, Charlotte and Tyler Pipe.
- B. Cast Iron Pipe: CISPI 301, hub-less, service weight.
  - 1. Fittings: Cast iron, CISPI 301.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
  - 3. Acceptable Manufacturers: ABI, Charlotte and Tyler Pipe.
- C. Copper Tube: ASTM B306, DWV.
  - 1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
  - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

#### **2.05 UNIONS AND FLANGES**

- A. Unions for Pipe 2 inches and Smaller:
  - 1. Ferrous Piping: Class 150, malleable iron, threaded.
  - 2. Copper Piping: Class 150, bronze unions with soldered.
  - 3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- B. Flanges for Pipe 2-1/2 inches and Larger:
  - 1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
  - 2. Copper Piping: Class 150, slip-on bronze flanges.
  - 3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

#### **2.06 UNDERGROUND PIPE MARKERS**

- A. Manufacturers:
  - 1. Saxon.
  - 2. Brady.
  - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.
- C. Trace Wire: Magnetic detectable conductor, bare.

#### **2.07 BEDDING AND COVER MATERIALS**

- A. Bedding: As specified in Section 31 05 16.
- B. Cover: As specified in Section 31 05 16.
- C. Soil Backfill from Above Pipe to Finish Grade: As specified in Section 31 05 13. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

- B. Verify excavations are to required grade, dry, and not over-excavated.
- C. Verify trenches are ready to receive piping.

### 3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

### 3.03 INSTALLATION - BURIED PIPING SYSTEMS

- A. Verify connection size, location, and invert are as indicated on Drawings.
- B. Establish elevations of buried piping with not less than 1 ft of cover.
- C. Establish minimum separation of 1 foot from other services piping in accordance with CPC code.
- D. Excavate pipe trench in accordance with Section 31 23 17.
- E. Install pipe to elevation as indicated on Drawings or as required.
- F. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent maximum density.
- G. Install pipe on prepared bedding.
- H. Route pipe in straight line.
- I. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- J. Install shutoff and drain valves at locations indicated on Drawings in accordance with this Section.
- K. Install plastic ribbon tape continuous over top of pipe, 6 inches above pipe line.
- L. Install trace wire continuous over top of pipe, 6 inches above pipe line.
- M. Pipe Cover and Backfilling:
  - 1. Backfill trench in accordance with Section 31 23 23.
  - 2. Maintain optimum moisture content of fill material to attain required compaction density.
  - 3. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 6 inches compacted layers to 12 inches minimum cover over top of jacket. Compact to 95 percent maximum density.
  - 4. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
  - 5. Do not use wheeled or tracked vehicles for tamping.

### 3.04 INSTALLATION - ABOVE GROUND PIPING

- A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
- C. Group piping whenever practical at common elevations.
- D. Sleeve pipe passing through partitions, walls and floors. Refer to Section 22 05 29.

- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 00.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Section 08 31 13.
- I. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- J. Establish invert elevations, slopes for drainage to ¼ inch per foot minimum. Maintain gradients unless otherwise indicated.
- K. Slope piping and arrange systems to drain at low points.
- L. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.
- M. Where pipe support members are welded to structural building framing, scrape, brush clean and apply one coat of zinc rich primer to welding.
- N. Prepare pipe, fittings, supports and accessories not prefinished, ready for finish painting.
- O. Install valves with steams upright or horizontal, not inverted.
- P. Install piping penetrating roofed areas to maintain integrity of roof assembly.
- Q. Install valves in accordance with Section 22 05 23.
- R. Insulate piping. Refer to Section 22 07 00.

### **3.05 INSTALLATION - DOMESTIC WATER PIPING SYSTEMS**

- A. Install domestic water piping system in accordance with CPC.

### **3.06 INSTALLATION - SANITARY WASTE AND VENT PIPING SYSTEMS**

- A. Install sanitary waste and vent piping systems in accordance with CPC.

### **3.07 APPLICATION**

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- C. Install ball valves for shut-off and to isolate equipment or part of system. Install access panel in hard ceilings and or walls as indicated on plans.

### **3.08 FIELD QUALITY CONTROL**

- A. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Test domestic water piping system in accordance with applicable code.
- C. Test sanitary waste and vent piping system in accordance with applicable code.

### **3.09 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

### **3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- A. Disinfect ion of potable water system shall comply with ANSI/AWWA C651-92.
- B. When hot and cold water piping, including fixtures, have been installed, tested and accepted. Disinfect the system using any of the three methods of chlorination explained in AWWA C651-92 standard.
- C. The basic disinfection procedure shall consists of:
  - 1. Preventing contaminating materials from entering the water piping system during storage, construction or repair.
  - 2. Removing, by flushing or other means, those materials that may have entered the water piping system.
  - 3. Chlorinating any residual contamination that may remain, and flushing the chlorinated water from the piping system.
  - 4. Protecting the existing distribution system from backflow due to hydrostatic pressure test and disinfection procedures.
  - 5. Determining the bacteriological quality by laboratory test after disinfect ion. At least one water sample from the existing distribution system shall be tested.
  - 6. Final connection of the water piping system to the active distribution system.
- D. Submit Record of Compliance: The record of compliance shall be the bacteriological test results certifying the water sampled from the water piping system to be free of coliform bacteria contamination, and to be equal to or better than the bacteriologic water quality in the distribution system.

### 3.11 TEST

- A. Test entire piping systems including valves and fittings in accordance with the 2007 CPC and local governing codes.

**END OF SECTION**

**SECTION 22 0523**

**GENERAL-DUTY VALVES FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Ball valves.
  - 2. Check valves.
- B. Related Sections:
  - 1. Section 22 05 03 - Pipes and Tubes for Plumbing Piping and Equipment: Product and installation requirements for piping materials applying to various system types.
  - 2. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment: Product and installation requirements for pipe hangers and supports.
  - 3. Section 22 07 00 - Plumbing Insulation: Product and installation requirements for insulation for valves.

**1.02 REFERENCES**

- A. Manufacturers Standardization Society of the Valve and Fittings Industry:
  - 1. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
  - 2. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
  - 3. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

**1.03 SUBMITTALS**

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.
- C. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

**1.04 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of valves.
- C. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views.

**1.05 QUALITY ASSURANCE**

- A. Maintain one copy of each document on site.

**1.06 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

**1.07 PRE-INSTALLATION MEETINGS**

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.

#### **1.09 ENVIRONMENTAL REQUIREMENTS**

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not install valves underground when bedding is wet or frozen.

#### **1.10 WARRANTY**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five year manufacturer warranty for valves excluding packing.

#### **1.11 EXTRA MATERIALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for extra materials.
- B. Furnish two packing kits for each size valve.

### **PART 2 PRODUCTS**

#### **2.01 BALL VALVES**

- A. Manufacturers:
  - 1. Crane Valve, North America.
  - 2. Milwaukee Valve Company.
  - 3. NIBCO, Inc.
  - 4. Stockham Valves & Fittings.
  - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. 2 inches and Smaller: MSS SP 110, 600 psi WOG, two-piece bronze body, 316 stainless steel ball full port, PTFE seats, blow-out proof stem, threaded ends, lever handle. Similar to Nibco Model T-580-70-66

#### **2.02 CHECK VALVES**

- A. Horizontal Swing Check Valves:
  - 1. Manufacturers:
    - a. Crane Valve, North America.
    - b. Milwaukee Valve Company.
    - c. NIBCO, Inc.
    - d. Stockham Valves & Fittings.
    - e. Substitutions: Section 01 60 00 - Product Requirements.
  - 2. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, bronze disc, solder or threaded ends. Similar to Nibco Model T-433.
  - 3. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends. Similar to Nibco Model F-918-B.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify piping system is ready for valve installation.

### **3.02 INSTALLATION**

- A. Install valves with stems upright or horizontal, not inverted.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.
- D. Install valves with clearance for installation of insulation and allowing access.
- E. Provide access where valves and fittings are not accessible.
- F. Refer to Section 22 05 29 for pipe hangers.
- G. Refer to Section 22 07 00 for insulation requirements for valves.
- H. Refer to Section 22 05 03 for piping materials applying to various system types.

### **3.03 VALVE APPLICATIONS**

- A. Install ball for shut-off and to isolate equipment, part of systems, or vertical risers.
- B. Install ball valves in domestic water systems for shut-off service.

**END OF SECTION**

**SECTION 22 0529**

**HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Pipe hangers and supports.
  - 2. Hanger rods.
  - 3. Inserts.
  - 4. Flashing.
  - 5. Sleeves.
- B. Related Sections:
  - 1. Section 03 10 00 - Concrete Forming and Accessories: Execution requirements for placement of [inserts] [sleeves] in concrete forms specified by this section.
  - 2. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this section.
  - 3. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
  - 4. Section 07 90 00 - Joint Protection: Product requirements for sealant materials for placement by this section.
  - 5. Section 09 90 00 - Painting and Coating: Product and execution requirements for painting specified by this section.
  - 6. Section 22 05 03 - Pipes and Tubes for Plumbing Piping and Equipment: Execution requirements for placement of hangers and supports specified by this section.
  - 7. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment: Product and execution requirements for vibration isolators.
  - 8. Section 22 15 00 - General Service Compressed-Air Systems: Execution requirements for placement of hangers and supports specified by this section.

**1.02 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME B31.1 - Power Piping.
  - 2. ASME B31.9 - Building Services Piping.
- B. ASTM International:
  - 1. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- C. American Welding Society:
  - 1. AWS D1.1 - Structural Welding Code - Steel.
- D. FM Global:
  - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- E. Manufacturers Standardization Society of the Valve and Fittings Industry:
  - 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
  - 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
  - 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

**1.03 SUBMITTALS**

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

- B. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.
- C. Product Data:
  - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
- D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers. Submit sizing methods and calculations sealed by a registered professional engineer.
- E. Manufacturer's Installation Instructions:
  - 1. Hangers and Supports: Submit special procedures and assembly of components.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

#### **1.04 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum 3 years documented experience.

#### **1.05 PRE-INSTALLATION MEETINGS**

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

#### **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

#### **1.08 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

#### **1.09 WARRANTY**

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for pipe hangers and supports.

### **PART 2 PRODUCTS**

#### **2.01 PIPE HANGERS AND SUPPORTS**

- A. Manufacturers:
  - 1. Carpenter & Paterson Inc.
  - 2. Creative Systems Inc.
  - 3. Flex-Weld, Inc.
  - 4. Glope Pipe Hanger Products Inc.

5. Michigan Hanger Co.
  6. Superior Valve Co.
  7. Tolco.
  8. Substitutions: Section 01 60 00 - Product Requirements.
- B. Plumbing Piping - DWV:
1. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69, or MSS SP89.
  2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
  3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
  4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
  6. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
  7. Vertical Support: Steel riser clamp.
  8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  9. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.
- C. Plumbing Piping - Water:
1. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69 or MSS SP89.
  2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
  3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
  4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
  5. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger.
  6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
  8. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
  9. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
  10. Wall Support for Hot Pipe Sizes 6 inches and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
  11. Vertical Support: Steel riser clamp.
  12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  13. Floor Support for Hot Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  14. Floor Support for Hot Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
  15. Copper Pipe Support: Copper-plated, Carbon-steel ring.

## 2.02 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

## 2.03 MANUFACTURERS - SEISMIC BRACING

- A. Systems: Products of B-Line, Inc., Oakland, CA, are the standard of quality required and specified herein. Similar products of other manufacturers meeting the same standards of performance and approved by OSHPD or ORS/DSA may be submitted for approval.

## 2.04 INSERTS

- A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

## **2.05 FLASHING**

- A. Metal Flashing: 24 gage thick galvanized steel.
- B. Metal Counterflashing: 24 gage thick galvanized steel.
- C. Lead Flashing:
  - 1. Waterproofing: 5 lb./sq. ft sheet lead.
  - 2. Soundproofing: 1 lb./sq. ft sheet lead.
- D. Flexible Flashing: 1/16 inch thick sheet; compatible with roofing.
- E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

## **2.06 SLEEVES**

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sealant: Acrylic.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.

### **3.02 PREPARATION**

- A. Obtain permission from Architect/Engineer before using powder-actuated anchors.
- B. Do not drill or cut structural members.

### **3.03 INSTALLATION - INSERTS**

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

### **3.04 INSTALLATION - PIPE HANGERS AND SUPPORTS**

- A. Install in accordance with ASME B31.1, ASME 31.9, ASTM F708, MSS SP 58, MSS SP 69 or MSS SP 89.
- B. Support horizontal piping as scheduled.
- C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Use hangers with 1-1/2 inch minimum vertical adjustment.

- F. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- G. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- H. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- I. Support riser piping independently of connected horizontal piping.
- J. Provide copper plated hangers and supports for copper piping.
- K. Design hangers for pipe movement without disengagement of supported pipe.
- L. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- M. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 07 00.

### **3.05 INSTALLATION - FLASHING**

- A. Provide flexible flashing and metal counterflashing where piping penetrates weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.
- C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.
- D. Seal floor, shower and mop sink drains watertight to adjacent materials.
- E. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

### **3.06 INSTALLATION - SLEEVES**

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- E. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with firestopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install chrome plated steel escutcheons at finished surfaces.

### **3.07 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

### **3.08 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

### **3.09 PROTECTION OF FINISHED WORK**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

**3.10 SCHEDULES**

**PIPE HANGER SPACING**

<b>PIPE MATERIAL</b>	<b>MAXIMUM HANGER SPACING (feet)</b>	<b>HANGER ROD DIAMETER (inches)</b>
Cast Iron (All Sizes)	5	5/8
Cast Iron (All Sizes) with 10 foot length of pipe	10	5/8
Copper Tube, 1-1/4 inches and smaller	6	1/2
Copper Tube, 1-1/2 inches and larger	10	1/2
Steel, 3 inches and smaller	12	1/2
Steel, 4 inches and larger	12	5/8

**END OF SECTION**

## SECTION 22 0553

### IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Nameplates.
  - 2. Tags.
  - 3. Stencils.
  - 4. Pipe markers.
  - 5. Ceiling tacks.
  - 6. Labels.
- B. Related Sections:
  - 1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this section.

##### 1.02 REFERENCES

- A. American Society of Mechanical Engineers:
  - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.

##### 1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit manufacturers catalog literature for each product required.
- C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

##### 1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

##### 1.05 QUALITY ASSURANCE

- A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.
- B. Maintain one copy of each document on site.

##### 1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience as recommended by the manufacturer.

#### PART 2 PRODUCTS

##### 2.01 NAMEPLATES

- A. Manufacturers:
  - 1. Brady Company
  - 2. Seton Nameplate Company
- B. Product Description: Laminated three-layer plastic with engraved black or white letters on light contrasting background color.

## 2.02 TAGS

- A. Plastic Tags:
  - 1. Laminated three-layer plastic with engraved black letters on light contrasting background color, or white letters on black background.
- B. Metal Tags:
  - 1. Brass with stamped letters; tag size minimum 2 inches diameter with smooth edges and brass chain.
- C. Tag Chart: Typewritten letter size list of applied tags and location in plastic laminated.

## 2.03 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
  - 1. Up to 2 inches Outside Diameter of Insulation or Pipe: 1/2 inch high letters.
  - 2. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1-inch high letters.
  - 3. Over 6 inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.
  - 4. Equipment: 1-3/4 inches high letters.
- B. Stencil Paint: As specified in Section 09 90 00, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

## 2.04 PIPE MARKERS

- A. Color and Lettering: Conform to ASME A13.1.
- B. Plastic Tape Pipe Markers:
  - 1. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

## 2.05 LABELS

- A. Description: Laminated Mylar, size 1.9 x 0.75 inches, adhesive backed with printed identification.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

### 3.02 INSTALLATION

- A. Apply stencil painting in accordance with Section 09 90 00.
- B. Install identifying devices after completion of coverings and painting.
- C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- D. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.
- E. Install tags using corrosion resistant chain. Number tags consecutively by location.
- F. Identify control panels and major control components outside panels with plastic nameplates.

- G. Identify valves in main and branch piping with tags.
- H. Identify piping, concealed or exposed, with plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- I. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

**END OF SECTION**

## SECTION 22 0700

### PLUMBING INSULATION

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Plumbing piping insulation, jackets and accessories.
  - 2. Plumbing equipment insulation, jackets and accessories.
  - 3. Related Sections:
    - a. Section 07 84 00 - Firestopping: Product requirements for firestopping for placement by this section.
    - b. Section 09 90 00 - Painting and Coating: Execution requirements for painting insulation jackets and covering specified by this section.

##### 1.02 REFERENCES

- A. ASTM International:
  - 1. ASTM C450 - Standard Practice for Prefabrication and Field Fabrication of Thermal Insulating Fitting Covers for NPS Piping, Vessel Lagging, and Dished Head Segments.
  - 2. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
  - 3. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
  - 4. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
  - 5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- 6. National Fire Protection Association:
  - a. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- 7. Underwriters Laboratories Inc.:
  - a. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

##### 1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

##### 1.04 QUALITY ASSURANCE

- A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.
- D. Maintain one copy of each document on site.

##### 1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience.

**1.06 PRE-INSTALLATION MEETINGS**

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

**1.08 ENVIRONMENTAL REQUIREMENTS**

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- C. Maintain temperature before, during, and after installation for minimum period of 24 hours.

**1.09 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

**1.10 WARRANTY**

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for man made fiber.

**PART 2 PRODUCTS**

**2.01 MANUFACTURER**

- A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:
  - 1. CertainTeed.
  - 2. Knauf.
  - 3. Johns Manville.
  - 4. Owens-Corning.
  - 5. Substitutions: Section 01 60 00 - Product Requirements.
  - 6. Manufacturers for Closed Cell Elastomeric Insulation Products:
    - a. Aeroflex. Aerocell.
    - b. Armacell, LLC. Armaflex.
    - c. Nomaco. K-flex.
    - d. Substitutions: Section 01 60 00 - Product Requirements.

**2.02 PIPE INSULATION**

- A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation.
  - 1. Thermal Conductivity: 0.23 at 75 degrees F.
  - 2. Operating Temperature Range: 0 to 850 degrees F.

3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
  4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- B. TYPE P-5: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
1. Thermal Conductivity: 0.27 at 75 degrees F.
  2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.

### 2.03 PIPE INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.
- D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.
- E. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with stainless steel jacket single piece construction with self adhesive closure. Thickness to match pipe insulation.
- F. Adhesives: Compatible with insulation.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify piping has been tested before applying insulation materials.
- C. Verify surfaces are clean and dry, with foreign material removed.

### 3.02 INSTALLATION - PIPING SYSTEMS

- A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.
- B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than one hour.
- C. Piping Systems Conveying Fluids Below Ambient Temperature:
  1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
  2. Furnish factory-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips.
  3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
  4. Hot Piping Systems less than 140 degrees F:
    - a. Furnish factory-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
    - b. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
    - c. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.
  5. Inserts and Shields:

- a. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
- b. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
  - 1) Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
  - 2) Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
6. Insulation Terminating Points:
  - a. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
  - b. Condensate Piping: Insulate entire piping system and components to prevent condensation.
7. Closed Cell Elastomeric Insulation:
  - a. Push insulation on to piping.
  - b. Miter joints at elbows.
  - c. Seal seams and butt joints with manufacturer's recommended adhesive.
  - d. When application requires multiple layers, apply with joints staggered.
  - e. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.
8. High Temperature Pipe Insulation:
  - a. Install in multiple layers to meet thickness scheduled.
  - b. Attach each layer with bands. Secure first layer with bands before installing next layer.
  - c. Stagger joints between layers.
  - d. Cover with seams located on bottom side of horizontal piping.
9. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap.
10. Prepare pipe insulation for finish painting. Refer to Section 09 90 00.

### 3.03 SCHEDULES

#### A. Water Supply Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS (Inches)
Domestic Hot Water Supply	P-1	1-1/4 inches and smaller	0.5
		1-1/2 inches and larger	1.0
		1 inch and smaller	1.0
Domestic Hot Water Supply	P-1	1-1/4 inches to 2 inches	1.5
		2-1/2 inches and larger	2.0

**END OF SECTION**

## SECTION 22 3300

### ELECTRIC DOMESTIC WATER HEATERS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Commercial electric water heaters.
- B. Related Sections:
  - 1. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for electric connections specified by this section.

##### 1.02 REFERENCES

- A. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
  - 1. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- B. American Society of Mechanical Engineers:
  - 1. ASME PTC 25 - Pressure Relief Devices.
  - 2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.

##### 1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate heat exchanger dimensions, size of taps, and performance data. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, taps, and drains.
- C. Product Data: Submit dimensioned drawings of water heaters indicating components and connections to other equipment and piping. Submit electrical characteristics and connection locations.
- D. Manufacturer's Installation Instructions: Submit mounting and support requirements.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

##### 1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit replacement part numbers and availability.

##### 1.05 QUALITY ASSURANCE

- A. Water Heater Performance Requirements: Equipment efficiency not less than prescribed by ASHRAE 90.1.
- B. Maintain one copy of each document on site.

##### 1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

##### 1.07 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

- B. Convene minimum one week prior to commencing work of this section.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Products storage and handling requirements.
- B. Accept water heaters on site in original labeled cartons. Inspect for damage.
- C. Protect tanks with temporary inlet and outlet caps. Maintain caps in place until installation.

#### **1.09 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

#### **1.10 WARRANTY**

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for domestic water heaters.

### **PART 2 PRODUCTS**

#### **2.01 COMMERCIAL ELECTRIC WATER HEATERS**

- A. Manufacturers:
  - 1. American Water Heater Group.
  - 2. Broan Manufacturing Co. Inc.
  - 3. Patterson-Kelley Co.
  - 4. Stiebel Eltron.
  - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Type: Factory-assembled and wired, electric, tankless type.
- C. Capacity:
  - 1. Heating element size: 14.4 kW.
  - 2. Minimum recovery rate: 1.50 GPM with 66 degrees F temperature rise.
  - 3. Maximum working pressure: 150 psig.
- D. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 125 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.

#### **2.02 ELECTRICAL CHARACTERISTICS AND COMPONENTS**

- A. Electrical Characteristics: In accordance with Section 26 05 03 and the following:
  - 1. 208 volts, single phase, 60 Hz.
  - 2. 70 amperes maximum.
- B. Disconnect Switch: Factory mount disconnect switch in control panel.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Maintain manufacturer's recommended clearances around and over water heaters.
- B. Connect domestic hot water and cold water piping to supply water heater connections.
- C. Install the following piping accessories.
  - 1. On cold and hot water piping:
    - a. Shutoff valve.
- D. Install water heater trim and accessories furnished loose for field mounting.
- E. Install electrical devices furnished loose for field mounting.

- F. Install control wiring between water heater control panel and field mounted control devices.

**END OF SECTION**

## SECTION 22 4000

### PLUMBING FIXTURES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Water closets.
  - 2. Lavatories.
  - 3. Insulation kit.
  - 4. Showers.
  - 5. Floor drains.
  - 6. Water hammer arrestors.
  - 7. Trap primers.
  - 8. Hose bibbs.
  - 9. Access panels.
  - 10. Cleanouts.
- B. Related Sections:
  - 1. Section 07 90 00 - Joint Protection: Product requirements for calking between fixtures and building components for placement by this section.
  - 2. Section 22 05 03 - Pipes and Tubes for Plumbing Piping and Equipment.
  - 3. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for electric connections to sensor valves and faucets specified by this section.

##### 1.02 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- B. American Society of Mechanical Engineers:
  - 1. ASME A112.6.1 - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use.
  - 2. ASME A112.18.1 - Plumbing Fixture Fittings.
  - 3. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures.
  - 4. ASME A112.19.2M - Vitreous China Plumbing Fixtures.
  - 5. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).
  - 6. ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
  - 7. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals.

##### 1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit catalog illustrations of fixtures, sizes, [rough-in dimensions,] utility sizes, trim, and finishes.
- C. Manufacturer's Installation Instructions: Submit installation methods and procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

##### 1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit fixture, trim, exploded view and replacement parts lists.

**1.05 QUALITY ASSURANCE**

- A. Provide products requiring electrical connections listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and indicated.
- B. Maintain one copy of each document on site.

**1.06 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

**1.07 PRE-INSTALLATION MEETINGS**

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept fixtures on site in factory packaging. Inspect for damage.
- C. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

**1.09 WARRANTY**

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for plumbing fixtures.

**1.10 EXTRA MATERIALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two sets of faucet washers, flush valve service kits, and lavatory supply fittings.

**PART 2 PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS - FIXTURES**

- A. American Standard
- B. Kohler
- C. Symmons
- D. Acorn

**2.02 ACCEPTABLE MANUFACTURERS - FLUSH VALVES**

- A. Sloan

**2.03 ACCEPTABLE MANUFACTURERS - WATER CLOSET SEATS**

- A. Olsonite
- B. Beneke
- C. Church

**2.04 ACCEPTABLE MANUFACTURERS - FIXTURE CARRIERS**

- A. J.R. Smith
- B. Zurn
- C. Josam

**2.05 ACCEPTABLE MANUFACTURERS - FIXTURE TRIM**

- A. Chicago Faucet
- B. Acorn

**2.06 ACCEPTABLE MANUFACTURERS - SHOWERS**

- A. Symmons
- B. Acorn
- C. Kohler

**2.07 ACCEPTABLE MANUFACTURERS - FLOOR DRAINS**

- A. J.R. Smith
- B. Zurn
- C. Josam

**2.08 ACCEPTABLE MANUFACTURERS - WATER HAMMER ARRESTORS**

- A. J.R. Smith
- B. Zurn
- C. Josam

**2.09 ACCEPTABLE MANUFACTURERS - TRAP PRIMERS**

- A. J.R. Smith
- B. Zurn
- C. Josam

**2.10 ACCEPTABLE MANUFACTURERS - HOSE BIBBS**

- A. Acorn
- B. Woodford
- C. Josam

**2.11 ACCEPTABLE MANUFACTURERS - CLEANOUTS**

- A. J.R. Smith
- B. Zurn
- C. Josam

**2.12 WATER CLOSET, WALL MOUNTED, NORMAL (WC-1)**

- A. Bowl shall be fabricated from 14 gage, Type 304 stainless steel. Construction shall be seamless welded and exposed surfaces shall have a satin finish. Toilet shall be concealed siphon jet type with an elongated bowl, a self-draining flushing rim, and an integral contoured

seat. Toilet shall meet ANSI 112.19.3-2008 and CSA B45.4-2008 requirements. Provide with through the wall pushbutton activation. Toilet shall have a mounting height of 15". Toilet trap shall have a minimum 3-1/2" seal that shall pass a 2-1/8" diameter ball and be fully enclosed. Fixture shall withstand loadings of 3,000 pounds without permanent damage. Fixture shall be furnished with necessary fasteners for proper installation.

**2.13 WATER CLOSET, FLOOR MOUNTED, ACCESSIBLE (WC-2)**

- A. Bowl shall be fabricated from 14 gage, Type 304 stainless steel. Construction shall be seamless welded and exposed surfaces shall have a satin finish. Toilet shall be concealed siphon jet type with an elongated bowl, a self-draining flushing rim, and an integral contoured seat. Toilet shall meet ANSI 112.19.3-2008 and CSA B45.4-2008 requirements. Provide with through the wall pushbutton activation. Toilet shall have a mounting height of 17". Toilet trap shall have a minimum 3-1/2" seal that shall pass a 2-1/8" diameter ball and be fully enclosed. Fixture shall withstand loadings of 3,000 pounds without permanent damage. Fixture shall be furnished with necessary fasteners for proper installation.

**2.14 WATER CLOSET, WALL HUNG, ACCESSIBLE (WC-3)**

- A. Bowl: ANSI A112.19.2; 1.6 gallon per flush, siphon jet, vitreous china closet bowl with elongated rim 17-1/4" high for accessibility and 1-1/2" spud. For model number see schedule on drawings.
- B. Flush Valve: ANSI A112.18.1; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, integral screwdriver stop, vacuum breaker. For model number see schedule on drawings.
- C. Seat: Solid white plastic open front with self-sustaining hinge, brass bolts. For model number see schedule on drawings.
- D. Wall Mounted Carrier: ANSI A112.19.1; cast iron and steel frame, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs. For model number see schedule on drawings.

**2.15 LAVATORY, WALL HUNG, NORMAL (L-1)**

- A. 18" wide ADA Compliant Lavatory with Rectangular Bowl, Front Access with overflow. Unit shall conform with ANSI, UFAS and ADA requirements for accessibility. Fixture shall be fabricated from 14 gage, Type 304 stainless steel. Construction shall be seamless welded and exposed surfaces shall have a satin finish. Countertop shall have an air-circulating, self-draining soap dish. Provide ADA compliant Air Control pneumatically operated, metering, non-hold open pushbutton valve. Valve conform with lead free requirements of NSF61. Cabinet bottom shall be removable and secured with tamper-resistant screws. Cabinet interior shall be sound deadened with fire-resistant material. Fixture shall be furnished with necessary fasteners for proper installation.

**2.16 LAVATORY, WALL HUNG, ACCESSIBLE (L-2)**

- A. 18" wide ADA Compliant Lavatory with Rectangular Bowl, Front Access with overflow. Unit shall conform with ANSI, UFAS and ADA requirements for accessibility. Fixture shall be fabricated from 14 gage, Type 304 stainless steel. Construction shall be seamless welded and exposed surfaces shall have a satin finish. Countertop shall have an air-circulating, self-draining soap dish. Provide ADA compliant Air Control pneumatically operated, metering, non-hold open pushbutton valve. Valve conform with lead free requirements of NSF61. Cabinet bottom shall be removable and secured with tamper-resistant screws. Cabinet interior shall be sound deadened with fire-resistant material. Fixture shall be furnished with necessary fasteners for proper installation.

**2.17 LAVATORY, WALL HUNG, ACCESSIBLE (L-3)**

- A. Basin: ANSI A112.19.2; vitreous china lavatory with 4 inch high back, drillings for 4" centers, and rectangular basin with splash lip front overflow. For model number see schedule on drawings.
- B. Trim: ANSI A112.18.1; chrome plated combination supply fitting with manually operated, chrome plated 17 gage L.A. pattern cast brass P-trap and arm with secured escutcheon and rigid supplies. For model number see schedule on drawings.
- C. Wall Mounted Carrier: ANSI A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs. For model number see schedule on drawings.

#### **2.18 INSULATION KIT**

- A. Where lavatories or sinks are noted to be insulated for ADA compliance, furnish the following: Safety covers conforming to ANSI A177.1, ASTM E84-07 and consisting of insulation kit of molded closet cell vinyl construction, 3/16 inch thick, white color, for insulating tailpiece, P-trap, valves and supply piping. Furnish with weep hole and angle valve access covers.

#### **2.19 SHOWER, STANDARD (SH-1) & ACCESSIBLE (SH-2)**

- A. Shower: 14 gauge, Type 304 stainless steel with removable front panel.
- B. Shower Head: Vandal resistant with threaded connection and set screw, spray patterns are adjustable.
- C. Valve: Air control pneumatically operated, requiring less than 5 lbs. of pressure to activate.

#### **2.20 SHOWER, ACCESSIBLE (SH-3)**

- A. Trim: ASME A112.18.1; concealed shower supply with pressure balanced mixing valves, hand held shower with 60 inch metal hose and 30 inch slide bar, female inlet.

#### **2.21 FLOOR DRAIN (FD-1)**

- A. ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, round, adjustable polished nickel-bronze strainer; and trap primer connection; see Schedule on drawings for Model number.

#### **2.22 WATER HAMMER ARRESTORS (WHA-1)**

- A. ANSI A112.26.1; sized in accordance with manufacturer's recommendation, precharged suitable for operation in temperature range - 100 to 300 degrees F and maximum 250 psig working pressure; see Schedule on drawings for Model number.

#### **2.23 TRAP PRIMERS (TP-1)**

- A. ANSI A112.26; cast bronze with 1/2-inch connection. See Schedule on drawings for Model number.

#### **2.24 HOSE BIBBS (HB-1)**

- A. Provide recessed box, having one piece cast construction, stainless steel wall flange with a satin finish. The door shall be provided with a cam lock. Valves shall be cast bronze, exposed parts chrome-plated, tamper resistant lockshield bonnet and replaceable cartridge, 3/4 inch inlet for cold, and 3/4 inch outlet with vacuum breaker, See Schedules for Model No.

#### **2.25 ACCESS PANELS**

- A. 12" x 12" No. 4 finish stainless steel flush type, locate and set after review. Steel door and frame with metal flange with concealed hinges and screwdriver operated stainless steel cam lock. Karp style DSC-214M for fire rated construction use KRP-150FR with ring turn lock.

## **2.26 CLEANOUTS**

- A. Exterior Surfaced Areas C.O.Y.B.: Round cast nickel bronze access frame and non-skid cover; see Schedule on drawings for Model number.
- B. Exterior Unsurfaced Areas G.C.O.: Line type with lacquered cast iron body and round epoxy coated gasketed cover; see Schedule on drawings for Model number.
- C. Interior Finished Floor Areas F.C.O.: Lacquered cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar and adjustable nickel-bronze strainer, round with scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas; see Schedule on drawings for Model number.
- D. Interior Finished Wall Areas W.C.O.: Line type with lacquered cast iron body and round epoxy coated gasketed cover and round stainless steel access cover secured with machine screw; see Schedule on drawings for Model number.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify walls and floor finishes are prepared and ready for installation of fixtures.
- C. Verify electric power is available and of correct characteristics.

### **3.02 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

### **3.03 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 00, color to match fixture.
- F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.
- G. For ADA accessible water closets, install flush valve with handle to wide side of stall.

### **3.04 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

### **3.05 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean plumbing fixtures and equipment.

**3.06 PROTECTION OF INSTALLED CONSTRUCTION**

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Do not permit use of fixtures before final acceptance.

**END OF SECTION**

**SECTION 23 0529**

**HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Flashing.
  - 2. Equipment bases and supports.

**1.02 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data:
- C. Supports: Submit manufacturers catalog data including load capacity.
- D. Supports: Submit special procedures and assembly of components.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- F. Engineering Judgements: For conditions not covered by UL or WH listed designs, submit judgements by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

**1.03 QUALITY ASSURANCE**

- A. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
  - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
  - 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- B. Surface Burning Characteristics: 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

**1.05 ENVIRONMENTAL REQUIREMENTS**

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

**1.06 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

**1.07 WARRANTY**

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for supports.

## **PART 2 PRODUCTS**

### **2.01 FLASHING**

- A. Metal Flashing: 26 gage thick galvanized steel.
- B. Metal Counterflashing: 22 gage thick galvanized steel.
- C. Lead Flashing:
  - 1. Waterproofing: 5 lb./sq. ft sheet lead.
  - 2. Soundproofing: 1 lb./sq. ft sheet lead.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

### **3.02 PREPARATION**

- A. Obtain permission from Architect/Engineer before drilling or cutting structural members.

### **3.03 INSTALLATION - EQUIPMENT SUPPORTS**

- A. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- B. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

### **3.04 INSTALLATION - FLASHING**

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed roofs.

### **3.05 INSTALLATION - SEALANT**

- A. Non-Rated Surfaces:
  - 1. Seal opening through non-fire rated wall, partition, floor, and roof opening as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    - c. Install type of firestopping material recommended by manufacturer.
  - 2. Install escutcheons floor plates or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.

### **3.06 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

### **3.07 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

### **3.08 PROTECTION OF FINISHED WORK**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

**END OF SECTION**

**SECTION 23 0553**

**IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Nameplates.
  - 2. Stencils.
- B. Related Sections:
  - 1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this section.

**1.02 REFERENCES**

- A. American Society of Mechanical Engineers:
  - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.

**1.03 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data: Submit manufacturers catalog literature for each product required.
- C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

**1.04 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

**1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

**PART 2 PRODUCTS**

**2.01 NAMEPLATES**

- A. Manufacturers:
  - 1. Craftmark Identification Systems.
  - 2. Safety Sign Co.
  - 3. Seton Identification Products.

**2.02 STENCILS**

- A. Stencils: With clean cut symbols and letters of following size:
  - 1. Equipment: 1-3/4 inches high letters.
- B. Stencil Paint: As specified in Section 09 90 00, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.

**3.02 INSTALLATION**

- A. Apply stencil painting in accordance with Section 09 90 00.
- B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- C. Identify unit heaters and exhaust fans with plastic nameplates.
- D. Identify control panels and major control components outside panels with plastic nameplates.
- E. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

**END OF SECTION**

**SECTION 23 0593**

**TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Testing adjusting, and balancing of air systems.
  - 2. Measurement of final operating condition of HVAC systems.
- B. Related Sections:
  - 1. Section 23 31 00 - HVAC Ducts and Casings.

**1.02 REFERENCES**

- A. Associated Air Balance Council:
  - 1. AABC MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.
- B. Natural Environmental Balancing Bureau:
  - 1. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

**1.03 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Prior to commencing Work, submit proof of latest calibration date of each instrument.
- C. Test Reports: Indicate data for Total System Balance forms.
- D. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- E. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty and Copy of NEBB Certificate of Conformance Certification.
- F. Submit draft copies of report for review prior to final acceptance of Project.
- G. Furnish reports in soft cover, letter size, 3-ring binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

**1.04 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

**1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with AABC MN-1 National Standards for Field Measurement and Instrumentation, Total System Balance, NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- B. Maintain one copy of each document on site.

- C. Prior to commencing Work, calibrate each instrument to be used.

#### **1.06 QUALIFICATIONS**

- A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum three years documented experience certified by AABC or Certified by NEBB.
- B. Perform Work under supervision of AABC Certified Test and Balance Engineer, NEBB Certified Testing, Balancing and Adjusting Supervisor.

#### **1.07 SEQUENCING**

- A. Section 01 10 00 - Summary: Work sequence.
- B. Sequence balancing between completion of systems tested and Date of Substantial Completion.

#### **PART 2 PRODUCTS**

Not Used.

#### **PART 3 EXECUTION**

##### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify systems are complete and operable before commencing work. Verify the following:
  1. Systems are started and operating in safe and normal condition.
  2. Temperature control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Duct systems are clean of debris.
  5. Fans are rotating correctly.
  6. Duct system leakage is minimized.

##### **3.02 PREPARATION**

- A. Furnish instruments required for testing, adjusting, and balancing operations.
- B. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

##### **3.03 INSTALLATION TOLERANCES**

- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.

##### **3.04 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Verify recorded data represents actual measured or observed conditions.
- C. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
- D. Report defects and deficiencies noted during performance of services, preventing system balance.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner.

##### **3.05 AIR SYSTEM PROCEDURE**

- A. Adjust air handling and distribution systems to obtain required or design supply, and exhaust air quantities.
- B. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.
- C. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.
- D. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- E. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.
- F. Adjust exhaust dampers for design conditions.

### 3.06 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing:
  - 1. Unit heater.
  - 2. Fans.
- B. Report Forms
  - 1. Title Page:
    - a. Name of Testing, Adjusting, and Balancing Agency
    - b. Address of Testing, Adjusting, and Balancing Agency
    - c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency
    - d. Project name
    - e. Project location
    - f. Project Architect
    - g. Project Engineer
    - h. Project Contractor
    - i. Report date
  - 2. Instrument List:
    - a. Instrument
    - b. Manufacturer
    - c. Model number
    - d. Serial number
    - e. Range
    - f. Calibration date
  - 3. Electric Motors:
    - a. Manufacturer
    - b. Model/Frame
    - c. HP/BHP and kW
    - d. Phase, voltage, amperage; nameplate, actual, no load
    - e. RPM
    - f. Service factor
    - g. Starter size, rating, heater elements
    - h. Sheave Make/Size/Bore
  - 4. V-Belt Drive:
    - a. Identification/location
    - b. Required driven RPM
    - c. Driven sheave, diameter and RPM
    - d. Belt, size and quantity
    - e. Motor sheave diameter and RPM
  - 5. Air Moving Equipment:
    - a. Location
    - b. Manufacturer

- c. Model number
  - d. Air flow, specified and actual
  - e. Return air flow, specified and actual
  - f. Total static pressure (total external), specified and actual
  - g. Inlet pressure
  - h. Discharge pressure
  - i. Fan RPM
6. Exhaust Fan Data:
- a. Location
  - b. Manufacturer
  - c. Model number
  - d. Air flow, specified and actual
  - e. Total static pressure (total external), specified and actual
  - f. Inlet pressure
  - g. Discharge pressure
  - h. Fan RPM

**END OF SECTION**

## SECTION 23 3100

### HVAC DUCTS AND CASINGS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Duct Materials.
  - 2. Single wall spiral round ducts.
  - 3. Ductwork fabrication.
  - 4. Duct cleaning.
- B. Related Sections:
  - 1. Section 09 90 00 - Painting and Coating: Execution requirements for Weld priming, weather resistant, paint or coating specified by this section.
  - 2. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for hangers, supports and sleeves for placement by this section.
  - 3. Section 23 33 00 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.

##### 1.02 REFERENCES

- A. ASTM International:
  - 1. ASTM A90/A90M - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
  - 2. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - 3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process.
  - 4. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Fire Protection Association:
  - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
  - 2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- C. Sheet Metal and Air Conditioning Contractors:
  - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- D. Underwriters Laboratories Inc.:
  - 1. UL 181 - Factory-Made Air Ducts and Connectors.

##### 1.03 PERFORMANCE REQUIREMENTS

- A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

##### 1.04 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Shop Drawings: Submit duct fabrication drawings, drawn to scale not smaller than 1/8inch equals 1 foot, on drawing sheets same size as Contract Documents, indicating:
  - 1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.

2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust duct systems, indicate classification of materials handled as defined in this section.
  3. Fittings.
  4. Reinforcing details and spacing.
  5. Seam and joint construction details.
  6. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.
- C. Product Data: Submit data for duct materials.
- D. Samples: Submit two samples of typical shop fabricated duct fittings.

#### **1.05 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

#### **1.06 QUALITY ASSURANCE**

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.
- B. Construct ductwork to NFPA 90A and NFPA 90B standards.
- C. Maintain one copy of each document on site.

#### **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

#### **1.08 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

#### **1.09 WARRANTY**

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish one year manufacturer warranty for ducts.

### **PART 2 PRODUCTS**

#### **2.01 DUCT MATERIALS**

- A. Furnish materials in accordance with State of California standards.
- B. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having zinc coating of in conformance with ASTM A90/A90M.
- C. Fasteners: Rivets, bolts, or sheet metal screws.
- D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

#### **2.02 SINGLE WALL SPIRAL ROUND DUCTS**

- A. Manufacturers:
  1. McGill AirFlow Corporation.

2. Semco Incorporated.
  3. Tangent Air Corp.
  4. Spiral Mfg. Co., Inc.
- B. Product Description: UL 181, Class 1, round spiral lockseam duct constructed of galvanized steel.
- C. Construct duct with the following minimum gages:
1. Diameter Gauge
  2. 3 inches to 14 inches 26
- D. Construct fittings with the following minimum gages:
1. Diameter Gauge
  2. 3 inches to 14 inches 24

### 2.03 DUCTWORK FABRICATION

- A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated on Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify sizes of equipment connections before fabricating transitions.

### 3.02 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 8 inch and smaller.
- D. Install duct hangers and supports in accordance with Section 23 05 29.
- E. Use double nuts and lock washers on threaded rod supports.

### 3.03 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

### 3.04 SCHEDULES

- A. Ductwork Material Schedule:  
AIR SYSTEM MATERIAL

General Exhaust      Steel

B. Ductwork Pressure Class Schedule:

AIR SYSTEM	PRESSURE CLASS
General Exhaust	2 inch wg regardless of velocity.

**END OF SECTION**

**SECTION 23 3300**

**AIR DUCT ACCESSORIES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Back-draft dampers.
- B. Related Sections:
  - 1. Section 23 31 00 - HVAC Ducts and Casings: Requirements for duct construction and pressure classifications.

**1.02 REFERENCES**

- A. Sheet Metal and Air Conditioning Contractors:
  - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- B. CBC Section 716.
- C. CMC Chapter 6.

**1.03 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors and duct test holes.
- C. Product Data: Submit data for shop fabricated assemblies and hardware used.
- D. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.
  - 1. Backdraft dampers.
- E. Product Data: For combination fire and smoke dampers submit the following:
  - 1. Include UL ratings, dynamic ratings, leakage, pressure drop and maximum pressure data.
  - 2. Indicate materials, construction, dimensions, and installation details.
  - 3. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

**1.04 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

**1.05 QUALITY ASSURANCE**

- A. Dampers tested, rated and labeled in accordance with the latest UL requirements.
- B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.
- C. Perform Work in accordance with State of California standards.

**1.06 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Protect dampers from damage to operating linkages and blades.
- C. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- D. Storage: Store materials in a dry area indoor, protected from damage.
- E. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

#### **1.08 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

#### **1.09 WARRANTY**

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish one year manufacturer warranty for duct accessories.

### **PART 2 PRODUCTS**

#### **2.01 BACK-DRAFT DAMPERS**

- A. Manufacturers:
  - 1. Pottorff.
  - 2. Ruskin.
  - 3. California Aire.
- B. Product Description: Multi-Blade, back-draft dampers: Parallel-action, gravity-balanced, Galvanized 16 gage thick steel, or extruded aluminum. Blades, maximum 6 inch width, center pivoted, with felt or flexible vinyl sealed edges. Blades linked together in rattle-free manner with 90-degree stop, steel ball bearings, and plated steel pivot pin. Furnish dampers with adjustment device to permit setting for varying differential static pressure.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Install back-draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated on Drawings.

**END OF SECTION**

## SECTION 23 3400

### HVAC FANS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Ceiling fans.
- B. Related Sections:
  - 1. Section 23 31 00 - HVAC Ducts and Casings: Product requirements for hangers for placement by this section.
  - 2. Section 23 33 00 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.

##### 1.02 REFERENCES

- A. Air Movement and Control Association International, Inc.:
  - 1. AMCA 99 - Standards Handbook.
  - 2. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
  - 3. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
  - 4. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- B. Underwriters Laboratories Inc.:
  - 1. UL 705 - Power Ventilators.

##### 1.03 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Shop Drawings: Indicate size and configuration of fan assembly, mountings, weights, ductwork and accessory connections.
- C. Product Data: Submit data on each type of fan and include accessories, fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, electrical characteristics and connection requirements.
- D. Manufacturer's Installation Instructions: Submit fan manufacturer's instructions.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

##### 1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

##### 1.05 QUALITY ASSURANCE

- A. Performance Ratings: Conform to AMCA 210 and bear AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
- C. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- D. Balance Quality: Conform to AMCA 204.

##### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

- B. Protect motors, shafts, and bearings from weather and construction dust.

#### **1.07 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

#### **1.08 WARRANTY**

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer's warranty for fans.

### **PART 2 PRODUCTS**

#### **2.01 CEILING FANS**

- A. Manufacturers:
  - 1. Loren Cook Company.
  - 2. Greenheck Corp.
  - 3. Penn Ventilation.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Centrifugal Fan Unit: Direct driven with injection molded resin, galvanized steel housing lined with 1/2 inch acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge opening, integral outlet duct collar. Discharge position convertible by moving interchangeable panels.
- C. Disconnect Switch: Cord and plug in housing, fan mounted toggle switch for thermal overload protected motor.
- D. Grille: Painted white aluminum metal.
- E. Wheel: Centrifugal forward curved type constructed of injection molded or polypropylene resin.
- F. Motor: Open drip proof type with permanently lubricated sealed bearings and thermal overload protection.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

#### **3.02 INSTALLATION**

- A. Provide backdraft dampers on outlet from cabinet and ceiling fans and as indicated on Drawings.

#### **3.03 MANUFACTURER'S FIELD SERVICES**

- A. Section 01 40 00 - Quality Requirements: Requirements for manufacturer's field services.
- B. Furnish services of factory trained representative for minimum of one day to start-up, calibrate controls, and instruct Owner on operation and maintenance.

#### **3.04 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

#### **3.05 DEMONSTRATION**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate fan operation.

**3.06 PROTECTION OF FINISHED WORK**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Do not operate fans for until ductwork is clean, bearings lubricated, and fan has been test run under observation.

**END OF SECTION**

**SECTION 23 8200**  
**ELECTRIC UNIT HEATERS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Electric unit heaters.
- B. Related Sections:
  - 1. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for electric connection to units specified by this section.

**1.02 SUBMITTALS**

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations. Indicate schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers.
- C. Manufacturer's Installation Instructions: Submit assembly, support details, and connection requirements.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

**1.03 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

**1.04 QUALITY ASSURANCE**

- A. Perform Work in accordance with the City of El Segundo standard.
- B. Maintain one copy of each document on site.

**1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

**1.06 PRE-INSTALLATION MEETINGS**

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept units on site in factory packing. Inspect for damage. Store under roof.

**1.08 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

**1.09 WARRANTY**

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish one year manufacturer's warranty for unit heater.

### **1.10 EXTRA MATERIALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

## **PART 2 PRODUCTS**

### **2.01 ELECTRIC UNIT HEATERS**

- A. Manufacturers:
  - 1. Reznor Model EGHB.
  - 2. Sterling.
  - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Assembly: UL listed and labeled assembly with terminal box and cover, and controls.
- C. Heating Elements: Stainless steel tubular heating elements.
- D. Cabinet: 18 and 20 gauge steel with easily removed front panel with integral air outlet and inlet grilles.
- E. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.
- F. Fan: Direct-drive propeller type, statically and dynamically balanced, with fan guard.
- G. Motor: Permanently lubricated, sleeve bearings for horizontal models; ball bearings for vertical models.
- H. Control: Furnish thermal overload; 24V relay with transformer and wall mounted thermostat.
- I. Electrical Characteristics:
  - 1. 10 kW.
  - 2. 208 volts, three phase, 60 Hz.
  - 3. Refer to Section 26 05 03.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify wall construction is ready for installation.
- C. Verify concealed blocking and supports are in place and connections are correctly located.

### **3.02 INSTALLATION**

- A. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.
- B. Protection: Install finished cabinet units with protective covers during remainder of construction.
- C. Unit Heaters: Hang from wall with factory supplied wall brackets.
- D. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals and Section 26 05 03.

### **3.03 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

**END OF SECTION**

**SECTION 26 0500**

**COMMON WORK RESULTS ON ELECTRICAL**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. This section supplements all sections of this division and shall apply to all phases of work hereinafter specified, shown on the drawings, or required to provide a complete installation of electrical systems for the Project. The work required under this division is not limited to the Electrical Drawings. Refer to Site, Architectural, Structural, and Mechanical Drawings which may designate Work to be accomplished. The intent of the Specifications is to provide a complete electrical system which include all documents which are a part of the Contract.
  - 1. Work included: Furnish all labor, material, tools, equipment, facilities, transportation, skilled supervision necessary for, and incidental to, performing operations in connection with furnishing, delivery, and installation of the work in this section complete as shown or noted on the Drawings and specified herein.
- B. Related Work Specified Elsewhere: Refer to all sections in Division 0, Contract Requirements and Division 1, General Requirements.
- C. Work Installed but Furnished by Others: The electrical work includes the installation or connection of certain materials and equipment furnished by others. Verify installation details. Foundations for apparatus and equipment will be furnished by others unless otherwise noted or detailed.

**1.02 GENERAL REQUIREMENTS**

- A. Guaranty See General Conditions and Section 01 70 00 - Execution and Closeout Requirements:
  - 1. Except as may be specified under other Sections in the specification, guarantee equipment furnished under the specifications for a period of one year, except for equipment required to have a longer guaranty period, from date of Substantial Completion against defective workmanship and material, and improper installation. Upon notification of failure, correct deficiency immediately and without cost to the Owner.
  - 2. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to the Owner or his service agency as approved. Furnish to the Owner, through the Architect, printed manufacturer's warranties complete with material included and expiration dates, upon completion of project. Conform to Section 01 70 00 - Execution and Closeout Requirements.
- B. Equipment Safety: All electrical materials and equipment shall be new and shall be listed by Underwriters Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety. Provide signage at all electrical rooms and on each exterior electrical enclosure access door or gate. Sign shall read "DANGER-HIGH VOLTAGE". Provide signage on each door or removable access panel on electrical equipment rated 600 volts and over. Sign shall read "DANGER-HIGH VOLTAGE".
- C. Codes and Regulations:
  - 1. Design, manufacture, testing and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the latest publications or standard rules of the following:
  - 2. Institute of Electrical and Electronic Engineers - IEEE
  - 3. National Electrical Manufacturers' Association - NEMA
  - 4. Underwriters' Laboratories, Inc. - UL
  - 5. National Fire Protection Association - NFPA

6. American Society for Testing and Materials - ASTM
  7. American National Standards Institute - ANSI
  8. California Electrical Code - CEC
  9. California Code of Regulations, Title 8, Subchapter 5
  10. California Building Code
  11. State & Municipal Codes in Force in the Specific Project Area
  12. Occupational Safety & Health Administration - OSHA
  13. California State Fire Marshal - CSFM
  14. The term "Code", when used within the specifications, shall refer to the Publications, Standards, ordinances and codes, listed above. In the case where the codes have different levels of requirements the most stringent rules shall apply.
- D. Requirements of Regulatory Agencies:
1. Codes, Permits, and Fees: Where the Contract Documents exceed minimum requirements, the Contract Documents take precedence. Where code conflicts occur, the most stringent shall apply unless variance is approved.
    - a. Comply with all requirements for permits, licenses, fees and Code. Permits, licenses, fees, inspections and arrangements required for the work shall be obtained by the Contractor at his expense, unless otherwise specified.
- E. Shop Drawings:
1. See Section 01 30 00 - Administrative Requirements: Submittal Procedures for additional requirements.
  2. Time Schedules for Submission and Ordering: The Contractor shall prepare, review and coordinate his schedule of submissions carefully, determining the necessary lead time for preparing, submitting, checking, ordering and delivery of materials and equipment for timely arrival. The Contractor shall be responsible for conformance with the overall construction schedule.
  3. Submittals will be checked for general compliance with specifications only. The Contractor shall be responsible for deviations from the drawings or specifications and for errors or omissions of any sort in submittals.
  4. Submit a complete list of materials and equipment proposed for the job, including manufacturers names and catalog numbers.
  5. Shop drawings shall be submitted in completed groups of materials (i.e., lighting fixtures or switchgear). The Contractor shall add and sign the following paragraph on equipment and materials submitted for review. "It is hereby certified that the (equipment) (material) shown and marked in this submittal is that proposed to be incorporated into the project; is in compliance with the Contract Drawings and specifications and can be installed in the allocated spaces". Failure to add the above written statement for compliance will result in return of submittals to be reviewed.
    - a. Bind catalog cuts, plate numbers, descriptive bulletins and drawings, 11" x 17" or smaller, in sets with covers neatly showing titles.
    - b. The Contractor shall verify dimensions of equipment and be satisfied as to Code compliance for fit prior to submitting shop drawings for approval.
    - c. Where current limiting devices are specified, submit technical data to substantiate adequate protection of equipment cascaded downstream. Submittals shall not be reviewed unless supporting calculations and data are submitted therewith.
    - d. Include complete catalog information such as construction, ratings and insulation systems, as applicable.
    - e. For any material specified to meet UL or trade standards, furnish the manufacturer or vendor's certification that the material furnished for the work does in fact equal or exceed such specifications.
    - f. Reference listings to the specifications' Sections and Article to which each is applicable.

- g. Equipment Floor Plans: After approval of material is secured, prepare a floor plan of each electrical communication, and voice/data equipment room, drawn to scale at 1/2 inch equals 1 foot and submit for approval prior to rough-in in the same manner as for shop drawings. The layout drawings shall be exact scale. Equipment dimensions shall not exceed those indicated on the drawings. If proposed equipment exceeds these dimensions, it shall be the responsibility of the contractor to coordinate all equipment arrangement within the room with all affected trades to provide all code clearances and proper arrangements prior to rough-in. Equipment that grossly exceeds the space allocated and would require an increase in room size is not acceptable.
- 6. Contractor shall prepare coordinated drawings when required by Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- F. Interpretations: Requests for interpretations of drawings and specifications must be made by the Contractor through the Architect. Any such requests made by equipment manufacturers or suppliers will be referred to the Contractor.
- G. Substitutions: Refer to General Conditions.
- H. Submit comprehensive material list, shop drawings and complete technical data for the following equipment and materials:
  - 1. General Requirements:
    - a. Main service and distribution switchboards.
    - b. Panelboards.
    - c. Conduits
    - d. Conductors, include selected insulation type.
    - e. Fuses
    - f. Disconnect switches.
    - g. Pullboxes, manholes and handholes.
    - h. Standard lighting fixtures, specially fabricated fixtures, ballasts and lamps, with samples and sample of standard finish available (where requested).
    - i. Control devices, standard and special receptacles, switches, plug strips and finish device plates.
    - j. Cabinets for signal and telephone system, special terminals and cabinets.
    - k. Fire alarm system.
    - l. Telephone/data network system.
- I. Record Drawings: Refer to Section 01 70 00 - Execution and Closeout Requirements.
- J. Work Responsibilities:
  - 1. The drawings indicate diagrammatically the desired locations or arrangement of conduit runs, outlets and equipment and are to be followed. Execute the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations. The Contractor is responsible for the correct placing of his work.
  - 2. Locations shown on architectural plan or on wall elevations shall take precedence over electrical plan locations, but where a major conflict is evident, notify the Architect before installing any rough-in conduit underground or above ground.
  - 3. In the event changes in the indicated locations or arrangement are necessary due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without extra cost.
  - 4. Verify dimensions and the correct location of Owner-Furnished equipment before proceeding with the roughing-in of connections.

5. Lighting fixtures in mechanical spaces and elevator machine rooms are shown in their approximate locations only. Do not install light outlets or fixtures until mechanical piping and ductwork are installed; then lights shall be installed in locations best suited for equipment arrangement as directed by the Architect. Verify locations of fixtures in elevator machine rooms with the elevator company before installation.
  6. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with work carefully check and verify dimensions and sizes with the drawings to see that the equipment will fit into the spaces provided without violation of applicable Codes.
  7. Should any changes to the work indicated on the drawings or described in the specifications be necessary in order to comply with the above requirements, notify the Architect.
  8. Be responsible for coordination of coordinated drawings.
  9. Replace or repair, without additional compensation, any work which does not comply with these requirements.
- K. Installation General: For special requirements, refer to specific equipment under these requirements.
1. Unless otherwise specified elsewhere in the specifications, do all excavating necessary for the proper installation of the electrical work.
  2. Locations of Openings: Locate chases, shafts and openings required for the installation of the electrical work during framing of the structure. Do any additional cutting and patching required. Cutting or drilling in any structural member is prohibited without approval of the Architect. Furnish access panels as required.
  3. Location of Sleeves: Where conduits pass through concrete walls, suspended slabs or metal deck floors, install sleeves of adequate size to permit installation of conduit. Sleeves shall be installed prior to pouring of concrete and shall have ends flush with the wall or extend 2 inches above floor surfaces. Verify locations.
  4. Type of Sleeves: Sleeves shall be steel pipe or galvanized sheet steel.
  5. Finish Around Sleeves: Rough edges shall be finished smooth. Space between conduit and sleeves where conduit passes through exterior walls shall be sealed to permit movement of conduit, but prevent entrance of water. Space between conduit and sleeves where conduit passes through fire rated interior walls and slabs shall be sealed with approved materials to provide a fire barrier conforming to the requirements of the governing authorities having jurisdiction, using UL Approved Firestopping Systems.
  6. Wherever conduit extends through roof, install flashings in accordance with drawings and details.
  7. Be responsible for cutting and patching which may be required for the proper installation of the electrical work.
  8. Protect work, materials and equipment cause whatever and provide adequate and proper storage facilities during the progress of the work.
  9. Storage outdoors shall be weather protected and shall include space heaters to prevent condensation. Provide for the safety and good condition of all work until final acceptance of the work. Replace all damaged or defective work, materials and equipment before requesting final acceptance.
  10. Conduit and Equipment to be Installed: Clean thoroughly to remove plaster, spattered paint, cement and dirt on both exterior and interior
  11. Conduit and Equipment to be Painted: Clean conduit exposed to view in completed structure by removing plaster and dirt. Remove grease, oil and similar material from conduit and equipment by wiping with clean rags and suitable solvents in preparation for paint.
  12. Items with Factory Finish: Remove cement, plaster, grease and oil, and leave surfaces, including cracks and corners, clean and polished. Touch up scratched or bare spots to

match finish.

13. Site Cleaning: Remove from site all packing cartons, scrap materials and other rubbish.
14. Electrical equipment and materials exposed to public and in finished areas shall be finish-painted after installation in accordance with the Painting Section. All exposed screw-type fasteners, exterior, or interior in restrooms, shall be vandal-resistant spanner type; include tool.

L. Excavation, Cutting and Patching:

1. Excavating, trenching and backfilling required for the work of this Division in accordance with the applicable requirements of Division 2. Excavating and backfilling connected with electrical work, repaving cuts and providing and maintaining protective measures for the electrical work excavation required by the governing authorities having jurisdiction shall be performed as a part of the work of this Division.
2. Verify openings indicated on the drawings. Additional cutting, patching and reinforcement of the construction of the building as required.

M. Tests:

1. Equipment and systems for which the National Electrical Testing Association (NETA) has an approved or recommended procedure, shall be tested in accordance with that procedure. Test values shall equal values recommended by NETA. Copies of test reports shall be submitted as required under shop drawing submittals.
2. Resistance to ground tests shall be accomplished by a qualified independent testing firm to measure resistance to ground at grounding electrodes. Make tests before slabs or affected areas are poured in order that corrective measures, if required, may be taken. Submit a report showing the results of these measurements. If the resistances exceed values specified elsewhere or NETA test procedure recommendations, perform corrective measures required to reduce resistance to acceptable values.
3. Prior to energizing any motor, measure the service voltage for phase balance and report if unbalance exceeds 1% from mean.
4. Measure the three-phase voltage at no load and at maximum load conditions and submit to the report showing the results of these measurements.
5. Upon completion of the work and adjustment of all equipment, conduct an operating test. Conduct the test in the presence of an authorized representative of the Architect. Demonstrate system and equipment to operate in accordance with requirements of the Contract Documents and to be free from electrical and mechanical defects. Provide systems free from short circuits and grounds and show an insulation resistance between phase conductors and ground not less than the requirements of the governing electric code. Test circuits for proper neutral connection.
6. Complete tests prior to final inspection of project, including corrective work based on the results of the tests.
7. Perform special tests on systems and equipment as specified herein using personnel qualified to perform such tests.
8. Submit a report showing test voltage of line to neutral on the secondaries of transformers.
9. Measure voltage on secondary side of transformers with full load connected and adjust taps to provide rated secondary voltage.
10. Refer to Section 01 40 00 - Quality Requirements for other testing requirements.

- N. Protection: Protect finish parts of the materials and equipment against damage during the progress of the work and until final completion and acceptance. Cover materials and equipment in storage and during construction in such a manner that no finished surfaces will be damaged or marred. Keep moving parts clean, dry and lubricated.

O. Cleaning Up:

1. Upon completion of the work and at various time during the progress of the work, remove from the building all surplus materials, rubbish and debris resulting from the work of this Division.
  2. Thoroughly clean switchgear including busses, apparatus, exposed conduit, metal work including the exterior and interior, and accessories for the work of this Division, of cement, plaster and other deleterious materials; remove grease and oil spots with cleaning solvent; carefully wipe surfaces and scrape cracks and corners clean.
  3. Thoroughly polish chromium or plated work. Remove dirt and stains from lighting fixtures.
  4. Leave the entire installation in a clean condition.
- P. Completion:
1. The work will not be reviewed for final acceptance until operating and maintenance data, manufacturer's literature, panel directories and nameplates specified herein have been approved and properly posted or installed and final cleaning of equipment and premises has been completed.
  2. When the installation is complete and adjustments have been made, operate the system for a period of one week, during which time demonstrate that systems are completed and operating in conformance with the specifications.
  3. Refer to Section 01 70 00 - Execution and Closeout Requirements for other system starting requirements.
- Q. Operating and Maintenance Data: Submit complete and at one time, prior to acceptance of the installation, 4 copies of manufacturer's instructions for operation and maintenance of electrical equipment, including replacement parts lists. As specified in Section 01 70 00 - Execution and Closeout Requirements.
- R. Inspection and Acceptance Procedures: The Architect will submit observation reports periodically during the construction phase detailing Contract deficiencies. The Contractor is responsible for making corrections immediately. Notice of Completion of the project will not be made until all items have been corrected.
- S. Substantial Completion of Electrical Systems:
1. Prior to Substantial Completion of operating electrical systems, the Contractor shall:
    - a. Provide materials of the type and quality specified and as necessary for proper operation, tested and ready for use.
    - b. Deliver to the Architect, the Record Drawings.
    - c. Furnish the required Operating and Maintenance Data/Manuals.
    - d. Clean up of the project pertaining to this Division of the work.
    - e. After installation has been completed and adjustments made, operate the system for a period of one week, during which time, demonstrate to the Architect that systems are complete and operating in conformance with Contract Documents.
    - f. Conduct tests required and as specified in this Division and submit test reports and corrective actions taken.
    - g. Submission of warranties and guarantees.
  2. Substantial Completion of Work Shall be Contingent On:
    - a. Contractor replacing defective materials and workmanship.
    - b. Upon completion of work and adjustments made, Contractor shall conduct an operating test for each system for approval at such time as Architect directs. Conduct test in presence of authorized representative of Architect and demonstrate that systems and equipment do operate in accordance with requirements of the Contract Documents and are free from electrical and mechanical defects.
    - c. Contractor shall provide the necessary training programs and instructions to the Owner's representative. Number of hours or days as required under separate Sections of these Specifications.

- d. Submit copies of manufacturer's instructions and maintenance of electrical equipment including replacement parts lists. Each set shall include one set of shop drawings of equipment installed.
- T. Submittals for Change Orders: When changes are made during the construction phase, deletions and additions shall be presented in a manner that will indicate the cost of each item of material and corresponding labor. Markup shall be then added in accordance with the requirements of the General Conditions as modified by the Supplementary Conditions.
  1. Unit pricing shall apply in event of changes, additions and deletions to the base Contract, as follows:
    - a. Submit a unit cost, covering one hour of labor, including all applicable supervision, nonproductive labor, burdens, benefits, insurance's, taxes, direct and indirect job expenses including drawings, engineering temporary power, warehouse, tools, equipment, clean-up, bonds, overhead and profit, charged for labor. Unit cost of labor shall be applicable for duration through completion of the project.
    - b. Material unit costs shall be based on the latest edition of "Electrical Trade Book," published by Trade Service Publications, Inc., Unit cost shall be taken from extreme right-hand column.
  2. Labor unit quantities, for specific items as required by unit pricing and for equipment not covered by unit pricing shall be those listed in the third column from the National Electrical Contractors' Association, Inc., "NECA Manual of Labor Units."
  3. For material not covered by the Unit Pricing, use the latest edition of "Electrical Trade Book, extreme right hand column. This materials cost shall remain for the duration of the contract and shall apply to all phases of construction.
- U. The Contractor at a time convenient to the Owner shall provide instruction to the Owner's operating personnel in the proper operation and maintenance of the equipment and systems. The instructors shall have received factory training and shall be thoroughly familiar with the equipment installed. The operating personnel shall receive the number of day's instruction as indicated in other sections.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 26 0503**

**EQUIPMENT WIRING CONNECTIONS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section includes electrical connections to equipment.
- B. Related Sections:
  - 1. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
  - 2. Section 26 05 33 - Raceway and Boxes for Electrical Systems.

**1.02 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA WD 1 - General Requirements for Wiring Devices.
  - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

**1.03 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data: Submit wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's installation instructions.

**1.04 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Submittal procedures.
- B. Project Record Documents: Record actual locations, sizes, and configurations of equipment connections.

**1.05 COORDINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- C. Determine connection locations and requirements.
- D. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- E. Sequence electrical connections to coordinate with start-up of equipment.

**PART 2 PRODUCTS**

**2.01 CORD AND PLUGS**

- A. Manufacturers:
  - 1. Hubbell.
  - 2. Pass & Seymour.
  - 3. General Electric.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Attachment Plug Construction: Conform to NEMA WD 1.
- C. Configuration: NEMA WD 6; match receptacle configuration at outlet furnished for equipment.

- D. Cord Construction: Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- E. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify equipment is ready for electrical connection, for wiring, and to be energized.

#### **3.02 INSTALLATION**

- A. Make electrical connections.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Install receptacle outlet to accommodate connection with attachment plug.
- E. Install cord and cap for field-supplied attachment plug.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

#### **3.03 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

**END OF SECTION**

## SECTION 26 0519

### LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section includes building wire and cable; nonmetallic-sheathed cable; direct burial cable; service entrance cable; armored cable; metal clad cable; and wiring connectors and connections.
- B. Related Sections:
  - 1. Section 26 05 53 - Identification for Electrical Systems: Product requirements for wire identification.
  - 2. Section 31 23 17 - Trenching: Execution requirements for trenching required by this section.
  - 3. Section 31 23 23 - Fill: Requirements for backfill to be placed by this section.

##### 1.02 REFERENCES

- A. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- B. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.
  - 2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air Handling Spaces.
- C. Underwriters Laboratories, Inc.:
  - 1. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

##### 1.03 SYSTEM DESCRIPTION

- A. Product Requirements: Provide products as follows:
  - 1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
  - 2. Stranded conductor for feeders and branch circuits #8 AWG and larger.
  - 3. Stranded conductors for control circuits.
  - 4. Conductor not smaller than 12 AWG for power and lighting circuits.
  - 5. Conductor not smaller than 16 AWG for control circuits.
  - 6. 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
  - 7. 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.
- B. Wiring Methods: Provide the following wiring methods:
  - 1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
  - 2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
  - 3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN insulation, in raceway.
  - 4. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
  - 5. Exterior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
  - 6. Underground Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
  - 7. Cable Tray Locations: Use only tray cable Type TC.

##### 1.04 DESIGN REQUIREMENTS

- A. Conductor sizes are based on copper. Aluminum conductors are not permitted.

### **1.05 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data: Submit for building wire and each cable assembly type.
- C. Test Reports: Indicate procedures and values obtained.

### **1.06 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of components and circuits.

### **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

### **1.08 FIELD MEASUREMENTS**

- A. Verify field measurements are as indicated on Drawings.

### **1.09 COORDINATION**

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

## **PART 2 PRODUCTS**

### **2.01 BUILDING WIRE**

- A. Manufacturers:
  - 1. Rome Cable.
  - 2. Superior Essex.
  - 3. Southwire.
  - 4. General Cable.
  - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Single conductor insulated wire.
- C. Conductor: Copper.
- D. Insulation: CEC; Type THHN/THWN 600 V insulation rated 75 degrees C for feeders and branch circuits larger than 2 AWG; Type THHN/THWN 600 V insulation rated 60 degrees C for feeders and branch circuits 1 AWG and smaller.

### **2.02 ARMORED CABLE**

- A. Manufacturers:
  - 1. Diamond Wire & Cable Co.
  - 2. Essex Group Inc.
  - 3. General Cable Co.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Conductor: Copper for sizes smaller than 4 AWG.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation Temperature Rating: 60 degrees C.
- E. Insulation Material: Thermoplastic.

- F. Armor Material: Steel.
- G. Armor Design: Interlocked metal tape.

### **2.03 METAL CLAD CABLE**

- A. Manufacturers:
  - 1. Diamond Wire & Cable Co.
  - 2. Essex Group Inc.
  - 3. General Cable Co.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Conductor: Copper for sizes smaller than 4 AWG.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation Temperature Rating: 60 degrees C.
- E. Insulation Material: Thermoplastic.
- F. Armor Material: Steel.
- G. Armor Design: Interlocked metal tape.
- H. Jacket: PVC.

### **2.04 TRAY CABLE**

- A. Manufacturers:
  - 1. Rome Cable Company.
  - 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Multiconductor power and control cable NFPA 70 Type TC.
- C. Conductor: Copper.
- D. Insulation: Flame-retardant cross-linked polyethylene.
- E. Overall Jacket: Polyvinyl Chlorine (PVC) in accordance with UL 1277.
- F. Insulation Voltage Rating: 600 volts.
- G. Insulation Temperature Rating: 90 degrees C.
- H. Listings: Finished cable UL listed as Type TC, and sunlight resistant.

### **2.05 WIRING CONNECTORS**

- A. Split Bolt Connectors:
  - 1. ILSCO Model SK.
  - 2. Burndy Model KSU.
  - 3. Blackburn Model HPS.
  - 4. Substitutions: Substitutions: Section 01 60 00 - Product Requirements.
- B. Solderless Pressure Connectors:
  - 1. ILSCO Model SLUH.
  - 2. Burndy Model KA-U.
  - 3. Panduit Model LAM.
  - 4. Substitutions: Substitutions: Section 01 60 00 - Product Requirements.
- C. Compression Connectors:
  - 1. ILSCO Model CRL.
  - 2. Burndy Model HYLUG/HYLINK.
  - 3. Blackburn Model ATL.

4. Substitutions: Substitutions: Section 01 60 00 - Product Requirements.

## **2.06 TERMINATIONS**

- A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression type copper.
- B. Lugs for Wires 4 AWG and Larger: Color keyed, compression type copper, with insulating sealing collars.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify interior of building has been protected from weather.
- C. Verify mechanical work likely to damage wire and cable has been completed.
- D. Verify raceway installation is complete and supported.

### **3.02 PREPARATION**

- A. Completely and thoroughly swab raceway before installing wire.

### **3.03 INSTALLATION**

- A. Route wire and cable to meet Project conditions.
- B. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- C. Identify and color code wire and cable under provisions of Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.
- D. Special Techniques--Building Wire in Raceway:
- E. Pull conductors into raceway at same time.
- F. Install building wire 4 AWG and larger with pulling equipment.
- G. Special Techniques - Cable:
  1. Protect exposed cable from damage.
  2. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.
  3. Use suitable cable fittings and connectors.
- H. Special Techniques - Wiring Connections:
  1. Clean conductor surfaces before installing lugs and connectors.
  2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
  3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
  4. Install split bolt connectors for conductor splices and taps, 6 AWG and larger.
  5. Install solderless pressure connectors with insulating covers for conductor splices and taps, 8 AWG and smaller.
- I. Install solid conductor for feeders and branch circuits 10 AWG and smaller.
- J. Install solid conductors for branch circuits 10 AWG and smaller. However, when stranded conductors are used in lieu of solid, then install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.
- K. Install terminal lugs on ends of 600 volt wires unless lugs are furnished on connected device, such as circuit breakers.

- L. Size lugs in accordance with manufacturer's recommendations terminating wire sizes. Install 2-hole type lugs to connect wires 4 AWG and larger to copper bus bars.
- M. For terminal lugs fastened together such as on motors, transformers, and other apparatus, or when space between studs is small enough that lugs can turn and touch each other, insulate for dielectric strength of 2-1/2 times normal potential of circuit.

### **3.04 WIRE COLOR**

- A. General
  - 1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following:
    - a. Black, red, and blue for circuits at 120/208 volts single or three phase.
  - 2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
    - a. Black, red, and blue for circuits at 120/208 volts single or three phase.
- B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.
- C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.
- D. Feeder Circuit Conductors: Uniquely color code each phase.
- E. Ground Conductors:
  - 1. For 6 AWG and smaller: Green.
  - 2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

### **3.05 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

**END OF SECTION**

**SECTION 26 0526**

**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Rod electrodes.
  - 2. Active electrodes.
  - 3. Wire.
  - 4. Grounding well components.
  - 5. Mechanical connectors.
  - 6. Exothermic connections.
- B. Related Sections:
  - 1. Section 03 20 00 - Concrete Reinforcing: Bonding or welding bars when reinforcing steel is used for electrodes.

**1.02 REFERENCES**

- A. Institute of Electrical and Electronics Engineers:
  - 1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
  - 2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.

**1.03 SYSTEM DESCRIPTION**

- A. Grounding systems use the following elements as grounding electrodes:
  - 1. Metal underground water pipe.
  - 2. Metal building frame.
  - 3. Concrete-encased electrode.
  - 4. Rod electrode.
  - 5. Plate electrode.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Grounding System Resistance: 5 ohms maximum.

**1.05 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data: Submit data on grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- D. Manufacturer's Installation Instructions: Submit for active electrodes.

**1.06 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of components and grounding electrodes.

### **1.07 QUALITY ASSURANCE**

- A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.
- B. Perform Work in accordance with CEC.
- C. Maintain 2 copies of each document on site.

### **1.08 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer Company specializing in performing work of this section with minimum 3 years documented experience.

### **1.09 PRE-INSTALLATION MEETINGS**

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

### **1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.
- D. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

### **1.11 COORDINATION**

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Complete grounding and bonding of building reinforcing steel prior to concrete placement.

## **PART 2 PRODUCTS**

### **2.01 ROD ELECTRODES**

- A. Product Description:
  - 1. Material: Copper-clad steel.
  - 2. Diameter: 3/4 inch.
  - 3. Length: 10 feet.
- B. Connector: Connector for exothermic welded connection.

### **2.02 ACTIVE ELECTRODES**

- A. Manufacturers:
  - 1. Erico, Inc.
  - 2. O-Z Gedney Co.
  - 3. Thomas & Betts, Electrical.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description:
  - 1. Material: Metallic-salt-filled copper-tube electrode.
  - 2. Shape: As indicated on Drawings.
  - 3. Length: 10 feet.

4. Connector: Connector for exothermic welded connection.

### **2.03 WIRE**

- A. Material: Stranded copper.
- B. Foundation Electrodes: 4 AWG or as noted.
- C. Grounding Electrode Conductor: Copper conductor bare, size to meet CEC requirements.
- D. Bonding Conductor: Copper conductor bare.

### **2.04 GROUNDING WELL COMPONENTS**

- A. Well Pipe: 8 inches NPS by 24 inches long concrete pipe with belled end.
- B. Well Cover: Cast iron with legend "GROUND" embossed on cover.

### **2.05 MECHANICAL CONNECTORS**

- A. Manufacturers:
  1. Erico, Inc.
  2. ILSCO Corporation.
  3. O-Z Gedney Co.
  4. Thomas & Betts, Electrical.
  5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

### **2.06 EXOTHERMIC CONNECTIONS**

- A. Manufacturers:
  1. Copperweld, Inc.
  2. ILSCO Corporation.
  3. O-Z Gedney Co.
  4. Thomas & Betts, Electrical.
  5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify final backfill and compaction has been completed before driving rod electrodes.

### **3.02 PREPARATION**

- A. Remove surface contaminants at connection points.

### **3.03 INSTALLATION**

- A. Install rod electrodes at locations as indicated on Drawings. Install additional rod electrodes to achieve specified resistance to ground.
- B. Install grounding and bonding conductors concealed from view.

- C. Install grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.
- D. Install grounding electrode conductor and connect to ufer grounding as indicated on Drawings.
- E. Bond together metal siding not attached to grounded structure; and bond to ground.
- F. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- G. Permanently attach equipment and grounding conductors prior to energizing equipment.
- H. Install continuous grounding using underground cold water system and building steel as grounding electrode. Where water piping is not available, install artificial station ground by means of driven rods or buried electrodes.
- I. Permanently ground entire light and power system in accordance with CEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.
- J. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with CEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment.
- K. Ground electrical system using continuous metal raceway system enclosing circuit conductors in accordance with CEC. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.

#### **3.04 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground resistance testing in accordance with IEEE 142.
- E. Perform leakage current tests in accordance with NFPA 99.
- F. Perform continuity testing in accordance with IEEE 142.
- G. When improper grounding is found on receptacles, check receptacles in entire project and correct. Perform retest.

**END OF SECTION**

**SECTION 26 0529**

**HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Conduit supports.
  - 2. Formed steel channel.
  - 3. Sleeves.
  - 4. Firestopping relating to electrical work.
  - 5. Firestopping accessories.
  - 6. Equipment bases and supports.
- B. Related Sections:
  - 1. Section 03 30 00 - Cast-In-Place Concrete: Product requirements for concrete for placement by this section.
  - 2. Section 27 05 29 - Hangers and Supports for Communications Systems.

**1.02 REFERENCES**

- A. ASTM International:
  - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
  - 3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
  - 4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- B. FM Global:
  - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- C. California Electrical Code:
  - 1. CEC - California Electrical Code.
- D. Underwriters Laboratories Inc.:
  - 1. UL 263 - Fire Tests of Building Construction and Materials.
  - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
  - 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
  - 4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
  - 5. UL - Fire Resistance Directory.

**1.03 DEFINITIONS**

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

**1.04 SYSTEM DESCRIPTION**

- A. Firestopping Materials: ASTM E119, UL 1479 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1 hour fire rating.
- B. Firestopping Materials: ASTM E119, UL 1479, to achieve fire ratings of adjacent construction in accordance with UL Design Numbers noted on Drawings.
- C. Firestop interruptions to fire rated assemblies, materials, and components.

**1.05 PERFORMANCE REQUIREMENTS**

- A. Firestopping: Conform to CSFM and UL for fire resistance ratings and surface burning characteristics.
- B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

#### **1.06 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.
- C. Product Data:
- D. Hangers and Supports: Submit manufacturers catalog data including load capacity.
- E. Firestopping: Submit data on product characteristics, performance and limitation criteria.
- F. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- G. Design Data: Indicate load carrying capacity of trapeze hangers and hangers and supports.
- H. Manufacturer's Installation Instructions:
- I. Hangers and Supports: Submit special procedures and assembly of components.
- J. Firestopping: Submit preparation and installation instructions.
- K. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- L. Engineering Judgements: For conditions not covered by UL or WH listed designs, submit judgements by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

#### **1.07 QUALITY ASSURANCE**

- A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
  - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
  - 2. Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
- B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
  - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
  - 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- C. Fire Resistant Joints in Fire Rated Roof, and Wall Assemblies: L 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on drawings for floor assembly.
- E. Maintain two copies of each document on site.

#### **1.08 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

#### **1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

#### **1.10 ENVIRONMENTAL REQUIREMENTS**

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.
- D. Provide ventilation in areas to receive solvent cured materials.

### **PART 2 PRODUCTS**

#### **2.01 CONDUIT SUPPORTS**

- A. Manufacturers:
  - 1. Allied Tube & Conduit Corp.
  - 2. Electroline Manufacturing Company.
  - 3. O-Z Gedney Co.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.
- F. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

#### **2.02 FORMED STEEL CHANNEL**

- A. Manufacturers:
  - 1. Allied Tube & Conduit Corp.
  - 2. B-Line Systems.
  - 3. Midland Ross Corporation, Electrical Products Division.
  - 4. Unistrut Corp.
  - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Galvanized 12 gage) thick steel. With holes 1-1/2 inches on center.

#### **2.03 SLEEVES**

- A. Sleeves for Conduits Through Non-fire Rated Floors: 18 gage thick galvanized steel.

- B. Sleeves for Conduits Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sleeves for Conduits Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

#### **2.04 MECHANICAL SLEEVE SEALS**

- A. Manufacturers:
  - 1. Thunderline Link-Seal, Inc.
  - 2. NMP Corporation.
  - 3. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

#### **2.05 FIRESTOPPING**

- A. Manufacturers:
  - 1. Dow Corning Corp.
  - 2. Fire Trak Corp.
  - 3. Hilti Corp.
  - 4. International Protective Coating Corp.
  - 5. 3M fire Protection Products.
  - 6. Specified Technology, Inc.
  - 7. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
  - 1. Silicone Firestopping Elastomeric Firestopping: Multiple component silicone elastomeric compound and compatible silicone sealant.
  - 2. Foam Firestopping Compounds: Multiple component foam compound.
  - 3. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
- C. Color: As selected from manufacturer's full range of colors.

#### **2.06 FIRESTOPPING ACCESSORIES**

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Dam Material: Permanent:
  - 1. Sheet metal.
- C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- D. General:
  - 1. Furnish UL listed products or products tested by independent testing laboratory.
  - 2. Select products with rating not less than rating of wall or floor being penetrated.
- E. Non-Rated Surfaces:
  - 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.

2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.
- C. Verify openings are ready to receive firestopping.

#### **3.02 PREPARATION**

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install backing materials to arrest liquid material leakage.
- D. Do not use powder actuated anchors.
- E. Do not drill or cut structural members.

#### **3.03 INSTALLATION - HANGERS AND SUPPORTS**

- A. Anchors and Fasteners:
  1. Concrete Structural Elements: Provide, expansion anchors.
  2. Steel Structural Elements: Provide beam clamps.
  3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
  4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
  5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
  6. Sheet Metal: Provide sheet metal screws.
  7. Wood Elements: Provide wood screws.
- B. Inserts:
  1. Install inserts for placement in concrete forms.
  2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- C. Install conduit and raceway support and spacing in accordance with CEC.
- D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- E. Install multiple conduit runs on common hangers.
- F. Supports:
  1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
  2. Install surface mounted cabinets and panelboards with minimum of four anchors.
  3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.

4. Support vertical conduit at every eight (8') feet.

#### **3.04 INSTALLATION - FIRESTOPPING**

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating to uniform density and texture.
- D. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
- E. Place intumescent coating in sufficient coats to achieve rating required.
- F. Fire Rated Surface:
  1. Seal opening at floor, wall, partition, ceiling and roof as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    - c. Pack void with backing material.
    - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
  2. Where cable tray, conduit, and wireway, penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- G. Non-Rated Surfaces:
  1. Seal opening through non-fire rated wall, partition, ceiling and roof opening as follows:
    - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
    - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
    - c. Install type of firestopping material recommended by manufacturer.
  2. Install escutcheons or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
  3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.
  4. Interior Partitions: Seal pipe penetrations at computer rooms, telecommunication rooms, and data rooms. Apply sealant to both sides of penetrations to completely fill annular space between sleeve and conduit.

#### **3.05 INSTALLATION - EQUIPMENT BASES AND SUPPORTS**

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment. Refer to Section 03 30 00.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of formed steel channel. Brace and fasten with flanges bolted to structure.

#### **3.06 INSTALLATION - SLEEVES**

- A. Exterior watertight entries: Seal with adjustable interlocking rubber links.
- B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.

- D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- E. Extend sleeves through floors 2 inches above finished floor level. Caulk sleeves.
- F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- G. Install stainless steel escutcheons at finished surfaces.

### **3.07 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect installed firestopping for compliance with specifications and submitted schedule.

### **3.08 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of firestopping materials.

### **3.09 PROTECTION OF FINISHED WORK**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

**END OF SECTION**

## SECTION 26 0533

### RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section includes conduit and tubing, wireways, outlet boxes, pull and junction boxes, and handholes.
- B. Related Sections:
  - 1. Section 26 05 03 - Equipment Wiring Connections.
  - 2. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  - 3. Section 26 05 29 - Hangers and Supports for Electrical Systems.
  - 4. Section 26 05 53 - Identification for Electrical Systems.
  - 5. Section 26 27 16 - Electrical Cabinets and Enclosures.
  - 6. Section 26 27 26 - Wiring Devices.
  - 7. Section 27 05 33 - Conduits and Backboxes for Communications Systems.
  - 8. Section 27 05 36 - Cable Trays for Communications Systems.

##### 1.02 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
  - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
  - 3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
- B. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
  - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
  - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
  - 5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
  - 6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
  - 7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

##### 1.03 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.
- B. Underground More than 5 feet outside Foundation Wall: Provide thickwall nonmetallic conduit. Provide cast metal boxes.
- C. Underground Within 5 feet from Foundation Wall: Provide PVC coated rigid steel conduit. Provide cast metal boxes.
- D. Under Slab on Grade: Provide PVC coated rigid steel conduit. Provide cast metal boxes.
- E. Outdoor Locations, Above Grade: Provide galvanized rigid steel conduit. Provide cast metal outlet, pull, and junction boxes.
- F. Wet and Damp Locations: Provide rigid steel conduit. Provide cast metal outlet, junction, and pull boxes. Provide weatherproof flush mounting outlet box in finished areas.

- G. Concealed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.
- H. Exposed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

#### **1.04 DESIGN REQUIREMENTS**

- A. Minimum Raceway Size: 3/4 inch unless otherwise specified.

#### **1.05 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data: Submit for the following:
  - 1. Flexible metal conduit.
  - 2. Liquidtight flexible metal conduit.
  - 3. Nonmetallic conduit.
  - 4. Flexible nonmetallic conduit.
  - 5. Nonmetallic tubing.
  - 6. Raceway fittings.
  - 7. Conduit bodies.
  - 8. Wireway.
  - 9. Pull and junction boxes.
- C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

#### **1.06 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents:
  - 1. Record actual routing of conduits larger than 2 inches.
  - 2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

#### **1.08 COORDINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate installation of outlet boxes for equipment connected under Section 26 05 03.
- C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

### **PART 2 PRODUCTS**

#### **2.01 METAL CONDUIT**

- A. Manufacturers:
  - 1. Allied Tube.
  - 2. Hubbell Wiring Devices.

3. Thomas & Betts Corp.
  4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Rigid Steel Conduit: ANSI C80.1.
  - C. Rigid Aluminum Conduit: ANSI C80.5.
  - D. Intermediate Metal Conduit (IMC): Rigid steel.
  - E. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

#### **2.02 PVC COATED METAL CONDUIT**

- A. Manufacturers:
  1. Carlon Electrical Products.
  2. Hubbell Wiring Devices.
  3. Thomas & Betts Corp.
  4. Walker Systems Inc.
  5. The Wiremold Co.
  6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 20 mil thick.
- C. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

#### **2.03 FLEXIBLE METAL CONDUIT**

- A. Manufacturers:
  1. Allied Tube.
  2. Hubbell Wiring Devices.
  3. Thomas & Betts Corp.
  4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Interlocked aluminum construction.
- C. Fittings: NEMA FB 1.

#### **2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT**

- A. Manufacturers:
  1. Carlon Electrical Products.
  2. Hubbell Wiring Devices.
  3. Thomas & Betts Corp.
  4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Interlocked aluminum construction with PVC jacket.
- C. Fittings: NEMA FB 1.

#### **2.05 ELECTRICAL METALLIC TUBING (EMT)**

- A. Manufacturers:
  1. Allied Tube.
  2. Hubbell Wiring Devices.
  3. Thomas & Betts Corp.
  4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: ANSI C80.3; galvanized tubing.
- C. Fittings and Conduit Bodies: NEMA FB 1; steel compression type.

#### **2.06 NONMETALLIC CONDUIT**

- A. Manufacturers:
  - 1. Carlon Electrical Products.
  - 2. Hubbell Wiring Devices.
  - 3. Thomas & Betts Corp.
  - 4. Walker Systems Inc.
  - 5. The Wiremold Co.
  - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA TC 2; Schedule 40.
- C. Fittings and Conduit Bodies: NEMA TC 3.

#### **2.07 OUTLET BOXES**

- A. Manufacturers:
  - 1. Carlon Electrical Products.
  - 2. Hubbell Wiring Devices.
  - 3. Thomas & Betts Corp.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
  - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
  - 2. Concrete Ceiling Boxes: Concrete type.
- C. Cast Boxes: NEMA FB 1, Type FD, aluminum. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.
- D. Wall Plates for Finished Areas: As specified in Section 26 27 26.

#### **2.08 WIREWAY**

- A. Manufacturers:
  - 1. Carlon Electrical Products.
  - 2. Hubbell Wiring Devices.
  - 3. Thomas & Betts Corp.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Raintight type wireway.
- C. Knockouts: Manufacturer's standard.
- D. Size: 4 x 4 inch, length as indicated on drawings.
- E. Cover: Screw cover with full gaskets.
- F. Connector: Flanged.
- G. Fittings: Lay-in type with drip shield.
- H. Finish: Rust inhibiting primer coating with gray enamel finish.

#### **2.09 OUTLET BOXES**

- A. Manufacturers:
  - 1. Carlon Electrical Products.
  - 2. Hubbell Wiring Devices.
  - 3. Thomas & Betts Corp.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish ½ inch male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.
- C. Nonmetallic: Outlet Boxes: NEMA OS 2.
- D. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.
- E. Wall Plates for Finished Areas: As specified in Section 26 27 26.
- F. Wall Plates for Unfinished Areas: Furnish gasketed cover.

## **2.10 PULL AND JUNCTION BOXES**

- A. Manufacturers:
  1. Carlon Electrical Products.
  2. Hubbell Wiring Devices.
  3. Thomas & Betts Corp.
  4. Walker Systems Inc.
  5. The Wiremold Co.
  6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- C. Hinged Enclosures: As specified in Section 26 27 16.
- D. Surface Mounted Cast Metal Box: NEMA 250, Type 4X; flat-flanged, surface mounted junction box:
  1. Material: Galvanized cast iron.
  2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- E. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:
  1. Material: Galvanized cast iron.
  2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
  3. Cover Legend: "POWER" or "SIGNAL".

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

### **3.02 INSTALLATION**

- A. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.
- C. Identify raceway and boxes in accordance with Section 26 05 53.
- D. Arrange raceway and boxes to maintain headroom and present neat appearance.

### **3.03 INSTALLATION - RACEWAY**

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.

- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29. Provide space on each for 25 percent additional raceways.
- E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Construct wireway supports from steel channel specified in Section 26 05 29.
- H. Route exposed raceway parallel and perpendicular to walls.
- I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- J. Route conduit under slab from point-to-point.
- K. Maintain clearance between raceway and piping for maintenance purposes.
- L. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- M. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- N. Bring conduit to shoulder of fittings; fasten securely.
- O. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
- P. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- Q. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch size.
- R. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- S. Install fittings to accommodate expansion and deflection where raceway crosses seismic and expansion joints.
- T. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- U. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
- V. Close ends and unused openings in wireways.

#### **3.04 INSTALLATION - BOXES**

- A. Install wall mounted boxes at elevations to accommodate mounting heights or as indicated on Drawings.
- B. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.
- C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

- F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.
- H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- I. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- J. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- K. Install adjustable steel channel fasteners for hung ceiling outlet box.
- L. Do not fasten boxes to ceiling support wires or other piping systems.
- M. Support boxes independently of conduit.
- N. Install gang box where more than one device is mounted together. Do not use sectional box.
- O. Install gang box with plaster ring for single device outlets.

### **3.05 INTERFACE WITH OTHER PRODUCTS**

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 07 84 00.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.
- C. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.
- D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

### **3.06 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused openings in boxes.

### **3.07 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean interior of boxes to remove dust, debris, and other material.
- C. Clean exposed surfaces and restore finish.

**END OF SECTION**

**SECTION 26 0553**

**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Nameplates.
  - 2. Wire markers.
  - 3. Conduit markers.
  - 4. Stencils.
  - 5. Underground Warning Tape.
- B. Related Sections:
  - 1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this section.
  - 2. Section 27 05 53 - Identification for Communications Systems.

**1.02 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data:
  - 1. Submit manufacturer's catalog literature for each product required.
  - 2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.
- C. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

**1.03 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of tagged devices; include tag numbers.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept identification products on site in original containers. Inspect for damage.
- C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

**1.05 ENVIRONMENTAL REQUIREMENTS**

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Install nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

**1.06 EXTRA MATERIALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for extra materials.

**PART 2 PRODUCTS**

## 2.01 NAMEPLATES

- A. Product Description: Laminated three-layer plastic with engraved black letters on white contrasting background color.
- B. Letter Size:
  - 1. 1/8 inch high letters for identifying individual equipment and loads.
  - 2. 1/4 inch high letters for identifying grouped equipment and loads.
- C. Minimum nameplate thickness: 1/8 inch.

## 2.02 WIRE MARKERS

- A. Description: Split sleeve type wire markers.
- B. Legend:
  - 1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.
  - 2. Low Voltage Circuits: Wire number as indicated on shop drawings.

## 2.03 UNDERGROUND WARNING TAPE

- A. Description: 4 inch wide plastic tape, detectable type, colored yellow with suitable warning legend describing buried electrical lines.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

### 3.02 INSTALLATION

- A. Install identifying devices after completion of painting.
- B. Nameplate Installation:
  - 1. Install nameplate parallel to equipment lines.
  - 2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
  - 3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
  - 4. Secure nameplate to equipment front using adhesive.
  - 5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
  - 6. Install nameplates for the following:
    - a. Switchboards.
    - b. Panelboards.
    - c. Transformers.
    - d. Service Disconnects.
- C. Wire Marker Installation:
  - 1. Install wire marker for each conductor at panelboard gutters, pullboxes, outlet and junction boxes and each load connection.
  - 2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
  - 3. Install labels at data outlets identifying patch panel and port designation.
- D. Underground Warning Tape Installation:
  - 1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches minimum below finished grade or as indicated on drawings and directly above buried conduit, raceway, or cable.

**END OF SECTION**

## SECTION 26 0572

### ACCEPTANCE TESTING

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. It is the intent of these acceptance tests to assure that all Contractor supplied equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with designed specifications.
- B. The acceptance tests and inspections shall determine suitability for energization of distribution switchboards and panelboards and cables.
- C. Items that shall be checked, inspected, and tested include, but are not limited to, the following:
  - 1. Relays.
  - 2. Power/Lighting panel boards.
  - 3. 600V rated cable.

##### 1.02 APPLICABLE CODES

- A. All inspections and tests shall be in accordance with the following applicable codes and standards except as provided otherwise herein.
  - 1. California Electrical Code - CEC 2004 Edition.
  - 2. National Electrical Manufacturer's Association - NEMA.
  - 3. American Society for Testing and Materials - ASTM.
  - 4. Institute of Electrical and Electronic Engineers - IEEE.
  - 5. National Electrical Testing Association - NETA.
  - 6. American National Standards Institute - ANSI:
    - a. C2, National Electrical Safety Code
    - b. Z244-1, American National Standard for Personnel Protection
  - 7. State Codes and Ordinances.
  - 8. Insulated Cable Engineers Association - ICEA.
  - 9. Association of Edison Illuminating Companies - AEIC.
  - 10. Occupational Safety and Health Administration:
    - a. Part 1910, Subpart S, 1910.30S
    - b. Part 1926, Subpart V, 1926.950 through 1926.960
  - 11. National Fire Protection Association - NFPA:
    - a. ANSI/CECB, Electrical Equipment Maintenance
    - b. CECE, Electrical Safety Requirements for Employee Workplaces
    - c. ANSI/CEC, National Electrical Code 2002 Edition
    - d. ANSI/NFPA 7S, Lightning Protection Code
    - e. ANSI/NFPA 101, Life Safety Code
  - 12. All inspections and tests shall utilize the following references:
    - a. Project Design Specification.
    - b. Project Design Drawings.
    - c. Manufacturer's instruction manuals applicable to each particular apparatus.

##### 1.03 QUALIFICATIONS OF TESTING AGENCY

- A. The testing firm shall be an independent testing organization, which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing firm.
- B. The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.

- C. The testing firm and all the testing personnel shall have been engaged in such practices for a minimum of ten years.
- D. The testing firm shall meet federal OSHA criteria for accreditation of testing laboratories, Title 29, Parts 1907, 1910, and 1936. Full membership in the National Electrical Testing Association constitutes proof of such criteria.
- E. The lead, on site, technical person shall be currently certified by the National Electrical Testing Associate (NETA) in Electrical Power Distribution System Testing.
- F. Testing firm shall utilize only full-time technicians who are regularly employed by the firm for testing services. Electrically unskilled employees are not permitted to perform testing or assistance of any kind. Electricians may assist, but may not perform testing and/or inspection services.
- G. The testing firm shall submit proof of the above qualifications.
- H. The testing firm shall be an independent organization as defined by OSHA Title 29, Part 1936 and the National Electrical Testing Association.
- I. All instruments used by the testing firm to evaluate electrical performance shall meet NETA's Specifications for Test Instruments. (See Section 1.7 of this specification).
- J. The terms used herewith such as Test Agency, Testing Laboratory, or Contractor Test Company, shall be construed to mean testing firm.

#### **1.04 RESPONSIBILITIES**

- A. The Contractor shall notify the Owners Representative prior to commencement of any testing.
- B. Any system, material or workmanship, which is found defective on the basis of acceptance tests, shall be reported.
- C. The testing firm shall maintain a written record of all tests and upon completion of project, assemble and certify a final test report.
- D. A stable source of 60 hertz power shall be provided for testing purposes by the Contractor. Owners Representative shall witness all tests and a minimum of 14 days notice shall be provided.

#### **1.05 TEST EQUIPMENT**

- A. Test Instrument Calibration
  - 1. The testing firm shall have a calibration program that assures that all applicable test instrumentation is maintained within rated accuracy.
  - 2. The accuracy shall be directly traceable to the National Bureau of Standards.
  - 3. Instruments shall be calibrated in accordance with the following frequency schedule:
    - a. Field instruments: Analog - 6 months maximum
    - b. Digital - 12 months maximum
    - c. Laboratory Instruments - 2 months
    - d. Leased specialty equipment - 12 months (where accuracy is guaranteed by lessor)
  - 4. Dated calibration labels shall be visible on all test equipment.
  - 5. Records must be kept up-to-date which show date and results of instruments calibrated or tested.
  - 6. An up-to-date instrument calibration instruction and procedure will be maintained for each test instrument.
  - 7. Calibrating standard shall be of higher accuracy than that of the instrument tested.

#### **1.06 TEST REPORTS**

- A. The test report shall include the following:

1. Summary of project.
2. Description of equipment/device tested.
3. Description of test, including date, time, and duration of test.
4. Test results.
5. Conclusions and recommendations.
6. Appendix, including appropriate test forms.
7. Identification of test equipment used.
8. Signature of responsible test organization authority.
9. Signature of the person witnessing the tests.
10. Furnish five copies of the complete report to the Owners Representative no later than thirty (30) days after completion of project unless otherwise directed.

#### **1.07 SAFETY AND PRECAUTIONS**

- A. Safety practices shall include, but are not limited to, the following requirements:
  1. Occupational Safety and Health Act of 1970 - OSHA.
  2. Accident Prevention Manual for Industrial Operations, National Safety Council, Chapter 4.
  3. Applicable State safety operating procedures.
  4. NETA Safety/Accident Prevention Program.
  5. District's safety practices.
  6. National Fire Protection Association - CECE.
  7. ANSI Z244.1 American National Standards for Personnel Protection.
- B. All tests shall be performed with apparatus de-energized except where otherwise specifically required.
- C. The testing firm shall have a designated safety representative on the project to supervise operations with respect to safety.

### **PART 2 PRODUCTS**

#### **2.01 PROTECTIVE DEVICE COORDINATION STUDY**

- A. A protective coordination study shall be performed using SKM's Dapper or equal software to select or check the selection of power fuse ratings, protective relay characteristics and settings, ratios, and characteristics of associated voltage breaker trip characteristics and settings.
- B. The coordination study shall include all voltage classes of equipment indicated on the single line diagram drawings. The entire electrical system shall be included in the coordination study. Verify characteristics and settings of existing devices in the field and from the manufacturer.
- C. The time-current characteristics of the specified protective devices shall be plotted on the appropriate log-log paper. The plots shall include complete titles, representative one-line diagrams of both buildings and legends, associated relays or fuse characteristics, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breaker trip curves, and fuse curves. The coordination plots shall indicate the types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, cable damage curves, symmetrical and asymmetrical fault currents. All requirements of the current California Electrical Code shall be adhered to. Reasonable coordination intervals and separation of characteristic curves shall be maintained. Separate coordination plots for phase and ground protective devices shall be provided on a system basis. Separate curves shall be used to clearly indicate the coordination achieved for feeder breakers with downstream fuses and circuit breakers in switchgear and substations. There shall be a maximum of six protective devices per plot.

- D. The selection and setting of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type, range of adjustment, and recommended settings. Discrepancies, problem areas, or inadequacies shall be promptly brought to the project Owners Representative's attention.
- E. Five copies of coordination curves and tabulated data indicating selection and settings of protective devices shall be submitted to the Owners Representative for approval.

### **PART 3 EXECUTION**

#### **3.01 EQUIPMENT VERIFICATIONS, TESTS AND CALIBRATIONS GENERAL**

- A. As part of the contract, the Contractor shall perform tests of installed work as herein specified and specified in other Sections of these Specifications.
- B. The Contractor shall provide all materials, equipment, labor and technical supervision to perform such tests and inspections.
- C. All tests shall be performed in compliance with the recommendations and requirements of the National Electrical Testing Association, Inc. (NET A), and applicable codes and standards.
- D. Upon completion of the tests and inspections noted in these Specifications, a label shall be attached to all serviced devices. These labels shall indicate date serviced and the service company responsible.
- E. The test and inspections shall determine suitability for continued reliable operation.
- F. All tests shall be conducted in the presence of the Owners Representative. Provide a minimum of two weeks notice to the Owners Representative.
- G. Furnish the necessary equipment and personnel to perform all required tests of all wiring and connections for continuity, short circuit, and improper grounds. Included, but not limited to, the following systems: substations, air interrupting switches, low voltage main and feeder circuit breakers, interlocking controls, panelboards, distribution transformers, branch circuits.

#### **3.02 DISTRIBUTION SWITCHBOARDS AND PANELBOARDS**

- A. Visual and mechanical inspection:
  - 1. Inspect for physical damage and code violations.
  - 2. Clean interior and exterior surfaces.
  - 3. Inspect for proper alignment, anchorage, and grounding.
  - 4. Check tightness of accessible bolted bus joints by torque wrench method. Tighten connections in accordance with industry standard torque levels.
  - 5. Make closure attempt on locked open devices. Make opening attempt on locked closed devices.
  - 6. Make exchange with devices operated in off-normal positions.
- B. Electrical tests:
  - 1. Measure insulation resistance of each bus section phase-to-phase and phase-to-ground.
  - 2. Inspect all accessible bus joints and cable connections by infrared scanner to detect loose or high-resistance connections and other circuit anomalies.
  - 3. Inspect correctness of control wiring.

#### **3.03 LOW VOLTAGE CIRCUIT BREAKERS**

- A. Visual and mechanical inspection:
  - 1. Inspect for physical condition.
  - 2. Inspect alignment and grounding.
  - 3. Perform mechanical operator and contact alignment tests on the breaker and its operating

- mechanism in accordance with manufacturer's instructions.
- 4. Perform insulation resistance test on control wiring.
- 5. Clean mechanism, insulating surfaces and contacts.

**B. Electrical tests:**

- 1. Measure contact resistance.
- 2. Trip overcurrent protective device by operation of each protective device.
- 3. Perform an insulation resistance test phase-to-ground, phase-to-phase and across open contacts.
- 4. Perform insulation resistance test in accordance with Doble procedure.
- 5. Perform timing test with Travel Analyzer to insure proper contact overtravel and pressure.

**3.04 CABLES, LOW VOLTAGE (600 VOLTS AND LESS)**

**A. Visual and mechanical inspections:**

- 1. Inspect cables for physical damage and proper connection.
- 2. Torque test cable connection. Tighten connections in accordance with industry standards.
- 3. Perform infrared scan of all connections under loaded conditions.

**B. Electrical tests:** Perform insulation resistance test of each cable with respect to ground and adjacent cables.

**3.05 GROUNDING SYSTEMS**

**A. Visual and mechanical inspection:** Inspect ground system connections for completeness and adequacy.

**B. Electrical tests:** Perform fall-of-the-potential test per IEEE No. 81, Section 9.03 to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral and/or derived neutral points.

**C. Infrared Inspection:**

- 1. All doors and cover shall be removed and upon completion of test be reinstalled by testing agency technicians.
- 2. A load bank shall be furnished to circulate low voltage currents of 400A magnitude through each bus, main breaker and feeder breaker. After two hours infrared scans shall be made of all bus joints. Problem area shall be photographed before and after corrections. After corrections, another current test of two hours duration shall be made. Again an infrared scan shall be made to confirm correct operation.
- 3. Upon completion, the switchgear shall be energized at 12kV. After 4 hours, infrared scans shall be made to determine areas of excessive corona. Problem area shall be treated the same as under B., above.
- 4. Upon completion of infrared scans, all covers and doors shall be reinstalled.

**END OF SECTION**

**SECTION 26 0923**

**LIGHTING CONTROL DEVICES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Lighting contactors.
  - 2. Switches.
  - 3. Switch plates.
  - 4. Occupancy sensors.
  - 5. Photocells.
  - 6. Photocell control unit.
- B. Related Sections:
  - 1. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for electric connections specified by this section.
  - 2. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
  - 3. Section 26 05 33 - Raceway and Boxes for Electrical Systems: Product requirements for raceway and boxes for placement by this section.
  - 4. Section 26 05 53 - Identification for Electrical Systems: Product requirements for electrical identification items for placement by this section.
  - 5. Section 26 24 16 - Panelboards.
  - 6. Section 26 27 26 - Wiring Devices: Product requirements for wiring devices for placement by this section.

**1.02 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
  - 2. NEMA FU 1 - Low Voltage Cartridge Fuses.
  - 3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contractors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
  - 4. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks.
  - 5. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
  - 6. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
  - 7. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

**1.03 SYSTEM DESCRIPTION**

- A. Distributed switching control using self contained individually mounted lighting relays.

**1.04 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Shop Drawings: Indicate dimensioned drawings of lighting control system components and accessories.
  - 1. One Line Diagram: Indicating system configuration indicating panels, number and type of switches or devices.
  - 2. Include typical wiring diagrams for each component.
- C. Product Data: Submit manufacturer's standard product data for each system component.
- D. Manufacturer's Installation Instructions: Submit for each system component.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

### 1.05 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record the following information:
  - 1. Actual locations of components and record circuiting and switching arrangements.
  - 2. Wiring diagrams reflecting field installed conditions with identified and numbered, system components and devices.
- C. Operation and Maintenance Data:
  - 1. Submit replacement parts numbers.
  - 2. Submit manufacturer's published installation instructions and operating instructions.
  - 3. Recommended renewal parts list.

### 1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept components on site in manufacturer's packaging. Inspect for damage.
- C. Protect components by storing in manufacturer's containers indoor protected from weather.

### 1.08 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five year manufacturer warranty for components.

### 1.09 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for extra materials.
- B. Furnish twenty of each switch type.
- C. Furnish twenty of each occupancy sensor type.
- D. Furnish ten of each photocell type.

## PART 2 PRODUCTS

### 2.01 LIGHTING CONTACTORS

- A. Manufacturers:
  - 1. Automatic Switch Co. Model.
  - 2. Cutler-Hammer Model.
  - 3. Square D Model.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA ICS 2, magnetic lighting contactor.
- C. Configuration: Mechanically held, 3 wire control.
- D. Coil Operating Voltage: 24 or 120 volts, 60 Hertz.
- E. Poles: To match circuit configuration and control function.
- F. Contact Rating: Conductor overcurrent protection, considering derating for continuous loads.

### 2.02 SWITCHES

- A. Manufacturers:
  - 1. Hubbell Incorporated.
  - 2. Leviton Manufacturing Co., Inc.
  - 3. Pass and Seymour/Legrand.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Wall Switch: Specification Grade unlighted, momentary pushbutton type for overriding relays.
  - 1. Material: Plastic.
  - 2. Color: White.
- C. Key Switch: Spade key type. Match non-key switch ratings.

### 2.03 SWITCH PLATES

- A. Manufacturers:
  - 1. Hubbell Incorporated.
  - 2. Leviton Manufacturing Co., Inc.
  - 3. Pass and Seymour/Legrand.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Specification Grade.
  - 1. Material: Stainless steel.
  - 2. Color: White.

### 2.04 OCCUPANCY SENSOR

- A. Manufacturers:
  - 1. System Sensors.
  - 2. Novitas.
  - 3. Watt Stopper.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Compatible with modular relay panels. Capable of being wired directly to Class 2 wiring without auxiliary components or devices.
- C. Separate sensitivity and time delay adjustments with LED indication of sensed movement. User adjustable time-delay: 30 seconds to 12 minutes.
- D. Furnish with manual override.
- E. Operation: Silent.
- F. Room Sensors: Two-way Pattern..

### 2.05 PHOTOCELLS

- A. Manufacturers:
  - 1. Tork.
  - 2. MYTECH Corporation.
  - 3. Novitas.
  - 4. Watt Stopper.
  - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. General: Consist of sensor mounted as indicated on Drawings with separate control-calibration module. Sensor connected to control-calibration module via single shielded conductor with maximum distance of 500 feet. Control unit powered by 24 VAC.
- C. Control-Calibration Module: Furnish with the following:
  - 1. Capable of being switched between 4 measurement ranges.
  - 2. Separate trip points for high and low response settings.
  - 3. Momentary contact device to override photocell relays.

4. Three minute time delay between switching outputs to avoid nuisance tripping.
- D. Sensor Devices: Each sensor employs photo diode technology to allow linear response to daylight within illuminance range.
  1. Exterior Lighting: Hooded sensor, horizontally mounted, employing flat lens, and working range 10-100 footcandles in 10 percent increments. Entire sensor encased in optically clear epoxy resin.
  2. Indoor Lighting: Sensor with Fresnel lens providing for 60 degree cone shaped response area to monitor indoor office lighting levels.

## **2.06 PHOTOCELL CONTROL UNIT**

- A. Manufacturers:
  1. Tork.
  2. MYTECH Corporation.
  3. Novitas.
  4. Watt Stopper.
  5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Photodiode control unit with PHOTOCELL ENABLE and MASTER OVERRIDE inputs for remote control, 10 minute time delay, and with selectable ranges for 10-100 footcandle.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Mount switches, occupancy sensors, and photocells as indicated on Drawings.
- B. Install wiring in accordance with Section 26 05 19.
- C. Use only properly color coded, stranded wire. Install wire sizes as indicated on Drawings. Install wire in conduit in accordance with Section 26 05 33.
- D. Label each low voltage wire clearly indicating connecting relay panel. Refer to Section 26 05 53.
- E. Identify power wiring with circuit breaker number controlling load. When multiple circuit breaker panels are feeding into relay panel, label wires to indicate originating panel designation.

### **3.02 MANUFACTURER'S FIELD SERVICES**

- A. Section 01 40 00 - Quality Requirements: Requirements for manufacturer's field services.
- B. Furnish services for minimum of 7 days for check, test, and start-up. Perform the following services:
  1. Check installation of panelboards.
  2. Test operation of remote controlled devices.
  3. Repair or replace defective components.

### **3.03 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Test each system component after installation to verify proper operation.
- C. Test contactors, and switches after installation to confirm proper operation.
- D. Confirm correct loads are recorded on directory card in each panel.

**3.04 DEMONSTRATION**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate operation of the following system components:
  - 1. Operation of switches. Demonstrate for all zones.
  - 2. Operation of each type of occupancy sensors. Demonstrate for all zones.
  - 3. Operation of each type of photocell. Demonstrate for all zones.
- C. Furnish 24 hours to instruct Owner's personnel in operation and maintenance of system. Schedule training with Owner, provide at least 7 days notice to Architect of training date.

**END OF SECTION**

**SECTION 26 22 00**

**LOW-VOLTAGE TRANSFORMERS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section includes two-winding transformers.
- B. Related Sections:
  - 1. Section 26 05 33 - Raceway and Boxes for Electrical Systems.

**1.02 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA ST 1 - Specialty Transformers (Except General Purpose Type).
  - 2. NEMA ST 20 - Dry Type Transformers for General Applications.
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

**1.03 SUBMITTALS**

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.
- C. Test Reports: Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.

**1.04 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of transformers.

**1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

- B. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

## **PART 2 PRODUCTS**

### **2.01 TWO-WINDING TRANSFORMERS**

- A. Manufacturers:
  - 1. Square D.
  - 2. Cutler-Hammer.
  - 3. GE.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA ST 20, factory-assembled, air-cooled, dry type transformers, ratings as indicated on Drawings]
- C. Primary Voltage: As indicated on drawings.
- D. Secondary Voltage: 208Y/120 volts, 3 phase, as indicated on drawings.
- E. Insulation system and average winding temperature rise for rated kVA as follows:
  - 1. 1-15 kVA: Class 185 with 80 degrees C rise.
  - 2. 16-500 kVA: Class 220 with 80 degrees C rise.
- F. Case temperature: Do not exceed 35 degrees C rise above ambient at warmest point at full load.
- G. Winding Taps:
  - 1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
  - 2. Transformers 15 kVA and Larger: NEMA ST 20.
- H. Sound Levels: NEMA ST 20.
- I. Basic Impulse Level: 10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger.
- J. Ground core and coil assembly to enclosure by means of visible flexible copper grounding strap.
- K. Mounting:
  - 1. 16-75 kVA: Suitable for floor mounting.
  - 2. Larger than 75 kVA: Suitable for floor mounting.
- L. Coil Conductors: Continuous copper windings with terminations brazed or welded.

- M. Enclosure: NEMA ST 20, Type 1 or Type 3R ventilated. Furnish lifting eyes or brackets.
- N. Isolate core and coil from enclosure using vibration-absorbing mounts.
- O. Nameplate: Include transformer connection data [and overload capacity based on rated allowable temperature rise].

## **2.02 SOURCE QUALITY CONTROL**

- A. Production test each unit according to NEMA ST20.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify mounting supports are properly sized and located including concealed bracing in walls.

### **3.02 INSTALLATION**

- A. Set transformer plumb and level.
- B. Use flexible conduit, in accordance with Section 26 05 33, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- C. Support transformers in accordance with Section 26 05 29.
  - 1. Mount floor-mounted transformers on vibration isolating pads suitable for isolating transformer noise from building structure.
- D. Provide seismic restraints.
- E. Install grounding and bonding in accordance with Section 26 05 26.

### **3.03 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.2.1.

### **3.04 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

- B. Measure primary and secondary voltages and make appropriate tap adjustments.

**END OF SECTION**

## SECTION 26 2413

### SWITCHBOARDS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section includes main and distribution switchboards.
- B. Related Sections:
  - 1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  - 2. Section 26 05 53 - Identification for Electrical Systems.
  - 3. Section 26 28 13 - Fuses.

##### 1.02 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI C12.1 - Code for Electricity Metering.
  - 2. ANSI C39.1 - Requirements, Electrical Analog Indicating Instruments.
- B. Institute of Electrical and Electronics Engineers:
  - 1. IEEE C57.13 - Standard Requirements for Instrument Transformers.
  - 2. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- C. National Electrical Manufacturers Association:
  - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
  - 2. NEMA FU 1 - Low Voltage Cartridge Fuses.
  - 3. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
  - 4. NEMA PB 2 - Deadfront Distribution Switchboards.
  - 5. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.
- D. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

##### 1.03 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars for each phase, neutral, and ground; and switchboard instrument details.
- C. Product Data: Submit electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of equipment and components.
- D. Test Reports: Indicate results of factory production and field tests.

##### 1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations, configurations, and ratings of switchboards and their components on single line diagrams and plan layouts.
- C. Operation and Maintenance Data: Submit spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

### **1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver in 48 inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.
- C. Accept switchboards on site. Inspect for damage.
- D. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.
- E. Handle in accordance with NEMA PB 2.1. Lift only with lugs provided. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

### **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Section 01 60 00 - Product Requirements.
- B. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

### **1.08 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

### **1.09 SEQUENCING**

- A. Section 01 10 00 - Summary: Work sequence.
- B. Sequence Work to avoid interferences with building finishes and installation of other products.

### **1.10 MAINTENANCE MATERIALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two of each key.
- C. Furnish two fuse pullers.

### **1.11 EXTRA MATERIALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish ten of each size and type of fuse installed.

## **PART 2 PRODUCTS**

### **2.01 DISTRIBUTION SWITCHBOARDS**

- A. Manufacturers:
  - 1. GE Electrical.
  - 2. Siemens.
  - 3. Square D.
  - 4. Cutler Hammer.
  - 5. Substitutions: Section 01 60 00 - Product Requirements.

- B. Product Description: NEMA PB 2, enclosed switchboard with electrical ratings and configurations as indicated on Drawings.
- C. Device Mounting:
  - 1. Main Section: Individually mounted and compartmented.
  - 2. Distribution Section: Panel mounted. Individually mounted and compartmented.
- D. Bus:
  - 1. Material: Copper, standard size.
  - 2. Connections: Bolted, accessible from front for maintenance.
  - 3. Insulation: Fully insulate bus bars. Do not reduce spacing of insulated bus.
- E. Ground Bus: Extend length of switchboard.
- F. Line and Load Terminations: Accessible from front only of switchboard, suitable for conductor materials and sizes as indicated on Drawings.
- G. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, insulated and braced for short circuit currents. Furnish continuous current rating as indicated on Drawings.
- H. Enclosure: Type 1 - General Purpose.
- I. Align sections at front and rear.
- J. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

## **2.02 MOLDED CASE CIRCUIT BREAKER**

- A. Product Description: NEMA AB 1, molded-case circuit breaker.
- B. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have mechanism for adjusting long time continuous current.
- C. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; ground fault trip with integral ground fault sensing; instantaneous trip; and adjustable short time trip.
- D. Accessories: As indicated on Drawings. Conform to NEMA AB 1.
  - 1. Shunt Trip Device: 120 volts, AC.
  - 2. Undervoltage Trip Device: 120 volts, AC.
  - 3. Handle Lock: Provisions for padlocking.
  - 4. Insulated Grounding Lug: In each enclosure.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify surface is suitable for switchboard installation.

### **3.02 INSTALLATION**

- A. Install in accordance with NEMA PB 2.1.
- B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.
- C. Install fuses in each switch and coordinate sizes with connected load.
- D. Install engraved plastic nameplates in accordance with Section 26 05 53.

- E. Install breaker circuit directory.
- F. Ground and bond switchboards in accordance with Section 26 05 26.

**3.03 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.1.

**3.04 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Adjust operating mechanisms for free mechanical movement.
- C. Tighten bolted bus connections.
- D. Adjust circuit breaker trip and time delay settings to values recommended by the manufacturer and as approved by the Architect.
- E. Provide and perform coordination study, from main switchboard down to the branch circuit panelboards.

**3.05 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Touch up scratched or marred surfaces to match original finish.

**END OF SECTION**

## SECTION 26 2416

### PANELBOARDS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section includes distribution and branch circuit panelboards.
- B. Related Sections:
  - 1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  - 2. Section 26 05 53 - Identification for Electrical Systems.

##### 1.02 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
  - 1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- B. National Electrical Manufacturers Association:
  - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
  - 2. NEMA FU 1 - Low Voltage Cartridge Fuses.
  - 3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
  - 4. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
  - 5. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
  - 6. NEMA PB 1 - Panelboards.
  - 7. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.
- C. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- D. California Electrical Code (CEC):
  - 1. CEC - California Electrical Code.
- E. Underwriters Laboratories Inc.:
  - 1. UL 67 - Safety for Panelboards.
  - 2. UL 1283 - Electromagnetic Interference Filters.
  - 3. UL 1449 - Transient Voltage Surge Suppressors.

##### 1.03 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- C. Product Data: Submit catalog data showing specified features of standard products.

##### 1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.

- C. Operation and Maintenance Data: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

#### 1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

#### 1.06 MAINTENANCE MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance products.
- B. Furnish two of each panelboard key.

### PART 2 PRODUCTS

#### 2.01 DISTRIBUTION PANELBOARDS

- A. Manufacturers:
  - 1. Cutler-Hammer.
  - 2. GE Electrical.
  - 3. Siemens.
  - 4. Square D.
  - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA PB 1, circuit breaker type panelboard.
- C. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
- D. Minimum integrated short circuit rating: 22,000 amperes rms symmetrical for 208 volt panelboards; 42,000 amperes rms symmetrical for 480 volt panelboards, or as indicated on Drawings.
- E. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Furnish interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.
- F. Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
- G. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated on Drawings.
- H. Enclosure: NEMA PB 1, Type 1 or 3R as indicated on drawings.
- I. Cabinet Front: Surface type, fastened with hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

#### 2.02 BRANCH CIRCUIT PANELBOARDS

- A. Manufacturers:
  - 1. Cutler-Hammer.
  - 2. GE Electrical].
  - 3. Siemens.
  - 4. Square D.
  - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit

panelboard.

- C. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
- D. Minimum Integrated Short Circuit Rating: 10,000, 22,000 and 42,000 amperes rms symmetrical for 240 volt panelboards; or as indicated on Drawings.
- E. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.
- F. Enclosure: NEMA PB 1, Type 1 or Type 3R as indicated on drawings.
- G. Cabinet Box: 6 inches deep, 20 inches wide.
- H. Cabinet Front: Flush or Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install panelboards in accordance with NEMA PB 1.1.
- B. Install panelboards plumb.
- C. Install recessed panelboards flush with wall finishes.
- D. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- E. Install filler plates for unused spaces in panelboards.
- F. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes to balance phase loads.
- G. Install engraved plastic nameplates in accordance with Section 26 05 53.
- H. Install spare conduits out of each recessed panelboard to accessible location above ceiling. Minimum spare conduits: 5 empty, 3/4 inch. Identify each as SPARE.
- I. Ground and bond panelboard enclosure according to Section 26 05 26. Connect equipment ground bars of panels in accordance with CEC.

#### **3.02 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements, 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.
- D. Perform switch inspections and tests listed in NETA ATS, Section 7.5.
- E. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

#### **3.03 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.

- B. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

**END OF SECTION**

## SECTION 26 2716

### ELECTRICAL CABINETS AND ENCLOSURES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section includes hinged cover enclosures, cabinets, terminal blocks, and accessories.
- B. Related Sections:
  - 1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  - 2. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
  - 3. Section 27 05 33 - Conduits and Backboxes for Communications Systems.

##### 1.02 REFERENCES

- A. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 2. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks.

##### 1.03 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data: Submit manufacturer's standard data for enclosures, cabinets, and terminal blocks.
- C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

##### 1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years [documented] experience.

##### 1.05 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two of each key.

#### PART 2 PRODUCTS

##### 2.01 HINGED COVER ENCLOSURES

- A. Manufacturers:
  - 1. Appleton.
  - 2. Circle AW.
  - 3. Reliance Electric.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Construction: NEMA 250, Type 1 or 3R steel enclosure.
- C. Covers: Continuous hinge, held closed by [flush latch operable by key.
- D. Furnish interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel.
- E. Enclosure Finish: Manufacturer's standard enamel.

## 2.02 CABINETS

- A. Manufacturers:
  - 1. Appleton.
  - 2. Circle AW.
  - 3. Reliance Electric.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Boxes: Galvanized steel.
- C. Box Size: 24 inches wide x 30 inches high x 6 inches deep.
- D. Backboard: Furnish 3/4 inch thick plywood backboard for mounting terminal blocks. Paint matte white.
- E. Fronts: Steel, flush or surface type with door with concealed hinge, and flush lock. Finish with gray baked enamel.
- F. Furnish metal barriers to form separate compartments wiring of different systems and voltages.
- G. Furnish accessory feet for free-standing equipment.

## 2.03 TERMINAL BLOCKS

- A. Manufacturers:
  - 1. Carlon Electrical Products.
  - 2. Hubbell Wiring Devices.
  - 3. Reliance Electric.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Terminal Blocks: NEMA ICS 4.
- C. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
- D. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.
- E. Furnish ground bus terminal block, with each connector bonded to enclosure.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner in accordance with Section 26 05 29.
- B. Install cabinet fronts plumb.

### 3.02 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean electrical parts to remove conductive and harmful materials.
- C. Remove dirt and debris from enclosure.
- D. Clean finishes and touch up damage.

**END OF SECTION**

**SECTION 26 2726**

**WIRING DEVICES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section includes wall switches; wall dimmers; receptacles; and device plates and decorative box covers.
- B. Related Sections:
  - 1. Section 26 05 33 - Raceway and Boxes for Electrical Systems: Outlet boxes for wiring devices.

**1.02 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA WD 1 - General Requirements for Wiring Devices.
  - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

**1.03 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data: Submit manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Samples: Submit two samples of each wiring device and wall plate illustrating materials, construction, color, and finish.

**1.04 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

**1.05 EXTRA MATERIALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish fifty of each style, size, and finish wall plate.

**PART 2 PRODUCTS**

**2.01 WALL SWITCHES**

- A. Manufacturers:
  - 1. Leviton.
  - 2. Hubbell.
  - 3. Pass & Seymour,
  - 4. Substitutions: Section 01 60 00 - Product Requirements.

**2.02 WALL SWITCHES**

- A. Product Description: NEMA WD 1, General-Duty, AC only general-use snap switch.
- B. Body and Handle: Ivory plastic with toggle handle.
- C. Indicator Light: Lighted handle type switch.
- D. Locator Light: Lighted handle type switch.
- E. Ratings:

1. Voltage: 120-277 volts, AC.
- F. Ratings: Match branch circuit and load characteristics.

### **2.03 WALL DIMMERS**

- A. Manufacturers:
  1. Leviton.
  2. Hubbell.
  3. Pass & Seymour.
  4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA WD 1, Type 1 semiconductor dimmer for incandescent or fluorescent lamps.
- C. Body and Handle: Ivory plastic with linear slide.
- D. Voltage: 120-277 volts.
- E. Power Rating: Match load shown on drawings; 600 watts minimum.
- F. Accessory Wall Switch: Match dimmer appearance.

### **2.04 RECEPTACLES**

- A. Manufacturers:
  1. Leviton.
  2. Hubbell.
  3. Pass & Seymour.
  4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA WD 1, Heavy-duty general use receptacle.
- C. Device Body: Ivory nylon.
- D. Configuration: NEMA WD 6, type as indicated on Drawings.
- E. Convenience Receptacle: Type 5-20.
- F. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

### **2.05 WALL PLATES**

- A. Manufacturers:
  1. Leviton.
  2. Hubbell.
  3. Pass & Seymour.
  4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Coverplate: 0.035 inch thick, satin-finished stainless steel.
- C. Weatherproof Cover Plate: Gasketed cast metal plate with threaded and gasketed device cover.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify outlet boxes are installed at proper height.
- C. Verify wall openings are neatly cut and completely covered by wall plates.

- D. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

### **3.02 PREPARATION**

- A. Clean debris from outlet boxes.

### **3.03 INSTALLATION**

- A. Install devices plumb and level.
- B. Install switches with OFF position down.
- C. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- D. Do not share neutral conductor on load side of dimmers.
- E. Install receptacles with grounding pole on bottom.
- F. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.
- G. Connect wiring devices by wrapping solid conductor around screw terminal. Install stranded conductor for branch circuits 10 AWG and smaller. When stranded conductors are used in lieu of solid, use crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under device screws.
- H. Use jumbo size plates for outlets installed in masonry walls.
- I. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

### **3.04 INTERFACE WITH OTHER PRODUCTS**

- A. Coordinate locations of outlet boxes provided under Section 26 05 33 to obtain mounting heights as specified and as indicated on drawings.
- B. Install wall switch 48 inches above finished floor to top of device.
- C. Install convenience receptacle 15 inches minimum to bottom of device.

### **3.05 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect each wiring device for defects.
- C. Operate each wall switch with circuit energized and verify proper operation.
- D. Verify each receptacle device is energized.
- E. Test each receptacle device for proper polarity.
- F. Test each GFCI receptacle device for proper operation.

### **3.06 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Adjust devices and wall plates to be flush and level.

### **3.07 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

- B. Clean exposed surfaces to remove splatters and restore finish.

**END OF SECTION**

## SECTION 26 2813

### FUSES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section includes fuses.

##### 1.02 REFERENCES

- A. National Electrical Manufacturers Association:
  - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.

##### 1.03 DESIGN REQUIREMENTS

- A. Select fuses to provide appropriate levels of short circuit and overcurrent protection for the following components: wire, cable, bus structures, and other equipment. Design system to maintain component damage within acceptable levels during faults.
- B. Select fuses to coordinate with time current characteristics of other overcurrent protective elements, including other fuses, circuit breakers, and protective relays. Design system to maintain operation of device closest to fault operates.

##### 1.04 FUSE PERFORMANCE REQUIREMENTS

- A. Motor Load Feeder Switches: Class RK1 (time delay).
- B. General Purpose Branch Circuits: Class RK1 [(time delay).
- C. Motor Branch Circuits: Class RK1 (time delay).

##### 1.05 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data: Submit data sheets showing electrical characteristics, including time-current curves.

##### 1.06 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual sizes, ratings, and locations of fuses.

##### 1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

##### 1.08 MAINTENANCE MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two fuse pullers.

##### 1.09 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for extra materials.
- B. Furnish fifteen spare fuses of each Class, size, and rating installed.

#### PART 2 PRODUCTS

## **2.01 FUSES**

- A. Manufacturers:
  - 1. Bussman.
  - 2. Gould Shawmut.
  - 3. Reliance.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Dimensions and Performance: NEMA FU 1, Class as specified or as indicated on Drawings.
- C. Voltage: Rating suitable for circuit phase-to-phase voltage.

## **2.02 CLASS RK1 (TIME DELAY) FUSES**

- A. Manufacturers:
  - 1. Bussman.
  - 2. Gould Shawmut.
  - 3. Reliance.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Dimensions and Performance: NEMA FU 1.
- C. Voltage: Rating suitable for circuit phase-to-phase voltage.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install fuse with label oriented so manufacturer, type, and size are easily read.

**END OF SECTION**

## SECTION 26 2819

### ENCLOSED SWITCHES

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section includes fusible and nonfusible switches.
- B. Related Sections:
  - 1. Section 26 28 13 - Fuses.

##### 1.02 REFERENCES

- A. National Electrical Manufacturers Association:
  - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
  - 2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

##### 1.03 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data: Submit switch ratings and enclosure dimensions.

##### 1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of enclosed switches and ratings of installed fuses.

##### 1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

#### PART 2 PRODUCTS

##### 2.01 FUSIBLE SWITCH ASSEMBLIES

- A. Manufacturers:
  - 1. GE Electrical.
  - 2. Hubbell Inc.
  - 3. Square D.
  - 4. Cutler-Hammer
  - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.
- D. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray.
  - 1. Interior Dry Locations: Type 1.
  - 2. Exterior Locations: Type 3R.

- E. Furnish switches with entirely copper current carrying parts.

## **2.02 NONFUSIBLE SWITCH ASSEMBLIES**

- A. Manufacturers:
  - 1. GE Electrical.
  - 2. Hubbell Inc.
  - 3. Square D.
  - 4. Cutler-Hammer
  - 5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position of enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray.
  - 1. Interior Dry Locations: Type 1.
  - 2. Exterior Locations: Type 3R.
- D. Furnish switches with entirely copper current carrying parts.

## **2.03 SWITCH RATINGS**

- A. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.
- B. Short Circuit Current Rating: UL listed for 200,000 rms symmetrical amperes when used with or protected by Class R.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install enclosed switches plumb. Provide supports in accordance with Section 26 05 29.
- B. Height: 5 feet to operating handle.
- C. Install fuses for fusible disconnect switches. Refer to Section 26 28 13 for product requirements.
- D. Install engraved plastic nameplates in accordance with Section 26 05 53.
- E. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

### **3.02 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements]: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.

**END OF SECTION**

**SECTION 26 2823**

**ENCLOSED CIRCUIT BREAKERS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section includes molded-case and insulated-case circuit breakers in individual enclosures.

**1.02 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

**1.03 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data: Submit catalog sheets showing ratings, trip units, time current curves, dimensions, and enclosure details.

**1.04 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations and continuous current ratings of enclosed circuit breakers.

**1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

**1.06 EXTRA MATERIALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish three of each size and type of current limiter.

**PART 2**

**2.01 MOLDED CASE CIRCUIT BREAKER**

- A. Manufacturers:
  - 1. Square D.
  - 2. General Electric.
  - 3. Siemens.
  - 4. Westinghouse.
  - 5. Challenger.
  - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Enclosed, molded-case circuit breaker conforming to NEMA AB 1[, suitable for use as service entrance equipment where applied].
- C. Service Conditions:
  - 1. Temperature: 115 degrees F.

- D. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have mechanism for adjusting long time and short time, continuous current and short time, and long time pickup current setting for automatic operation.
- E. Field-Changeable Ampere Rating Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have changeable trip units.
- F. Current Limiting Circuit Breaker: Circuit breaker indicated as current-limiting have automatically-resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.
- G. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; ground fault trip with zero sequence type ground fault sensor; instantaneous trip; and adjustable short time trip.
- H. Current Limiter: Designed for application with molded case circuit breaker.
  - 1. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.
  - 2. Interlocks trip circuit breaker and prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.
- I. Accessories: Conform to NEMA AB 1.
  - 1. Shunt Trip Device: 120 volts, AC.
  - 2. Undervoltage Trip Device: 120 volts, AC.
  - 3. Auxiliary Switch: 120 volts, AC.
  - 4. Alarm Switch: 120 volts, AC.
  - 5. Electrical Operator: 120 volts, AC.
  - 6. Handle Lock: Provisions for padlocking.
  - 7. Insulated Grounding Lug: In each enclosure.
- J. Enclosure: NEMA AB 1, to meet conditions. Fabricate enclosure from [steel finished with manufacturer's standard gray enamel.
  - 1. Interior Dry Locations: Type 1.
  - 2. Exterior Locations: Type 3R.
- K. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install enclosed circuit breakers plumb. Provide supports in accordance with Section 26 05 29.
- B. Height: 5 feet to operating handle.
- C. Locate and install engraved plastic nameplates in accordance with Section 26 05 53.

#### **3.02 FIELD QUALITY CONTROL**

- A. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1.

#### **3.03 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

- B. Adjust trip settings to coordinate circuit breakers with other overcurrent protective devices in circuit.
- C. Adjust trip settings to provide adequate protection from overcurrent and fault currents.

**END OF SECTION**

## SECTION 26 5100

### INTERIOR LIGHTING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section includes interior luminaires, lamps, ballasts, and accessories.
- B. Related Sections:
  - 1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  - 2. Section 26 05 33 - Raceway and Boxes for Electrical Systems.

##### 1.02 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI C82.1 - American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.
  - 2. ANSI C82.4 - American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).

##### 1.03 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Shop Drawings: Indicate dimensions and components for each luminaire not standard product of manufacturer.
- C. Product Data: Submit dimensions, ratings, and performance data.

##### 1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

##### 1.05 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

##### 1.06 MAINTENANCE MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish twenty of each plastic lens type.
- C. Furnish one replacement lamps for each lamp installed.
- D. Furnish twenty of each ballast type.

#### PART 2 PRODUCTS

##### 2.01 INTERIOR LUMINAIRES

- A. Product Description: Complete interior luminaire assemblies, with features, options, and accessories as scheduled.
- B. Refer to Section 01 60 00 - Product Requirements for product options. Substitutions are not permitted.

##### 2.02 FLUORESCENT BALLASTS

- A. Manufacturers:

1. General Electric Co.
  2. Hubbell Lighting.
  3. Magnetek Inc.
  4. Philips Electronic North America.
  5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Electronic ballast, suitable for lamps specified, with voltage to match luminaire voltage.

### **2.03 HIGH INTENSITY DISCHARGE (HID) BALLASTS**

- A. Manufacturers:
1. General Electric Co.
  2. Philips Electronics North America.
  3. Siemens Corp.
  4. Venture Lighting International Inc.
  5. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: ANSI C82.4, metal halide lamp ballast, suitable for lamp specified, with voltage to match luminaire voltage.

### **2.04 FLUORESCENT DIMMING BALLASTS AND CONTROLS**

- A. Manufacturers:
1. Lutron.
  2. Magnetek.
  3. Hubbell Inc.
  4. Pass & Seymour.
  5. Thomas Industries.
  6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Electrical assembly of control unit and ballast to furnish smooth dimming of fluorescent lamps.
- C. Control Unit: Linear slide type, rated 1500 watts at 277 volts.
- D. Ballast: Selected by dimming system manufacturer as suitable for operation with control unit and suitable for lamp type and quantity specified for luminaire.

### **2.05 INCANDESCENT LAMPS**

- A. Manufacturers:
1. General Electric Co.
  2. Philips Electronics North America.
  3. RCS Industries Co.
  4. Substitutions: Section 01 60 00 - Product Requirements.

### **2.06 FLUORESCENT LAMPS**

- A. Manufacturers:
1. General Electric Co.
  2. Hubbell Inc.
  3. Philips Electronics.
  4. Substitutions: Section 01 60 00 - Product Requirements.

### **2.07 HID LAMPS**

- A. Manufacturers:
1. Duro-Test Corp.
  2. General Electric Co.

3. Philips Electronic North America.
4. RCS Industries North America.
5. Siemens Corp.
6. Substitutions: Section 01 60 00 - Product Requirements.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install suspended luminaires using pendants supported from swivel hangers. Install pendant length required to suspend luminaire at indicated height.
- B. Support luminaires 2 x 4 foot size and larger independent of ceiling framing.
- C. Locate recessed ceiling luminaires as indicated on Drawings.
- D. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- E. Exposed Grid Ceilings: Support surface-mounted luminaires on grid ceiling directly from building structure. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.
- F. Install recessed luminaires to permit removal from below.
- G. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Install clips to secure recessed grid-supported luminaires in place.
- I. Install wall-mounted luminaires at height as indicated on Drawings as scheduled.
- J. Install accessories furnished with each luminaire.
- K. Connect luminaires to branch circuit outlets provided under Section 26 05 33.
- L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- M. Install specified lamps in each luminaire.
- N. Ground and bond interior luminaires in accordance with Section 26 05 26.

#### **3.02 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

#### **3.03 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Aim and adjust luminaires as indicated on Drawings.

#### **3.04 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Remove dirt and debris from enclosures.
- C. Clean photometric control surfaces as recommended by manufacturer.

- D. Clean finishes and touch up damage.

**3.05 PROTECTION OF FINISHED WORK**

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.
- B. Relamp luminaires having failed lamps at Substantial Completion.

**END OF SECTION**

## SECTION 26 5600

### EXTERIOR LIGHTING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section includes exterior luminaires, poles, and accessories.

##### 1.02 REFERENCES

- A. American National Standards Institute:
  1. ANSI C82.1 - American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.
  2. ANSI C82.4 - American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
  3. ANSI O5.1 - Wood Poles, Specifications and Dimensions.

##### 1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate dimensions and components for each luminaire not standard Product of manufacturer.
- C. Product Data: Submit dimensions, ratings, and performance data.
- D. Samples: Submit two color chips 3 x 3 inch in size illustrating luminaire finish color where indicated in luminaire schedule.

##### 1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

##### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

##### 1.06 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

##### 1.07 MAINTENANCE MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two of each lamp installed.
- C. Furnish two gallons of touch-up paint for each different painted finish and color.
- D. Furnish two ballasts of each lamp type installed.

#### PART 2 PRODUCTS

##### 2.01 LUMINAIRES

- A. Product Description: Complete exterior luminaire assemblies, with features, options, and accessories as scheduled.
- B. Refer to Section 01 60 00 - Product Requirements for product options.

## **2.02 FLUORESCENT BALLASTS**

- A. Manufacturers:
  - 1. Cooper Industries Inc.
  - 2. Duro-Test Corp.
  - 3. General Electric Co.
  - 4. Hubbell Lighting.
  - 5. Magnetek Inc.
  - 6. Pass & Seymour.
  - 7. Philips Electronic North America.
  - 8. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: High-power-factor type electromagnetic ballast certified by Certified Ballast Manufacturers, Inc. to comply with ANSI C82.1, suitable for lamps and environmental conditions specified, with voltage to match luminaire voltage.

## **2.03 HIGH INTENSITY DISCHARGE (HID) BALLASTS**

- A. Manufacturers:
  - 1. Duro-Test Corp.
  - 2. General Electric Co.
  - 3. Philips Electronics North America.
  - 4. Radiant Lamp Co.
  - 5. Siemens Corp.
  - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: ANSI C82.4, metal halide, high pressure sodium lamp ballast, suitable for lamp and environmental conditions specified, with voltage to match luminaire voltage.

## **2.04 LAMPS - GENERAL**

- A. Minimum Efficacy, Lamps Greater Than 100 Watts: 60 lumens/W, except where otherwise indicated or permitted by applicable code.

## **2.05 INCANDESCENT LAMPS**

- A. Manufacturers:
  - 1. Duro-Test Corp.
  - 2. General Electric Co.
  - 3. Neo-Ray Products.
  - 4. Philips Electronics North America.
  - 5. RCS Industries Co.
  - 6. Radiant Lighting.
  - 7. Substitutions: Section 01 60 00 - Product Requirements.

## **2.06 FLUORESCENT LAMPS**

- A. Manufacturers:
  - 1. Duro-Test Corp.
  - 2. General Electric Co.
  - 3. Hubbell Inc.
  - 4. Philips Electronics.
  - 5. Siemens Corp.
  - 6. Substitutions: Section 01 60 00 - Product Requirements.

## **2.07 HID LAMPS**

- A. Manufacturers:
  - 1. Duro-Test Corp.

2. General Electric Co.
3. Philips Electronic North America.
4. RCS Industries North America.
5. Siemens Corp.
6. Substitutions: Section 01 60 00 - Product Requirements.

## **2.08 METAL POLES**

- A. Manufacturers: Same as light fixtures.
- B. Material and Finish: Steel with prime finish for field painting.
- C. Section Shape and Dimensions: Round.
- D. Height: As indicated on Drawings,
- E. Base: Direct embedded type.
- F. Accessories:
  1. Handhole.
  2. Anchor bolts.
- G. Loading Capacity Ratings:
  1. Luminaire Weight: 55 pounds
  2. Luminaire and Bracket Effective Projected Area: 4.1 square feet
  3. Steady Wind: 100 miles per hour, minimum.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and Project conditions.
- B. Verify foundations are ready to receive fixtures.

### **3.02 INSTALLATION**

- A. Install concrete bases for lighting poles at locations as indicated on Drawings, in accordance with Section 03 30 00.
- B. Install poles plumb. Install double nuts to adjust plumb. Grout around each base.
- C. Install lamps in each luminaire.
- D. Bond and ground luminaries, metal accessories and metal poles in accordance with Section 26 05 26. Install supplementary grounding electrode at each pole.

### **3.03 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Operate each luminaire after installation and connection. Inspect for improper connections and operation.
- C. Measure illumination levels to verify conformance with performance requirements.
- D. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

### **3.04 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

- B. Aim and adjust luminaries to provide illumination levels and distribution [as indicated on Drawings].

**3.05 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean photometric control surfaces as recommended by manufacturer.
- C. Clean finishes and touch up damage.

**3.06 PROTECTION OF FINISHED WORK**

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.
- B. Relamp luminaries having failed lamps at Substantial Completion.

**END OF SECTION**

## SECTION 27 0526

### GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Wire.
  - 2. Mechanical connectors.
- B. Related Sections:
  - 1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

##### 1.02 REFERENCES

- A. Building Industry Consulting Service International, Inc.
  - 1. BICSI TDM Manual - Telecommunications Distribution Methods Manual.
- B. California Electrical Code:
  - 1. CEC - California Electrical Code.
- C. Telecommunication Industry Association/Electronic Industries Alliance:
  - 1. TIA/EIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications.

##### 1.03 SYSTEM DESCRIPTION

- A. Communications grounding systems use the following elements as grounding electrodes:
  - 1. Building grounding electrode.
- B. Do not use the following elements as grounding electrodes:
  - 1. Building plumbing system.
  - 2. Building gas system.

##### 1.04 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 25 ohms maximum.

##### 1.05 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data: Submit data on grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground.
- D. Manufacturer's Installation Instructions: Submit for active electrodes.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

##### 1.06 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of components and grounding electrodes.

##### 1.07 QUALITY ASSURANCE

- A. Provide grounding and surge protection of telecommunications system in accordance with latest version of Grounding, Bonding and Electrical Protection chapter of the BICSI TDM Manual, TIA/EIA 607, and CEC.

### **1.08 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 3 years documented experience.

### **1.09 PRE-INSTALLATION MEETINGS**

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

### **1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

### **1.11 COORDINATION**

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Complete grounding and bonding of building power system ground.

## **PART 2 PRODUCTS**

### **2.01 WIRE**

- A. Material: Stranded copper.
- B. Grounding Conductor: Copper conductor bare.
- C. Bonding Conductor: Copper conductor bare.

### **2.02 MECHANICAL CONNECTORS**

- A. Manufacturers:
  - 1. Apache Grounding/Erico Inc.
  - 2. Copperweld, Inc.
  - 3. Erico, Inc.
  - 4. ILSCO Corporation.
  - 5. O-Z Gedney Co.
  - 6. Thomas & Betts, Electrical.
  - 7. Substitutions: Section 01 60 00 - Product Requirements.
- B. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Remove paint at connection points.

### **3.02 INSTALLATION**

- A. Install in accordance with BICSI TDM Manual, TIA/EIA 607, and CEC.
- B. Install grounding and bonding conductors concealed from view.

- C. Install grounding for each rack using 6 AWG THHN, rated for 90 degrees C, insulated, copper stranded conductor to copper communication grounding bus bar located in main telecommunications room.
- D. Bond main telecommunications grounding system to building grounding electrode system at main electrical service entrance location with 6 AWG THHN, rated for 90 degrees C, insulated, copper stranded conductor.
- E. Install routing for grounding conductor as short and direct as practical.
- F. Install routing of bonding conductors with minimum number of bends and splices. Use sweeping bends.
- G. Install bonding connections with listed bolts, crimp pressure connectors, clamps, or lugs.
- H. Between each telecommunications/signal room, install multiple busbars directly bonded with 6 AWG copper conductor.
- I. Position busbars near associated equipment and insulate from supports.
- J. Construct busbars of copper, 4 inches x 8 inches by 1/4 inch thick with pilot holes for ground lug.
- K. Bond backbone cabling at each sheath opening.
- L. Ground data cabinets, racks, cable trays, and mounting hardware located in MDF Room and IDF Rooms.
- M. Install ground from each piece of equipment to MDF Room grounding bar via an insulated cable no smaller than 6 AWG stranded copper wire. Install proper grounding lug on cable where connecting to racks and grounding bar.
- N. Label grounding conductors and grounding bus bars in accordance with Section 27 05 53.
- O. Permanently attach equipment and grounding conductors prior to energizing equipment.

### **3.03 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Visually inspect from each bus bar to main grounding electrode service location.
- C. Test in accordance with BICSI TDM Manual, TIA/EIA 607, and CEC.
- D. When improper grounding is found, check entire project and correct. Perform retest.

**END OF SECTION**

## SECTION 27 0529

### HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Conduit supports.
  - 2. Formed steel channel.
  - 3. Sleeves.
  - 4. Mechanical sleeve seals.
  - 5. Firestopping relating to electrical work.
  - 6. Firestopping accessories.
  - 7. Equipment bases and supports.
- B. Related Sections:
  - 1. Section 03 30 00 - Cast-In-Place Concrete: Product requirements for concrete for placement by this section.
  - 2. Section 26 05 29 - Hangers and Supports for Electrical Systems.

##### 1.02 REFERENCES

- A. ASTM International:
  - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
  - 3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
  - 4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- B. FM Global:
  - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- C. California Electrical Code:
  - 1. CEC - California Electrical Code.
- D. Underwriters Laboratories Inc.:
  - 1. UL 263 - Fire Tests of Building Construction and Materials.
  - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
  - 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
  - 4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
  - 5. UL - Fire Resistance Directory.
- E. Intertek Testing Services (Warnock Hersey Listed):
  - 1. WH - Certification Listings.

##### 1.03 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

##### 1.04 SYSTEM DESCRIPTION

- A. Firestopping Materials: ASTM E119, UL 1479 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1 hour fire rating.
- B. Firestop interruptions to fire rated assemblies, materials, and components.

### 1.05 PERFORMANCE REQUIREMENTS

- A. Firestopping: Conform to FM and UL for fire resistance ratings and surface burning characteristics.
- B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

### 1.06 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.
- C. Product Data:
- D. Hangers and Supports: Submit manufacturers catalog data including load capacity.
- E. Firestopping: Submit data on product characteristics, performance and limitation criteria.
- F. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- G. Manufacturer's Installation Instructions:
- H. Hangers and Supports: Submit special procedures and assembly of components.
- I. Firestopping: Submit preparation and installation instructions.
- J. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- K. Engineering Judgements: For conditions not covered by UL or WH listed designs, submit judgements by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

### 1.07 QUALITY ASSURANCE

- A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
  - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
  - 2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
    - a. Floor Penetrations Within Wall Cavities: T-Rating is not required.
- B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
  - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
  - 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.

- E. Surface Burning Characteristics: 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

#### **1.08 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section [with minimum 3 years documented experience.

#### **1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

#### **1.10 ENVIRONMENTAL REQUIREMENTS**

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.
- D. Provide ventilation in areas to receive solvent cured materials.

### **PART 2 PRODUCTS**

#### **2.01 CONDUIT SUPPORTS**

- A. Manufacturers:
  - 1. Allied Tube & Conduit Corp.
  - 2. Electroline Manufacturing Company.
  - 3. O-Z Gedney Co.
  - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.
- F. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

#### **2.02 FORMED STEEL CHANNEL**

- A. Manufacturers:
  - 1. Allied Tube & Conduit Corp.
  - 2. B-Line Systems.
  - 3. Midland Ross Corporation, Electrical Products Division.
  - 4. Unistrut Corp.

5. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Galvanized 12 gage) thick steel. With holes 1-1/2 inches on center.

### 2.03 SLEEVES

A. Sleeves for Through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

C. Fire-stopping Insulation: Glass fiber type, non-combustible.

### 2.04 MECHANICAL SLEEVE SEALS

A. Manufacturers:

1. Thunderline Link-Seal, Inc.
2. NMP Corporation.
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

### 2.05 FIRESTOPPING

A. Manufacturers:

1. Dow Corning Corp.
2. Fire Trak Corp.
3. Hilti Corp.
4. International Protective Coating Corp.
5. 3M fire Protection Products.
6. Specified Technology, Inc.
7. Substitutions: Section 01 60 00 - Product Requirements.

### 2.06 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:  
1. Sheet metal.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

D. General:

1. Furnish UL listed products [or products tested by independent testing laboratory].
2. Select products with rating not less than rating of wall or floor being penetrated.

E. Non-Rated Surfaces:

1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.
- C. Verify openings are ready to receive firestopping.

#### **3.02 PREPARATION**

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install backing materials to arrest liquid material leakage.
- D. Do not drill or cut structural members.

#### **3.03 INSTALLATION - HANGERS AND SUPPORTS**

- A. Anchors and Fasteners:
  - 1. Concrete Structural Elements: Provide precast inserts, expansion anchors.
  - 2. Steel Structural Elements: Provide beam clamps.
  - 3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
  - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts.
  - 5. Sheet Metal: Provide sheet metal screws.
  - 6. Wood Elements: Provide wood screws.
- B. Inserts:
  - 1. Install inserts for placement in concrete forms.
  - 2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- C. Install conduit and raceway support and spacing in accordance with CEC.
- D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- E. Install multiple conduit runs on common hangers.
- F. Supports:
  - 1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
  - 2. Install surface mounted cabinets and panelboards with minimum of four anchors.
  - 3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.

#### **3.04 INSTALLATION - FIRESTOPPING**

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.

**3.05 INSTALLATION - SLEEVES**

- A. Exterior watertight entries: Seal with adjustable interlocking rubber links.
- B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.
- D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- G. Install chrome plated steel escutcheons at finished surfaces.

**3.06 FIELD QUALITY CONTROL**

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect installed firestopping for compliance with specifications and submitted schedule.

**3.07 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of firestopping materials.

**3.08 PROTECTION OF FINISHED WORK**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

**END OF SECTION**

## SECTION 27 0533

### CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.
- B. Related Sections:
  - 1. Section 26 05 03 - Equipment Wiring Connections.
  - 2. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
  - 3. Section 26 27 16 - Electrical Cabinets and Enclosures.
  - 4. Section 26 27 26 - Wiring Devices.
  - 5. Section 27 05 26 - Grounding and Bonding for Communications Systems.
  - 6. Section 27 05 29 - Hangers and Supports for Communications Systems.
  - 7. Section 27 05 53 - Identification for Communications Systems.

##### 1.02 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
  - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
  - 3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
- B. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
  - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
  - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
  - 5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
  - 6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
  - 7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

##### 1.03 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.
- B. Underground More than 5 feet outside Foundation Wall: Provide thickwall nonmetallic conduit. Provide cast metal boxes or nonmetallic handhole.
- C. Underground Within 5 feet from Foundation Wall: Provide rigid steel conduit. Provide cast metal or nonmetallic boxes.
- D. Outdoor Locations, Above Grade: Provide rigid conduit. Provide cast metal or nonmetallic outlet, pull, and junction boxes.
- E. Wet and Damp Locations: Provide rigid steel. Provide cast metal or nonmetallic outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.
- F. Concealed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

- G. Exposed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

#### **1.04 DESIGN REQUIREMENTS**

- A. Minimum Raceway Size: 3/4 inch unless otherwise specified.

#### **1.05 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

#### **1.06 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents:
  - 1. Record actual routing of conduits larger than 2 inches.
  - 2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

#### **1.08 COORDINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate installation of outlet boxes for equipment connected under Section 26 05 03.
- C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

### **PART 2 PRODUCTS**

#### **2.01 METAL CONDUIT**

- A. Manufacturers:
  - 1. Allied Tube.
  - 2. Hubbell Wiring Devices.
  - 3. Thomas & Betts Corp.
  - 4. Walker Systems Inc.
  - 5. The Wiremold Co.
  - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Rigid Aluminum Conduit: ANSI C80.5.
- D. Intermediate Metal Conduit (IMC): Rigid steel.
- E. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

#### **2.02 FLEXIBLE METAL CONDUIT**

- A. Manufacturers:
  - 1. Carlon Electrical Products.
  - 2. Hubbell Wiring Devices.
  - 3. Thomas & Betts Corp.
  - 4. Walker Systems Inc.
  - 5. The Wiremold Co.
  - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Interlocked aluminum construction.
- C. Fittings: NEMA FB 1.

### **2.03 LIQUIDTIGHT FLEXIBLE METAL CONDUIT**

- A. Manufacturers:
  - 1. Carlon Electrical Products.
  - 2. Hubbell Wiring Devices.
  - 3. Thomas & Betts Corp.
  - 4. Walker Systems Inc.
  - 5. The Wiremold Co.
  - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Interlocked aluminum construction with PVC jacket.
- C. Fittings: NEMA FB 1.

### **2.04 ELECTRICAL METALLIC TUBING (EMT)**

- A. Manufacturers:
  - 1. Allied Tube.
  - 2. Hubbell Wiring Devices.
  - 3. Thomas & Betts Corp.
  - 4. Walker Systems Inc.
  - 5. The Wiremold Co.
  - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: ANSI C80.3; galvanized tubing.
- C. Fittings and Conduit Bodies: NEMA FB 1; steel compression type.

### **2.05 NONMETALLIC CONDUIT**

- A. Manufacturers:
  - 1. Carlon Electrical Products.
  - 2. Hubbell Wiring Devices.
  - 3. Thomas & Betts Corp.
  - 4. Walker Systems Inc.
  - 5. The Wiremold Co.
  - 6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: NEMA TC 2; Schedule 80 PVC.
- C. Fittings and Conduit Bodies: NEMA TC 3.

### **2.06 OUTLET BOXES**

- A. Manufacturers:
  - 1. Carlon Electrical Products.
  - 2. Hubbell Wiring Devices.
  - 3. Thomas & Betts Corp.
  - 4. Walker Systems Inc.

5. The Wiremold Co.
  6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
  2. Concrete Ceiling Boxes: Concrete type.
- C. Nonmetallic Outlet Boxes: NEMA OS 2.
- D. Cast Boxes: NEMA FB 1, Type FD, aluminum. Furnish gasketed cover by box manufacturer.
- E. Wall Plates for Finished Areas: As specified in Section 26 27 26.
- F. Wall Plates for Unfinished Areas: Furnish gasketed cover.

### **2.07 PULL AND JUNCTION BOXES**

- A. Manufacturers:
1. Carlon Electrical Products.
  2. Hubbell Wiring Devices.
  3. Thomas & Betts Corp.
  4. Walker Systems Inc.
  5. The Wiremold Co.
  6. Substitutions: Section 01 60 00 - Product Requirements.
- B. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- C. Hinged Enclosures: As specified in Section 26 27 16.
- D. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
1. Material: Galvanized cast iron.
  2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- E. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:
1. Material: Galvanized cast iron.
  2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.
  3. Cover Legend: "COMMUNICATION".

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

### **3.02 INSTALLATION**

- A. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.
- C. Identify raceway and boxes in accordance with Section 26 05 53.
- D. Arrange raceway and boxes to maintain headroom and present neat appearance.

### **3.03 INSTALLATION - RACEWAY**

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.

- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29 provide space on each for 25 percent additional raceways.
- E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Construct wireway supports from steel channel specified in Section 26 05 29.
- H. Route exposed raceway parallel and perpendicular to walls.
- I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- J. Route conduit in and under slab from point-to-point.
- K. Maintain clearance between raceway and piping for maintenance purposes.
- L. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- M. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- N. Bring conduit to shoulder of fittings; fasten securely.
- O. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
- P. Install conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations to cast boxes.
- Q. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch size.
- R. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- S. Install fittings to accommodate expansion and deflection where raceway crosses seismic and expansion joints.
- T. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- U. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

#### **3.04 INSTALLATION - BOXES**

- A. Install wall mounted boxes at elevations to accommodate mounting heights.
- B. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.
- C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

- G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.
- H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- I. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- J. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- K. Install adjustable steel channel fasteners for hung ceiling outlet box.
- L. Do not fasten boxes to ceiling support wires or other piping systems.
- M. Support boxes independently of conduit.
- N. Install gang box where more than one device is mounted together. Do not use sectional box.
- O. Install gang box with plaster ring for single device outlets.

### **3.05 INTERFACE WITH OTHER PRODUCTS**

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 07 84 00.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.
- C. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.
- D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

### **3.06 ADJUSTING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused openings in boxes.

### **3.07 CLEANING**

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean interior of boxes to remove dust, debris, and other material.
- C. Clean exposed surfaces and restore finish.

**END OF SECTION**

**SECTION 27 0536**

**CABLE TRAYS FOR COMMUNICATIONS SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Ladder rack and accessories.

**1.02 REFERENCES**

- A. CEC - California Electrical Code.
- B. ASTM A 123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
- C. ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process.
- D. NEMA VE 1 - Metallic Cable Tray Systems.

**1.03 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Shop Drawings: Indicate tray type, dimensions, support points, and finishes.
- C. Product Data: Provide data for fittings and accessories.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

**1.04 PROJECT RECORD DOCUMENTS**

- A. Submit under provisions of Section 01 70 00.
- B. Record actual routing of ladder rack and locations of supports.

**1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum five years documented experience.

**1.06 REGULATORY REQUIREMENTS**

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. P.W. Industries
- B. B-line.
- C. Erico.
- D. Approved equal.

**2.02 LADDER RACK**

- A. Description: NEMA VE 1, Class 20C ladder type tray.
- B. Material: Steel.
- C. Finish: ASTM A 123, hot dipped galvanized after fabrication.
- D. Inside Width: 18 inches. As indicated on drawings.
- E. Inside Depth: 4 inches. As indicated on drawings.
- F. Straight Section Rung Spacing: 9 inches on center. As indicated on drawings.
- G. Inside Radius of Fittings: 24 inches or as indicated on drawings.
- H. Provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps.

### 2.03 WARNING SIGNS

- A. Engraved Nameplates: 3/4-inch high black letters on yellow laminated plastic nameplate, engraved with the following wording:

**WARNING! DO NOT USE CABLE TRAY AS WALKWAY, LADDER, OR SUPPORT. USE ONLY AS MECHANICAL SUPPORT FOR CABLES AND TUBING!**

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install metallic cable tray in accordance with NEMA VE 1.
- C. Support trays in accordance with Section 26 05 29. Provide supports at each connection point, at the end of each run, and at other points to maintain spacing between supports of 8 feet maximum.
- D. Use expansion connectors where required.
- E. Ground and bond cable tray under provisions of Section 26 05 26.
  - 1. Provide continuity between tray components.
  - 2. Use anti-oxidant compound to prepare aluminum contact surfaces before assembly.
  - 3. Provide 2 AWG bare copper equipment grounding conductor through entire length of tray; bond to each component.
  - 4. Connections to tray may be made using mechanical or exothermic connectors.
- F. Install warning signs at 20-ft centers along cable tray, located to be visible.

**END OF SECTION**

**SECTION 27 0553**

**IDENTIFICATION FOR COMMUNICATIONS SYSTEMS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes:
  - 1. Nameplates.
  - 2. Wire markers.
  - 3. Conduit markers.
  - 4. Stencils.
  - 5. Underground Warning Tape.
- B. Related Sections:
  - 1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this section.
  - 2. Section 27 05 53 - Identification for Communications Systems.

**1.02 SUBMITTALS**

- A. Section 01 30 00 - Administrative Requirements: Submittal Procedures.
- B. Product Data:
  - 1. Submit manufacturer's catalog literature for each product required.
  - 2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.
- C. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

**1.03 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of tagged devices; include tag numbers.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept identification products on site in original containers. Inspect for damage.
- C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

**1.05 ENVIRONMENTAL REQUIREMENTS**

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Install nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

**1.06 EXTRA MATERIALS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for extra materials.

**PART 2 PRODUCTS**

## 2.01 NAMEPLATES

- A. Product Description: Laminated three-layer plastic with engraved black letters on white contrasting background color.
- B. Letter Size:
  - 1. 1/8 inch high letters for identifying individual equipment and loads.
  - 2. 1/4 inch high letters for identifying grouped equipment and loads.
- C. Minimum nameplate thickness: 1/8 inch.

## 2.02 WIRE MARKERS

- A. Description: Split sleeve type wire markers.
- B. Legend:
  - 1. Power and Lighting Circuits: Branch circuit or feeder number [as indicated on Drawings].
  - 2. Low Voltage Circuits: Wire number as indicated on shop drawings.

## 2.03 UNDERGROUND WARNING TAPE

- A. Description: 4 inch wide plastic tape, detectable type, colored yellow with suitable warning legend describing buried electrical lines.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

### 3.02 EXISTING WORK

- A. Install identification on all equipment.
- B. Replace lost nameplates.

### 3.03 INSTALLATION

- A. Install identifying devices after completion of painting.
- B. Nameplate Installation:
  - 1. Install nameplate parallel to equipment lines.
  - 2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
  - 3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
  - 4. Secure nameplate to equipment front using [screws] [, rivets] [, or] [adhesive].
  - 5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
  - 6. Install nameplates for the following:
    - a. Switchboards.
    - b. Panelboards.
    - c. Transformers.
    - d. Service Disconnects.
- C. Underground Warning Tape Installation: Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches minimum below finished grade or as indicated on drawings, and directly above buried conduit, raceway, or cable.

**END OF SECTION**

## SECTION 27 1300

### COMMUNICATIONS BACKBONE CABLING

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Pathways.
  - 2. UTP cable.
  - 3. 50/125-micrometer, optical fiber cabling.
  - 4. Coaxial cable.
  - 5. Cable connecting hardware, patch panels, and cross-connects.
  - 6. Cabling identification products.
- B. Related Sections:
  - 1. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables.

##### 1.03 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- C. EMI: Electromagnetic interference.
- D. IDC: Insulation displacement connector.
- E. LAN: Local area network.
- F. RCDD: Registered Communications Distribution Designer.
- G. UTP: Unshielded twisted pair.

##### 1.04 BACKBONE CABLING DESCRIPTION

- A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.
- B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

##### 1.05 PERFORMANCE REQUIREMENTS

- A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

##### 1.06 SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. For coaxial cable, include the following installation data for each type used:
    - a. Nominal OD.
    - b. Minimum bending radius.

- c. Maximum pulling tension.
- B. Shop Drawings:
  - 1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
  - 2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
  - 3. Cabling administration drawings and printouts.
  - 4. Wiring diagrams to show typical wiring schematics including the following:
    - a. Cross-connects.
    - b. Patch panels.
    - c. Patch cords.
  - 5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
  - 6. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
    - a. Vertical and horizontal offsets and transitions.
    - b. Clearances for access above and to side of cable trays.
    - c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
    - d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.
- C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Maintenance Data: For splices and connectors to include in maintenance manuals.
- G. Software and Firmware Operational Documentation:
  - 1. Software operating and upgrade manuals.
  - 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
  - 3. Device address list.
  - 4. Printout of software application and graphic screens.

#### 1.07 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
  - 1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
  - 2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
  - 3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
  - 4. Testing Agency Qualifications: An NRTL.
  - 5. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. 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.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 50 or less.
  - 3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

- D. Grounding: Comply with ANSI-J-STD-607-A.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Test cables upon receipt at Project site.
1. Test optical fiber cable to determine the continuity of the strand end to end. Use an optical loss test set.
  2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connectors, including the loss value of each. Retain test data and include the record in maintenance data.
  3. Test each pair of UTP cable for open and short circuits.

#### **1.09 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

#### **1.10 COORDINATION**

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

#### **1.11 SOFTWARE SERVICE AGREEMENT**

- A. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

#### **1.12 EXTRA MATERIALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Patch-Panel Units: two of each type.
  2. Connecting Blocks: two of each type.

### **PART 2 PRODUCTS**

#### **2.01 PATHWAYS**

- A. General Requirements: Comply with TIA/EIA-569-A.
- B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
1. Support brackets with cable tie slots for fastening cable ties to brackets.
  2. Lacing bars, spools, J-hooks, and D-rings.
  3. Straps and other devices.
- C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

#### **2.02 BACKBOARDS**

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements in Division 06 Section "Rough Carpentry" for plywood backing panels.

### 2.03 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Belden CDT Inc.; Electronics Division.
  - 2. CommScope, Inc.
  - 3. Mohawk; a division of Belden CDT.
  - 4. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
  - 5. Superior Essex.
  - 6. General Cable Technologies Corporation.
- B. Description: 100-ohm, 100-pair UTP, formed into 25-pair binder groups covered with a thermoplastic jacket and overall metallic shield.
  - 1. Comply with ICEA S-90-661 for mechanical properties.
  - 2. Comply with TIA/EIA-568-B.1 for performance specifications.
  - 3. Comply with TIA/EIA-568-B.2, Category 6.
  - 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and CEC for the following types:
    - a. Communications, General Purpose: Type CMR
    - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
    - c. Communications, Riser Rated: Type CMR, complying with UL 1666.

### 2.04 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
  - 2. Panduit.
  - 3. Leviton.
- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
- E. Number of Terminals per Field: One for each conductor in assigned cables.
- F. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
  - 1. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.
- G. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- H. Patch Cords: Factory-made, 4-pair cables in 36-inch lengths; terminated with 8-position modular plug at each end.
  - 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
  - 2. Patch cords shall have color-coded boots for circuit identification.

## 2.05 OPTICAL FIBER CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Superior Essex Part Number W3018HGA1..
- B. Description: One (1) 12 strand MM, one (1) 6 strand SM, 50/125-micrometer, tight buffer, optical fiber cable. Outer Sheath Color: Different than existing station wiring (not Red). Outer Sheath NAPA Rating: CM or CMP.
  - 1. Comply with ICEA S-83-596 for mechanical properties.
  - 2. Comply with TIA/EIA-568-B.3 for performance specifications.
  - 3. Comply with TIA/EIA-492AAAA-B for detailed specifications.
  - 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and CEC for the following types:
  - 5. General Purpose, Nonconductive: Type OFN or OFNG.
    - a. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
    - b. Riser Rated, Nonconductive: Type OFNR, complying with UL 1666.
    - c. General Purpose, Conductive: Type OFC or OFCG.
    - d. Plenum Rated, Conductive: Type OFCP, complying with NFPA 262.
    - e. Riser Rated, Conductive: Type OFCR, complying with UL 1666.
  - 6. Conductive cable shall be aluminum armored type.
  - 7. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
  - 8. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
- C. Jacket:
  - 1. Jacket Color: Orange for 50/125-micrometer cable.
  - 2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
  - 3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

## 2.06 OPTICAL FIBER CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Leviton
  - 2. Panduit.
- B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
  - 1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
- C. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.
- D. Cable Connecting Hardware:
  - 1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
  - 2. Quick-connect, simplex and duplex, Type LC connectors. Insertion loss not more than 0.75 dB.
  - 3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

## 2.07 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

## 2.08 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

## **2.09 SOURCE QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.
- E. Cable will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

## **PART 3 EXECUTION**

### **3.01 ENTRANCE FACILITIES**

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

### **3.02 WIRING METHODS**

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
  - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
  - 2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

### **3.03 INSTALLATION OF PATHWAYS**

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Hangers and Supports for Communication Systems." Drawings indicate general arrangement of pathways and fittings.
- C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Pathway Installation in Communications Equipment Rooms:
  - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
  - 2. Install cable trays to route cables if conduits cannot be located in these positions.
  - 3. Secure conduits to backboard when entering room from overhead.

4. Extend conduits 3 inches above finished floor.
  5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

### 3.04 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
1. Comply with TIA/EIA-568-B.1.
  2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
  3. Install 110-style IDC termination hardware unless otherwise indicated.
  4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
  5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
  7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
  8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
  10. In the communications equipment room, install with a 10-foot- minimum service at the MDF/IDF cabinets and each workstation..
  11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
  12. Fiber optic cable shall be permanently labeled on both ends at the fiber patch panel and all junction boxes with their IDF or MDF destination using (P-touch) labeling, (i.e. to MDF).
  13. Fiber optic cables shall be terminated on both ends with SC style connections.
  14. Fiber optic rack mount enclosures will be installed at the top of wall mount and freestanding equipment rack.
  15. Fiber optic cables are to be installed by Contractor, provided UL rated inner duct where conduit pathways are not provided.
  16. All wire (copper, fiber and ground) will enter and or exit equipment closets by passing through Contractor provided and installed EMT conduit fastened where needed by uni-strut.
  17. A minimum of insulated #6 AWG copper conductor(s) wire will be provided and installed by the Contractor and grounded in MDF/IDF.
- C. UTP Cable Installation:
1. Comply with TIA/EIA-568-B.2.
  2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.
- D. Optical Fiber Cable Installation:
1. Comply with TIA/EIA-568-B.3.
  2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.
- E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
  3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- F. Group connecting hardware for cables into separate logical fields.
- G. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
  2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
  3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
  4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
  5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
  6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

### 3.05 CODES AND STANDARDS

- A. The Following are codes and standards that apply to this installation:
1. TIA/EIA-568B- Commercial BLDG telecommunication wiring standard.
  2. TIA/EIA-569- Commercial BLDG standards for telecommunications pathways and spaces.
  3. TIA/EIA-606- Administration standard for the telecommunications infrastructure of commercial Buildings.
  4. TIA/EIA-607- Commercial building grounding and bonding requirements for telecommunications
  5. TIA/EIA-67- Transmission performance spec's for field testing of "UTP" cabling systems
  6. ISO.IEC 8802-3- ANSI/IEEE 802.3 series standards.

### 3.06 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping." Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

### 3.07 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

- B. Comply with ANSI-J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

### 3.08 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  - 1. Administration Class: 2.
  - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- E. Cable and Wire Identification:
  - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
  - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
  - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
  - 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
    - a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
    - b. Label each unit and field within distribution racks and frames.
  - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:
  - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

### 3.09 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
  - 1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
  - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  - 3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
    - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
  - 4. Optical Fiber Cable Tests:
    - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    - b. Link End-to-End Attenuation Tests:
      - 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
      - 2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
- D. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- E. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- F. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.
- H. The power meter test results shall be recorded and printed using the software provided with the test equipment. Provide a hard and soft copy of the fiber optics test results to Alford SD IT Department including a copy of the test equipment software. Hard copy test result must be provided in an 8-1/2" x 11" binder including a cover sheet.

**END OF SECTION**

## SECTION 28 3100

### FIRE ALARM SYSTEMS

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This Section covers fire alarm initiating devices and supervisory devices.
- B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.
- C. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:
  - 1. Fire alarm and detection operations.

##### 1.02 MANUFACTURERS

- A. System Sensor
- B. Gentex
- C. Approved equal.
- D. The Manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained and NICET level 2 certified technicians, and shall maintain a service organization within 50 miles of this project location. The Manufacturer and service organization shall have a minimum of 10 years experience in the fire protective signaling systems industry.

##### 1.03 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.
- B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:
  - 1. Section 16010: "Basic Electrical Materials and Methods".
  - 2. Sections 16123, 16130, 16140, 16180.
  - 3. Division 15: "Fire Protection".
- C. The system and all associated operations shall be in accordance with the following:
  - 1. NFPA 72, National Fire Alarm Code, CA. Amended 1996 edition.
  - 2. NFPA 70, California. Electrical Code, part 3, Title 24 CCR, 1996 NEC, 1998 CA. amendments.
  - 3. California Building Code, part 2, Title 24 CCR, 1997 UBC volumes 1,2&3 and 1998 CA. amendments.
  - 4. 1998 California Fire Code, part 9, Title 24 CCR, 1997 UFC, 1998 CA. amendments.
  - 5. California Mechanical Code, part 4, Title 24 CCR, 1997 UMC, 1998 CA. amendments.
  - 6. NFPA 101.
  - 7. Local Jurisdictional Adopted Codes and Standards.
  - 8. ADA Accessibility Guidelines

##### 1.04 SYSTEM DESCRIPTION

- A. General: Provide a complete conventional fire alarm system with initiating devices, monitoring and control devices as indicated on the drawings and as specified herein.
- B. Fire Suppression Monitoring:
  - 1. Water flow: Activation of a water flow switch shall initiate general alarm operations.

2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.
3. FS: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.

#### 1.05 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
  1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.
  2. Wiring diagrams from manufacturer.
  3. Shop drawings showing system details including location of all devices and circuiting.
  4. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all automatically initiated system inputs and outputs.
  5. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences. Provide the names, addresses, and telephone numbers of service organizations.
  6. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
  7. Record of field tests of system.
- B. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions if required to make clarifications or revisions to obtain approval.

#### 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A factory authorized installer is to perform the work of this section.
- B. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

### PART 2 PRODUCTS

#### 2.01 SMOKE DETECTORS

- A. General: Comply with UL 217, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
  1. Factory Nameplate: Serial number and type identification.
  2. Operating Voltage: 120 VDC, nominal.
  3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
  4. Self-restoring integral 135°F fixed temperature thermal.
  5. Each detector shall contain an LED that will flash indicating condition. In alarm condition, the sensor base LED shall be on steady.
  6. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
  7. Removal of the sensor head for cleaning shall not require the setting of addresses.

8. Type: Smoke detectors shall be of the photoelectric type. System Sensor Model 7103T; or approved equal.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION, GENERAL**

- A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.
- B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
  1. Factory trained and certified personnel.
  2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
  3. Personnel licensed or certified by state or local authority.

#### **3.02 EQUIPMENT INSTALLATION**

- A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient smoke detectors, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

#### **3.03 WIRING INSTALLATION**

- A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AH) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
- B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
- C. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.

#### **3.04 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
  1. Factory trained and certified.
  2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
  3. International Municipal Signal Association (IMSA) fire alarm certified.
  4. Certified by a state or local authority.
  5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.

- C. **Pretesting:** Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
- D. **Final Test Notice:** Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.
- E. **Minimum System Tests:** Test the system according to the procedures outlined in NFPA 72.
- F. **Retesting:** Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- G. **Report of Tests and Inspections:** Provide a written record of inspections, tests, and detailed test results in the form of a test log.
- H. **Final Test, Certificate of Completion, and Certificate of Occupancy:**
  - 1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

### **3.05 CLEANING AND ADJUSTING**

- A. **Cleaning:** Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.
- B. **Occupancy Adjustments:** When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

### **3.06 TRAINING**

- A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.
  - 1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.
  - 2. Schedule training with the Owner at least seven days in advance.

**END OF SECTION**

**SECTION 31 1000**

**SITE PREPARATION**

**PART 1 GENERAL**

**1.01 WORK OF THIS SECTION**

- A. The WORK of this Section includes site preparation, clearing and grubbing.

**1.02 STANDARD SPECIFICATIONS**

- A. Except as specifically modified herein or shown otherwise on the Contract Drawings, the work under this Section shall be in compliance with the provisions in the applicable Sections of the Standard Specifications for Public Works Construction (SSPWC) also known as the "Green Book" (Edition in effect on the date that the Contract Drawings were signed and sealed by the Design Engineer) including all Supplements issued prior to the date of execution of the Contract.
- B. In case of conflict between any requirements set forth in this Section, the Contract Drawings and any provisions of the foregoing Standard Specifications, the requirements shown on the Contract Drawings shall govern over the requirements set forth herein and the requirements set forth herein and the requirements set forth herein shall govern over the SSPWC.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. Existing Conditions: The site shall be examined and the City shall be notified of any conditions which affect the Work of this Section.
- B. Utility Interference: Where existing utilities interfere with the Work of this Section, the City shall be notified of interferences.

**3.02 CLEARING AND GRUBBING**

- A. Clearing and grubbing shall comply with SSPWC Subsection 300-1 and the following:
1. The site shall be cleared of grass and weeds to a depth of at least 6 inches and debris and obstructions including brush, trees, logs, stumps, roots, heavy sod, vegetation, rock, stones larger than 6 inches in any dimension, broken or old concrete and pavement.

**3.03 SALVAGE AND DISPOSAL**

- A. Salvage: Topsoil shall be salvaged and stored at a location which will not interfere with the Work.
- B. Disposal: Waste material shall be disposed of in accordance with SSPWC Subsection 300-1.3.

**END OF SECTION**

**SECTION 31 2300**

**EARTHWORK - PIPELINE AND MISCELLANEOUS STRUCTURES**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. Contractor shall provide all tools, equipment, materials, labor, traffic control, excavating, shoring, dewatering, subgrade preparation, backfilling, compacting, grading and temporary resurfacing required for the construction of the work shown on the Contract Drawings and/or required in the Specifications.
- B. Earthwork shall include, without classification, the removal and disposal of all materials of whatever nature encountered that interfere with the proper construction and completion of the Work.
- C. Where any permit requirements exceed the requirements of this Section, the permit requirements shall govern.

**1.02 SYSTEM**

- A. The Work of this Section shall include the excavation, backfill, temporary resurfacing and traffic control for proper completion of the Work.

**1.03 STANDARD SPECIFICATION**

- A. Except as specifically modified herein or shown otherwise on the Contract Drawings, the work under this Section shall be in compliance with the provisions in the applicable Sections of the Standard Specifications for Public Works Construction (SSPWC) also known as the "Green Book" (Edition in effect on the date that the Contract Drawings were signed and sealed by the Design Engineer) including all Supplements issued prior to the date of execution of the Contract.
- B. In case of conflict between any requirements set forth in this Section, the Contract Drawings and any provisions of the foregoing Standard Specifications the requirements shown on the Contract Drawings shall govern over the requirements set forth herein and the requirements set forth herein shall govern over the SSPWC.

**PART 2 MATERIALS**

**2.01 CRUSHED ROCK**

- A. Crushed rock material used for pipe bedding and/or trench backfill shall conform to SSPWC Sections 200-1.1 and 200-1.2 (Crushed Rock and Rock Dust). Gradation shall be 1-inch unless otherwise shown on the Contract Drawings.

**2.02 SAND**

- A. Sand used for pipe bedding and/or trench backfill shall conform to SSPWC Section 200-1.5 (Sand for Asphalt Concrete).

**2.03 SELECT SUB-BASE**

- A. Material used for select subbase/subgrade shall conform to SSPWC Section 200-6.

**2.04 TEMPORARY RESURFACING**

- A. Trench temporary resurfacing used for streets, parking areas, driveways and sidewalks shall conform to SSPWC Section 306-1.5.1.

**PART 3 EXECUTION**

### **3.01 GENERAL**

- A. Conform to the requirements of SSPWC Sections 306-1, 306-1.5, the Contract Drawings and as stated herein.

### **3.02 REMOVAL AND REPLACEMENT OF SURFACE IMPROVEMENTS**

- A. Removal and replacement of surface improvements shall conform to SSPWC Section 306-1.1.5 shown unless otherwise shown on the Contract Drawings or stated herein..
- B. Asphalt paving replacement shall be as shown on the Contract Drawings and shall conform to Sections 203-6, 302.5, 302.6 and 306-1.5 of the SSPWC.

### **3.03 PROTECTION OF EXISTING UTILITIES/FACILITIES**

- A. Contractor shall be responsible for the protection of all existing utilities/facilities in accordance with SSPWC Section 5. Any method of construction chosen which necessitates heavy equipment imposing loads on existing utilities/facilities requires approval by the City and the utility.
- B. Contractor shall be responsible for complying with SSPWC Section 5-1 and Section 4216 of the California Government Code for the proper notification of the regional notification center (Underground Service Alert of Southern California) and shall obtain an inquire identification number.

### **3.04 SHORING AND BRACING**

- A. The Contractor shall prepare detailed excavation shoring, bracing, sloping plans or other provisions to be made for worker and public protection from the hazard of caving ground during the excavation. All plans shall include a statement that the plan complies with all Division of Industrial Safety of the State of California (CAL/OSHA) Construction Safety Orders requirements
- B. The Contractor shall submit, in advance (minimum of 5-working days) of any excavation operation, a copy of their plan(s).

### **3.05 CONTROL OF SURFACE AND GROUND WATER**

- A. Contractor shall be responsible for furnishing/placing all temporary drainage facilities required to protect the Contractor's excavations from surface waters (including rainfall) by grading, sandbags, temporary berms, etc. to ensure that excavations remain dry at all times and also to ensure that construction water and/or storm water does not create or contribute to water pollution. In channels, storm drains, drainage courses and bodies of water.
- B. All excavations shall be maintained free of ground water at all times to a minimum elevation of 1-foot below all foundation or pipeline construction.
  - 1. Dewatering/removal of ground water shall be in conformance with Section 31 23 19 of these specifications.

### **3.06 MAXIMUM LENGTH OF OPEN TRENCH OR EXCAVATION**

- A. Maximum length of open trench in public streets shall be limited to 250 feet for each pipeline heading during the Contractor's working hours. Trenches in public streets shall be protected by trench bridging (steel trench plates) to allow public vehicular and pedestrian traffic during working hours and during all nonworking hours (including nonworking days, weekends and holidays). Steel trench plates shall be in accordance with Section 13 of the "Work Area Traffic Control Handbook" (WATCH MANUAL), Edition in effect on the date of execution of the Contract) and shall have a nonskid surface.
- B. Maximum length of open trench in open areas (restricted public access areas) shall be limited to 250 feet for each pipeline heading during the Contractor's working hours. All trenches in open areas shall be protected by trench bridging (steel trench plates) or by secure temporary fencing

surrounding the entire open trench during all nonworking hours (including nonworking days, weekends and holidays). Temporary fencing shall be 6 feet high chain link fencing

- C. All open excavations shall be protected by trench bridging or temporary fencing (6-feet high) during all nonworking hours (including nonworking days, weekends and holidays).

### **3.07 TRENCH WIDTH**

- A. Trench widths shall conform to SSPWC Section 306-1.1.3 except as follows:
  - 1. Unless otherwise shown on the Contract Drawings, maximum and minimum width of sewer and water pipeline trenches shall be as follows:
  - 2. Maximum width shall be no more than 24-inches wider than the widest dimension of the pipe (not including fittings), unless otherwise shown on the Contract Drawings. Width shall be measured at the top of pipe.
  - 3. Minimum width shall not be less than 12-inches wider than the widest dimension of the pipe (not including fittings), unless otherwise shown on the Contract Drawings. Width shall be measured at the top of pipe.
- B. All trenches in public streets shall have vertical walls.
- C. Trenches in open areas may have vertical walls or be sloped back as appropriate with site and soil conditions.

### **3.08 ACCESS TO TRENCHES AND EXCAVATIONS**

- A. Ingress and egress to all trenches and excavations shall be in accord with SWPWC Section 306-1.1.4.

### **3.09 SUBGRADE/SUBBASE PREPARATION**

- A. Subgrade/subbase depth shall extend to 12-inches below pipeline bedding or the structure subgrade and shall be firm, unyielding, and free of rock(s) and debris.
  - 1. Removal and replacement of any unsuitable subgrade/subbase material, shall be as determined by the City. The Contractor shall over-excavate the trench bottom and backfill the trench subgrade with 1½-inch crushed rock when directed by the City. The Contractor shall roll this rock into place as tight as possible to ensure all voids are filled. The Contractor shall also install a geofabric under, over and on the sides of the rock base. Joints shall be overlapped a minimum of 8 inches. Geofabric shall be woven geotextile, made of 100% polypropylene silt film yarns. Geofabric shall be Mirafi 500X or equal. Payment for over-excavation to a maximum of 12 inches below the structure subgrade, and installation of 1½-inch crushed rock and geofabric will be included in the bid for the project, and no additional compensation shall be allowed.
- B. All "UNAUTHORIZED" over excavation by the Contractor shall be replaced and compacted to a minimum relative compaction of 90% in conformance with the State of California, Division of Highways (Caltrans) Test Method No. 216. All cost associated with "unauthorized" over excavation, material replacement and testing shall be at the Contractor's expense.

### **3.10 PIPELINE BEDDING AND SUBBASE FOR STRUCTURES**

- A. Pipeline bedding and subbase for structures shall conform to these specifications unless otherwise shown on the Contract Drawings.

### 3.11 BACKFILL AND COMPACTION

- A. Trench backfill material shall be clean, free from organic material, trash, debris, rubbish, broken portland cement concrete, asphalt concrete, rocks over 6-inches in size or other objectionable material and shall have a minimum sand equivalent of 30 as determined by the State of California, Division of Highways (Caltrans) Test Method No. Calif. 217, and not more than 20 percent of the backfill material will pass through a 200 mesh sieve.
- B. Structures backfill material shall be clean, free from organic material, trash, debris, rubbish, broken portland cement concrete, asphalt concrete, rocks over 3-inches in size or other objectionable material and shall have a minimum sand equivalent of 30 as determined by the State of California, Division of Highways (Caltrans) Test Method No. Calif. 217, and not more than 20 percent of the backfill material will pass through a 200 mesh sieve.
- C. Place bedding and backfill materials true to the lines, grades, cross-sections and compact in accord with the requirements shown on the Contract Drawings.
- D. Trench backfill shall not be placed over pipe until after the pipe has been inspected by the Engineer.
- E. Backfill shall not be placed against structures until the 28-day compressive strength is obtained.
- F. Backfill material shall be in vertical lifts and shall not exceed the thickness specified for various types of equipment (SSPWC Section 306-1.3.2 (uncompacted lifts) horizontal lifts. The difference in compacted backfill material on each side of pipe or structure shall not exceed 4-inches.
- G. Impact, free falling, or "stomping" equipment shall not be used within 3-feet of top of pipe of for structures backfill compaction.
- H. Jetting (water densifying) methods for compaction shall not be permitted for trench or structures backfill.
- I. Compaction requirements shall be as shown on the Contract Drawings.
- J. Compaction testing shall conform to the State of California, Division of Highways (Caltrans) Test Method No. 216.
- K. Frequency and depth of all compaction tests will be as determined by the Engineer.
- L. Unless otherwise stated on the Contract Drawings or in these Specifications, the City will employ a qualified materials testing organization (laboratory) for performing all compaction and sand equivalent sampling and testing.
- M. Cost for all passing compaction and sand equivalent sampling and testing will be paid by the City, unless otherwise stated on the Contract Drawings or in these specifications. The Contractor shall be responsible for the cost of all failing sampling and testing. The City will determine the costs of all failing sampling and testing and will deduct the cost from the Contractor's progress payments.

**END OF SECTION**

## SECTION 31 2319

### DEWATERING

#### PART 1 GENERAL

##### 1.01 WORK OF THIS SECTION

- A. The WORK of this Section includes site dewatering necessary to lower and control groundwater levels and hydrostatic pressures to permit excavation and construction to be performed properly under dry conditions. Groundwater will be encountered in all construction excavations for this project and shall be anticipated by the Contractor.
- B. Dewatering operations shall be adequate to assure the integrity of the finished project. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the Contractor. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.

##### 1.02 RELATED SECTIONS

- A. The WORK of the following Section applies to the Work of this Section. Other sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
- B. Section 31 23 00-Earthwork

##### 1.03 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the Contractor shall comply with the Standard Specifications for Public Works Construction, latest edition.
- B. The Contractor shall also obtain and comply with the provisions of NPDES Order No. R4-2008-0032 for dewatering operations required by the Regional Water Quality Control Board. The actual order and permit application has been included in the appendix of these specifications. The Contractor shall comply with all provisions of this permit including the effluent testing and reporting requirements.

##### 1.04 SCHEDULE AND PLAN

- A. The following shall be submitted in compliance with Section 2-5.3 of the SSPWC.
  - 1. Prior to commencement of excavation, a detailed plan and schedule, with description, for dewatering of excavations.
  - 2. Demonstration of proposed system and verification that adequate personnel, materials and equipment are readily available.
  - 3. Detailed plan and location of reference points and observation wells to be constructed.

##### 1.05 CONTROL AND OBSERVATION

- A. Adequate control shall be maintained to ensure that the stability of excavated and constructed slopes are not adversely affected by water, that erosion is controlled and that flooding of excavation or damage to structures does not occur.
- B. Prepare and submit a monitoring program for all areas to be dewatered.

##### 1.06 PERMITS

- A. Dewatering operations are to be conducted in accordance with the Regional Water Quality Control Board (RWQCB), Los Angeles Region, Order No. R4-2008-0032, which has been included in the appendix of these specifications. The Contractor is responsible for obtaining a permit for this order and paying all associated fees. Supplemental information which may be required (such as a geotechnical study) shall also be the responsibility of the Contractor,

including all costs. The Contractor is responsible for complying with all provisions contained in this permit.

- B. To be authorized to discharge under this order, the Contractor must submit a Notice-of-Intent (NOI), as described under Item II, Part D of the order (pages 4, 5 and 6). The Notice-of-Intent form to be submitted to the RWQCB is also contained in the appendix of these specifications. The NOI requires water quality data be submitted, along with the form. The Contractor is responsible for obtaining representative groundwater samples to be discharged, and having the samples analyzed for the pollutants of concern. The list of pollutants which are to be measured is included in the appendix of these specifications. The Contractor is responsible for obtaining the samples, and paying all costs associated with the required laboratory analysis.
- C. The RWQCB requires a minimum of 60 days to process a NOI application. The Contractor must account for this time when developing their schedule for the project. Further, the RWQCB charges a \$5,800 fee for issuing the NPDES permit. The Contractor is responsible for paying this fee.

## **PART 2 PRODUCTS**

### **2.01 EQUIPMENT**

- A. Dewatering includes well points, sump pumps, temporary pipelines for water disposal, and rock or gravel placement, and other means including standby pumping equipment maintained on the jobsite continuously.

## **PART 3 EXECUTION**

### **3.01 GENERAL REQUIREMENTS**

- A. Dewatering shall be performed in compliance with Subsection 306-3.3 of SSPWC and as specified herein.
- B. An adequate system shall be maintained to lower and control the ground water to permit excavation, construction of structures and placement of fill materials to be performed under dry conditions.
- C. Sufficient dewatering equipment shall be installed to pre-drain the water-bearing strata below the bottom of foundations, drains, sewers and other excavations.
- D. The hydrostatic head in water-bearing strata below foundations, drains, sewers and other excavations shall be reduced to ensure that the water level is below the excavation surface at all times.
- E. The system shall be placed into operation prior to excavation below ground water level to lower the ground water level and shall be operated continuously 24 hours a day, 7 days a week until drains, sewers and structures have been constructed and fill materials have been placed and dewatering is no longer required.
- F. The site shall be graded to facilitate drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity away from the excavation.
- G. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- H. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock at no additional cost to the City.

- I. Flotation of structures and facilities shall be prevented by maintaining a positive and continuous removal of water.
- J. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.
- K. Water and debris shall be disposed of in a suitable manner in compliance with Subsection 306-3.3 of SSPWC and without damage to adjacent property. No water shall be drained into work built or under construction as required by the waste discharge permit contained in the Appendix, water shall be filtered to remove sand and fine-sized soil particles and further treated before disposal into any drainage system.
- L. The release of groundwater to its original level shall be performed in such a manner as not to disturb natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines and sewers.
- M. Groundwater Monitoring Wells
  - 1. Groundwater monitoring wells shall be provided when dewatering the wells are installed. A minimum of 4 monitoring wells shall be constructed as part of this project.
  - 2. Groundwater levels shall be monitored by the Contractor daily, at a minimum, and four (4) times per day during dewatering activities.
  - 3. Contractor shall submit groundwater monitoring data daily to the City for review.
  - 4. Groundwater levels shall be maintained between 1 and 2 feet below the proposed trench excavation. Groundwater levels observed lower than 2 feet below the trench excavation will result in a stoppage of work. The Contractor shall then employ the services of a professional geotechnical firm to establish corrective measures. Work shall not be allowed to continue until the plan for corrective action has been reviewed and accepted by the City.
  - 5. After completion of the watermain installation, the Contractor shall be responsible for destroying all groundwater monitoring wells, in accordance with the local requirements and the following:
    - a. Over-drill the entire well, removing the well casing, filter, pack, annular seal, and well box.
    - b. The borehole shall then be filled with one of the following sealing materials.
      - 1) Bentonite
      - 2) Bentonite Grout
      - 3) Bentonite-Cement
      - 4) Neat Cement
      - 5) Sand Cement Grout
      - 6) Concrete
- N. A settlement monitoring system shall be developed and maintained by a professional geotechnical firm, with experience in establishing such systems. It shall be capable of identifying vertical ground movement which may occur during the course of construction. At a minimum, it shall include the following:
  - 1. Prior to beginning dewatering or excavation, the Contractor shall install ground survey settlement points on the north and south and east sides of the proposed wet well excavation.
    - a. Survey settlement points daily during excavation or dewatering activities. Submit results to City each day.
      - 1) Settlement at points shall be maintained at ¼-inch. Settlement in excess of this limitation will result in a stoppage of work. The Contractor shall then employ the services of a professional geotechnical firm to establish corrective measures to

prevent damage to adjacent structures and further settlement. The Contractor shall not be allowed to continue work until the proposed plan for corrective action is reviewed and accepted by the City.

- (a) The Contractor shall certify in writing that the proposed monitoring program is sufficient for its intended purpose.
- (b) The Contractor shall submit for review and approval in conformance with Section 2-5.3 of the SSPWC its proposed monitoring program.
- (c) All surveys of monitoring points shall be performed by a licensed surveyor in the State of California.
- (d) No claim for delay shall be allowed for stoppages of work resulting from the interpretation of monitoring data described above.

**END OF SECTION**

**SECTION 32 3113**

**CHAIN LINK FENCE**

**PART 1 GENERAL**

**1.01 WORK OF THIS SECTION**

- A. The work of this Section includes providing chain link fencing and appurtenances.

**1.02 STANDARD SPECIFICATIONS**

- A. Except as otherwise indicated in this Section of the Specifications, the Contractor shall comply with the Standard Specifications for Public Works Construction, 2009 Edition.

**1.03 SPECIFICATIONS AND STANDARDS**

- A. Except as otherwise indicated, the current editions of the following apply to the work of this Section.
1. ASTM A 90 - Standard Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
  2. ASTM A 392 - Standard Specifications for Zinc-Coated Steel Chain Link Fence Fabric

**1.04 FACTORY TESTING**

- A. Wire fabric shall be factory tested for weight of zinc coating in accordance with method specific in ASTM A 90.

**PART 2 PRODUCT**

**2.01 GENERAL**

- A. Material for chain link fencing, gates and appurtenances shall conform to the requirements of SSPWC, Subsection 206-6 and as indicated herein.

**2.02 POSTS AND RAILS**

- A. Materials for posts, rail and braces shall be Class 1 complying with SSPWC Subsection 206-6.2.

**2.03 WIRE FABRIC**

- A. Chain link fabric shall be zinc-coated fabric conforming to Subsection 206-6.3.1 of SSPWC.

**2.04 FOOTINGS**

- A. Concrete for post footings shall conform to Subsection 201-1 of SSPWC, Class 560-C-3250 concrete.

**PART 3 EXECUTION**

**3.01 INSTALLATION OF FENCING**

- A. All earth, brush or other obstructions which interfere with the proper alignment of construction of fences shall be removed.
1. Line posts shall be spaced at not more than 10-foot intervals measured from center-to-center of the post and generally parallel to the ground slope. Posts shall be set plumb and shall be centered in concrete foundation.
    - a. Gate post shall be provided with concrete foundation.
    - b. Changes in the fence lines, where the horizontal angle is 15 degrees or more, shall be considered as corners, and corner posts shall be installed.

- c. Corner, end and gate posts shall be braced to the nearest line post. Corner and end posts shall be diagonally braced. Bracing of gate posts shall be horizontal braces with truss rods. Line posts shall be braced horizontally and trusses in both directions with truss rods at 1,000 feet maximum intervals.
- d. Chain link fabric shall be taut and shall be attached to posts, stretcher bars, and wires with galvanized fabric bands or tie wires at a maximum spacing of 12 inches on posts and 18 inches on the rails and tension wires. The tension wires shall be stretched tight with turnbuckles at the end and corner posts. The bottom tension wire shall be installed on a straight grade between posts.
- e. The fabric shall be fastened to the end, corner, and gate posts with stretcher bars and stretcher bar bands spaced at approximately 12 inches.

**END OF SECTION**

**SECTION 33 3113**

**PVC GRAVITY SEWER**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. This specification designates the requirements for the manufacture and installation for gravity sewer piping systems to be constructed to the lines and grades shown on the Contract Drawings and as specified herein.
- B. Contractor performing the work shall provide all tools, equipment, materials, labor and services for furnishing, constructing to the required grades/depths, traffic control, testing and placing into operation a functioning system.
- C. Where any permit requirements exceed the requirements of this Section, the permit requirements shall govern.

**1.02 SYSTEM**

- A. Work of this Section includes the furnishing, construction and placing into service of under ground piping and cleanouts, including appurtenant improvements (including temporary pavement replacement) specified herein, or shown on the Contract Drawings.
- B. Trench earthwork is in Section 31 23 00 of these specifications.

**1.03 STANDARD SPECIFICATIONS**

- A. Standard Specifications for Public Works Construction (SSPWC) also known as the "Green Book".
  - 1. Except as supplemented or specifically modified herein or shown otherwise on the Contract Drawings, the work under this Section shall be in compliance with the provisions in the applicable Sections of the SSPWC Edition that was in effect on the date that the Contract Drawings were signed and sealed by the Design Engineer and includes all Supplements.
  - 2. In case of conflict between any requirements set forth in this Section, the Contract Drawings and any provisions of the foregoing Standard Specifications the requirements shown on the Contract Drawings shall govern over the requirements set forth herein and the requirements set forth herein shall govern over the SSPWC.
- B. Local Agency Standards
  - 1. In case of conflict between any requirements set forth in this Section, the Contract Drawings and any provisions of the foregoing Standard
  - 2. Specifications the requirements shown in the Local Agency Standards shall govern over the Contract Drawings and the Standard Specifications.

**1.04 SUBMITTALS**

- A. Shop Drawings
  - 1. Contractor shall submit data to show that all pipe and appurtenances, including couplings, specified or proposed in this section are in conformance with the Specification requirements.
- B. Operations and Procedures Submittals
  - 1. Contractor shall submit a detailed plan for system leakage testing.

**PART 2 MATERIALS**

**2.01 GENERAL**

- A. Pipe sizes are nominal inside diameter unless otherwise noted..

- B. Materials shall be as specified herein, required by the Local Agency Standards or as shown on the Contract Drawings.
- C. All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, size manufacture and other appropriate data.
- D. Acceptance of materials shall be subject to inspection, strength and quality testing in addition to field inspection of the completed product. Acceptance of the completed piping systems shall be based on field inspection, video inspection, cleaning of manholes and pipelines and leakage tests as specified.

#### **2.02 PVC PIPE (AWWA) C-900)**

- A. PVC pipe 12 inches or smaller shall comply with AWWA C900. All pipe shall be Class 200 (DR14).
- B. Fittings shall be molded PVC, conforming to AWWA C907.

### **PART 3 EXECUTION**

#### **3.01 GENERAL REQUIREMENTS**

- A. Installation shall conform to the requirements of SSPWC, the Contract Drawings, the Local Agency Standards, the pipe manufacturer's printed installation procedures and as stated in these specifications.
- B. Contractor operations shall conform to the requirements of the Contract Documents, the Pipe Manufactures requirements, the Standard Specifications and Local Agency/Owner Requirements.
- C. Contractor operations shall conform to all Local Agency(s) Permit Requirements.
- D. Trench excavation and backfill work shall conform to requirements of Section 31 23 00 Earthwork of these specifications.

#### **3.02 TRENCH EXCAVATION AND BACKFILL**

- A. Trench excavation, pipe base material, protection of existing utilities/facilities, shoring and bracing, control of surface and ground water, length of open trench, trench width, trench access, subgrade/subbase preparation, pipeline bedding and manhole subbase, backfill and compaction shall be conformance with the requirements of Section 31 23 00 of these specifications.

#### **3.03 PIPE ALIGNMENT AND GRADE**

- A. Contractor shall establish a continuous reference line in the pipe trench to ensure that the pipe is installed to the Contract Drawing line and grade.
- B. The continuous reference line may be either a string line or a laser line in the trench.

#### **3.04 PIPE LAYING**

- A. Pipe shall be laid upgrade with the pipe bell (socket) facing upgrade.
- B. Pipe shall be laid to Contract Drawing line and grade (pipeline sags will not be permitted and will be cause for the Contractor to remove and replace all sag areas at the Contractor's cost) with uniform bearing under the length of the barrel of the pipe. Suitable excavation shall be made at each bell to ensure that the pipe is supported on the pipe barrel and not on the pipe bell.
- C. Contractor shall take the necessary precautions to maintain the pipeline clean and dry during construction
- D. Immediately prior to installation, the Contractor shall thoroughly clean and inspect the interior of each length of pipe and each fitting to ensure the pipe and fitting is free of defects and that no foreign material will remain in the system.

- E. All open ends of pipe and fittings shall be sealed with secure watertight plugs or bulkheads whenever pipe laying operations are interrupted for short periods of time during the work day and at the end of each work day.
- F. Adequate trench pumping (dewatering) shall be provided to ensure that trench water does not enter any pipe or fitting at any time during construction.
- G. All newly constructed pipe shall be cleaned by balling with a high pressure water jet.

### **3.05 PIPELINE CLEANING**

- A. All newly constructed pipelines shall be cleaned after all trench backfill operations have been completed (including passing compaction testing) but prior to leakage testing.
- B. All pipeline and manhole cleaning operations shall be performed in the presence of and witnessed by the Agency/Owner representative.
- C. Pipelines shall be cleaned by one of the following methods:
  - 1. The balling method such as the "Wayne Sewer Ball", "Cherne Ball/Pig" or approved equal. Ball surface shall have spiral groves to create high water velocities around the ball perimeter.
  - 2. The water jet equipment method. Water jet equipment shall be capable of operating from 0 psi to 4,000 psi.
- D. A temporary sediment trap shall be installed in each downstream manhole to prevent any dirt, sand, rocks or other heavy material from passing downstream to the next sewer segment.
- E. All dirt, sand, rocks and other material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from one manhole section to another shall not be permitted.

### **3.06 LEAKAGE TESTING OF SEWER**

- A. All newly constructed sewer shall be tested for leakage after all trench backfill operations have been completed (including passing compaction testing) but prior to placing permanent paving. Additional backfill compaction efforts shall not be permitted after leakage testing has been completed.
- B. Gravity pipelines shall tested for leakage in compliance with the applicable parts of SSPWC Section 306-1.4.1. Unless otherwise authorized by the Agency's/Owner's representative, all pipeline leakage testing shall be by the air testing method.
- C. All leakage testing shall be performed in the presence of and witnessed by the Agency's/Owner's representative.

**END OF SECTION**

## SECTION 33 3400

### PIPING, VALVES AND ACCESSORIES

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. The Contractor shall furnish and install all piping, including fittings, valves, supports, and accessories as shown on the Drawings, described in the Specifications and as required for complete and operable systems.

##### 1.02 QUALITY ASSURANCE

- A. All materials and equipment furnished under this section shall be of a manufacturer who has been engaged in the design and manufacture of the specific materials and equipment for a period of at least 5 years.

##### 1.03 SUBMITTALS

- A. Shop drawings: Submit in accordance with Section 2-5.3 of the SSPWC.
  - 1. Verify by excavation, inspection and measurement all installation conditions for shop fabricated pipe before preparation of Shop Drawings. Submit field measurements and photos with Shop Drawings where exposed conditions are significantly different than indicated on the Drawings.
  - 2. Layouts and Schematics: Submit detailed installation drawings of all piping. Schematics may be submitted for piping 4-inches and smaller. The drawings shall include pipe support locations, and types if different than shown on the Drawings and specifications, all fittings, valves and other appurtenances.
  - 3. Submit data to show that the following items conform to the Specification requirements:
    - a. Pipe, fittings, and accessories.
    - b. Flexible couplings and flanged adapters.
    - c. Float switches.
      - 1) Submit certified test reports as required herein and by the referenced standard specifications.
  - 4. Affidavits: The Contractor shall furnish affidavits from the manufacturers for valves.

##### 1.04 APPURTENANCES

- A. Furnish and install all necessary guides, inserts, anchors and assembly bolts; washers nuts, hangers, supports, gaskets, and flanges; all other appurtenant items shown on the Drawings, specified or required for the proper installation and operation of the piping; devices included in or on the piping equipment; and piping accessories.

#### PART 2 PRODUCTS

##### 2.01 GENERAL

- A. Pipe and valve sizes are nominal inside diameter unless otherwise noted.
- B. All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping.
- C. Acceptance of materials shall be subject to strength and quality testing in addition to inspection of the complete product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified hereinafter.

## 2.02 GENERAL MATERIAL REQUIREMENTS

- A. Gaskets: Unless specifically specified otherwise, all gaskets shall be 1/8" thick full face cloth inserted rubber.
1. Fluid compatibility for the gaskets shall be rated excellent.
    - a. Bolts and Tie Rods: Unless specifically specified otherwise, flange bolts and nuts, tie rods and other flange hardware shall be as follows:
      - 1) Exposed: Type 316 stainless steel.
      - 2) Submerged: Type 316 stainless steel.
      - 3) Encased: Steel.
      - 4) Buried: Type 316 Stainless steel.
  2. Flexible Sealant: Flexible sealant for pipe joints, where shown on the Drawings, shall be a two component polysulfide, non-sag; Sikaflex 412, Dualthane, or equal.

## 2.03 MATERIALS

A. PVC Pipe 2" and Smaller

PVC pipe shall meet the following requirements:

Pipe	PVC SCH 80
Joints	Solvent Weld
Unions	PVC, SCH 80, Solvent Weld

B. Stainless Steel Pipe and Appurtenances

Stainless steel pipe shall meet the following requirements:

Pipe	Stainless Steel, STD Weight , ASTM A312, A269
Fittings	Screwed, 3000 PSI 316 SS
Unions	3000 PSI, 316 SS
Flex Couplings	Dresser Style 38, 316 SS with Harness Restraints

C. Copper Pipe 2" and Smaller

Copper pipe and appurtenances shall be in accordance with the following:

Pipe	Seamless, Type K Copper Tubing, ASTM B88
Pipe Joints	Sweat Type, Screwed
Fittings	Wrought Copper, Sweat Type
Gate Valves	200 PSI, WOG, Bronze, Ends, Screwed Bonnet, Rising Stem
Solid Wedge	
Globe Valves	200 PSI, WOG, Bronze, Screwed Bonnet, Renewable Seat
Check Valves	200 PSI, WOG, Bronze, Screwed Ends, Swing Type, Bronze
Disc, Screwed Cap	

D. Ductile Iron Pipe Materials

Flanged pipe and fittings: shall be thickness Class 53. and shall have Protecto 401 lining not less than 40 mils thick.

Bell and spigot pipe and fittings: shall be thickness Class 53. and shall have Protecto 401 lining not less than 40 mils thick.

Appurtenances shall conform to the pressure class Ductile Iron Pipe as designated on the Plans.

All ductile iron pipe shall be new and shall conform to all requirements of Federal Specification WW-P-421C, ANSI A21.51 (latest version) and AWWA C151 (latest version)

All pipe and fittings shall be clearly marked with the name of the manufacturer or with a trademark of the size and type which has been approved by and filed with the City.

- a. Lining and Coating: All ductile iron pipe and fittings, unless otherwise prescribed in another item of the Contract Documents, shall be painted with the following system:
  - Surface Preparation - SSPC-SP10
  - Prime Coat - Tnemec L69 Epoxoline - 4.0-6.0 mils DFT

Intermediate Coat - Tnemec L69 Epoxoline 4.0-6.0 mils DFT

Finish Coat - Tnemec L69 Epoxoline 4.-6..0 mils DFT

Interior Lining shall be Protecto 401 lining not less than 40 mils thick

- b. Type of Joints: Ductile iron pipe shall have any of the following types of joints as specified: Flanged or restrained push-on joints. Pipe joints shall be as shown in the plans.
  - c. Specials and Fittings: All fittings for ductile iron pipe, unless otherwise required by the Drawings or Specifications, shall conform in all respects to AWWA C110 (latest version).
  - d. Delivery and Handling: All pipe and fittings shall be manufactured, handled, loaded and shipped in such a manner that is delivered undamaged, in sound condition, and conforming in all respects to these Specifications. Care shall be taken in loading and handling the pipe so as not to injure the pipe coating. No other pipe or material of any kind shall be placed inside a pipe or fitting at anytime after the coating has been applied and prior to installation. All pipe and fittings installed on the work shall be new material which has never been previously used for any purpose whatsoever.
- E. PVC Vent Pipe:
1. Pipe and fittings shall be SCH 40 solvent weld type, conforming to ASTM D-1785, Type 1, Grade 1.

#### 2.04 PIPE COUPLINGS AND FLEXIBLE PIPE PIECES

- A. General: For typical pipe joints refer to pipe material specifications. Other joint devices shall be furnished where called for as specified below.
- B. Flexible Couplings and Flange Coupling Adaptors:
  1. Sleeve: Cast iron or fabricated steel
  2. Followers: Cast iron, ductile iron, or steel
  3. Sleeve Bolts: 316 stainless steel
  4. Coating: Fusion epoxy line and coat sleeve and followers.
  5. Pressure Rating: Pressure rating shall be equal to or greater than that of pipe being connected as determined by Barlow's Formula.
  6. Manufacturers:
    - a. Flexible Couplings:
      - 1) Connecting pipe with identical outside diameters: Smith Blair 411 or 431; Dresser style 38 or 53; or equal with thrust restraint.
      - 2) Connecting pipe with slightly different outside diameters: Romac Style 501; or equal with thrust restraint.
    - b. Flange Coupling Adaptors: Smith-Blair 912 or 913; Dresser Style 127 or 128, or equal.
    - c. Victaulic Couplings: Style 31 coupling with ductile iron housing and grade M gasket.
    - d. Rubber Banded Couplings: GMcB Shearband; or equal.
  7. Flex Coupling and Flanged Coupling Adapter Gaskets: Oil and grease resistant; Rockwell Grade 60; Dresser Grade 42; or equal.
  8. Joint Restraint: Provide joint harnesses (tie rod lug or attachment plate assemblies) across all flexible couplings, flange coupling adaptors. Design restraint for 1-1/2 times the test pressure of the applicable service.

#### 2.05 WET WELL FLOAT SWITCH

- A. Float switches shall be mercury free with an internal weight. Provide sufficient cable length to connect the float to the pump control panel with no splices. Float switches shall be Anchor Scientific Eco Float Model G Mounting Style SI or equal.

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. Proper implements, tools and facilities shall be provided and used for the safe performance of the work. All pipes, fittings, and valves shall be carefully moved into position in such a manner as to prevent damage to piping materials, protective coatings, linings, and adjacent structures.

### **3.02 INSPECTION OF MATERIAL**

- A. All pipe fittings, valve, and other appurtenances shall be carefully examined for damage and other defects immediately before installation. Defective materials shall be marked and held for repairs or rejected for replacement by manufacturer.

### **3.03 PIPE DEFLECTION**

- A. Where it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane, or where long radius curves are permitted, the amount of deflection shall not exceed shall not exceed the pipe manufacturers' recommendations.

### **3.04 PIPE CUTTING**

- A. Cutting pipe for the insertion of valves, and fittings, shall be done in as neat, workmanlike manner without damage to the pipe (or lining). Pipe shall be cut using a manufacturer's approved method. Cut ends and rough edges shall be smoothed, or beveled.

### **3.05 MANUFACTURERS SERVICES**

- A. If deemed necessary by the City the Contractor shall provide the services of the piping manufacturer's representative to inspect the completed piping installation for compliance with published installation recommendations.

**END OF SECTION**

## SECTION 33 3410

### PIPING - INSTALLATION

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. The work included in this section of the specifications consists of furnishing, installing and testing all piping, fittings and appurtenances, as indicated on the Drawings and specified herein or as required to complete the work.
- B. Whenever the word "piping" is used in this section, it shall be understood to refer to all exposed and buried pipes, fittings, valves, flanges gasketing, hangers and supports or bedding comprising any given system, plastic piping and instrument tubing included.
- C. All piping shall be installed to the lines and grades shown on the Drawings or as required for the mechanical equipment. All piping shall be properly supported and provisions shall be made for expansion and contraction.
- D. Dissimilar metals shall be properly insulated with the use of insulating bushings, dielectric unions, isolation gasket sets or wrappings.

##### 1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 33 34 00: Piping Materials Classification
- B. Section 31 23 00: Earthwork

##### 1.03 CODES AND PERMITS

- A. Installation shall comply with all applicable federal, state and local laws whether or not explicitly specified.
- B. The Contractor shall furnish to the City a certificate of final inspection and approval from the inspecting authority having jurisdiction.

##### 1.04 INSPECTION AND TESTING

- A. The quality of all materials, the process of manufacture and finished pipe shall be subject to inspection and approval of the City. Pipe may be inspected at the place of manufacture, and on the work site, and shall be subject to rejection at any time even though submitted samples may have been approved. In addition, the City reserves the right to have any or all pipe, fittings and appurtenances inspected or tested, or both, by an independent inspection service at either the manufacturer's plant or elsewhere. Such inspections and/or tests shall be at the City's expense.
- B. All pipe, fittings and appurtenances shall be carefully inspected in the field before installation. All piping found to be defective, as determined by the City, shall be pulled out and not installed. Such rejected pipe shall be clearly tagged in such a manner as not to deface or damage it, and the pipe shall then be removed from the job site by the Contractor at his own expense. Results of shop tests which may be required shall be submitted to the City prior to installation of the pipe for which such tests were ordered.

#### PART 2 PRODUCTS

##### 2.01 MATERIALS

- A. Piping materials shall conform to requirements specified in Section 33 34 00.

#### PART 3 - EXECUTION

##### 3.01 GENERAL PIPING INSTALLATION PRACTICES

- A. Any conflict arising during the erection of piping shall be brought to the attention of the City. No improvising or field changes shall be permitted without the approval of the City.
- B. All lifting and hoisting of piping material shall be accomplished in a manner so as to protect both lining and coating from damage, this may include cloth chokers or slings, spreader bars or other devices or methods necessary to maintain the integrity of the piping system. The Contractor at his own expense shall remove any piping that has been damaged by mishandling from the job site
- C. All piping shall be erected in such a manner as to obtain sufficient flexibility and to prevent excessive stresses in materials and excessive bending moments at joints or connections to equipment.
- D. Full lengths of pipe shall be used wherever possible. Short lengths of pipe with couplings will not be permitted, except as may be approved by the City to eliminate overstressing or misalignment. All pipe shall be cut to exact measurement and shall be installed without forcing or springing.
- E. Tool marks and unnecessary pipe threads shall be avoided. Burrs formed when cutting pipe shall be removed by reaming. Before installing any pipe, care shall be taken that the inside is thoroughly cleaned and free of cuttings and foreign matter.
- F. Where piping is pitched for drainage, an accurate grade shall be maintained. Piping shall be supported in such a manner as to prohibit deflection due to gravity that would be sufficient to pocket the lines when full of liquid. All changes in direction shall be made by using pipe fittings unless otherwise shown on the Drawings or as approved by the City.
- G. Unions shall be installed in all piping connections to equipment, regulating valves, and wherever necessary to facilitate the dismantling of piping and removal of valves and other items requiring maintenance. Flanges on equipment may be considered as unions. At least one union shall be provided in every straight run of pipe unless otherwise noted or permitted.
- H. Raised face flanges shall not be used for connection to 125-psi cast iron flanges or valves. The raised face shall be removed before use and full face gaskets shall be employed.
- I. In general, all service piping shall come off the top of headers, and if possible, service piping shall slope for drainage.
- J. Pipe anchors, thrust blocks, harness restraints with tie bolts, expansion joints, loops, and bends shall be installed as indicated on the Drawings, and as required to properly protect the piping against vibration, misalignment and overstressing.
- K. Exposed piping shall be neatly arranged, straight, run parallel to or at right angles to walls and shall be so graded that the entire system can be drained. Drain valves shall be installed at the low points of piping. Vent valves shall be installed at all high points of the piping.
- L. Installed piping shall not interfere with the operations or accessibility of doors or windows and shall not encroach on aisles, passageways, and equipment and shall not interfere with the servicing or maintenance of any equipment. Adjacent piping shall be grouped in the same horizontal or vertical plane.
- M. All buried bolts, nuts, lugs, rods, brackets, etc., except stainless steel, shall be given one coat of coal tar epoxy prior to backfilling. All exposed steel pipe supports and hangers shall be cleaned and painted similar to structural steel items.
- N. When a pipe joint is made at the intersection of a pipeline with a pump nozzle, all bolts, and nuts shall be installed loose until after the entire pipeline has been installed, aligned, and checked.

- O. All piping shall be installed in such a manner that it shall be free to expand and contract without injury to itself, structural steel or anchors. On all piping, self-equalizing type expansion joints of an approved make and quality shall be installed in all straight runs of 90 feet or more, unless otherwise shown on the Contract Drawings.
- P. All piping on jobsite shall be stored off ground on blocks or skids
- Q. All piping shall have open ends covered to prevent contamination and or lining damage
- R. When pipe is cut in the field, the cut end shall be tapered back approximately 1/8 inch, at an angle of 30 degrees with the centerline of the pipe, with a coarse file or grinder to remove any rough edges, which might injure a gasket, where applicable.
- S. Dissimilar metals shall be properly insulated to preclude galvanic corrosion.
- T. All pipe threads shall be NPT (National Pipe Taper) conforming to ASTM / ANSI B1.20.1
- U. Use a thread sealant on all NPT (National Pipe Taper) Threads & fittings. The type of thread sealant / lubricant shall be selected for compatibility with the piping material and with the material that the pipe will be conveying. Excess thread sealant shall not be allowed inside the pipe. All excess sealant on the exterior threads shall be removed after installation.

### 3.02 BURIED PIPING INSTALLATION PRACTICES

- A. Installation shall be in accordance with AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances, AWWA C600, AWWA C900 and WPCF Manual of Practice No. 9, Design and Construction of Sanitary and Storm Sewer, except as otherwise noted in the Specifications.
- B. Joining Push-On, Mechanical Joint and Restraint Joint Piping: After placing a length of pipe in the trench, the spigot end shall be centered in the socket and the pipe forced "home" and brought to correct line and grade. The pipe shall be secured in place with approved backfill material tamped under and around it. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, the amount of deflection allowed shall not exceed that required for making a satisfactory joint and shall be subject to the approval of the City.
- C. Where it is necessary to join pipes of different types, the Contractor shall furnish and install the necessary adapter. Adapters shall have ends conforming to specifications for the appropriate type of joint to receive the adjoining pipe.
- D. The Contractor shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the Drawings or as directed by the City. Piping shall be installed to exact lines and grades.
- E. Where required, bends, tees and other fittings in pipelines buried in the ground shall be thrust restrained with concrete thrust blocks, as specified in Section 03 30 00, thrust blocks shall be placed against undisturbed earth where firm support can be obtained. If the soil does not provide firm support, then suitable bridle rods, clamps and accessories to brace the fitting properly shall be provided. Such bridle rods, etc. shall be coated thoroughly and heavily with an approved bituminous paint after assembly or, if necessary, before assembly.
- F. All buried ductile iron pipe shall be polyethylene wrapped in accordance with ANSI/AWWA C105/A21.5.
- G. All buried non metallic piping shall be installed with detection tape placed above the pipe zone. Plastic metallic type consisting of a color coded polyethylene or melinex film, a solid core aluminum foil detection layer and other layers as required. Type shall be resistant to acids, alkalines and other components likely to be encountered in soils. Tape shall be imprinted with "CAUTION type of pipeline BELOW". Tape shall be Terra Tape "D" by Griffolyn Company,

Detectatape by Allen Systems, or approved equal.

### 3.03 WELDED PIPE

- A. All welding of steel piping shall be in accordance with the AWWA Standard for Field Welding of Steel Water Pipe, AWWA C206, latest edition. All welders and machine operators shall be certified as qualified under the above code.
- B. All other metallic pipe welding shall be in accordance with the ANSI Code for Pressure Piping, ANSI B31.1 Power Piping, latest edition. All welders and welding machine operators shall be certified as qualified under the above code. The Contractor shall submit a list of welding personnel with certification to the City for approval.
- C. Contractor shall submit his proposed welding procedures to the City for review. Proposed procedures shall be in accordance with the above codes and the recommendations of the manufacturers of the piping and welding materials. The City shall have the right at any time to call for and witness the making of test specimens by any welder, in accordance with the above, and to observe the physical testing of specimens. Materials shall be furnished and all tests shall be made by and at the expense of the Contractor.
  - 1. Welding of fusion bonded epoxy lined and/or coated pipe shall not be allowed after the application of the fusion bonded epoxy.

### 3.04 PUSH-ON TYPE JOINTS

- A. Inspect gasket, socket and spigot for cleanliness. Remove any foreign matter and excessive coating. When cast iron or ductile iron pipe is cut in the field, the cut end can be readily conditioned so that it may be used to make up the joint. The outside of the cut end should be tapered back approximately 1/4 inch, at an angle of about 30 degrees with the centerline of the pipe, with a coarse file or a portable grinder. All sharp or rough edges which otherwise might injure the gasket shall be removed.
- B. Insert the gasket in the socket, bulb end toward the inside. Heel of gasket shall be uniformly seated around the inside of the socket.
- C. Lubricate the exposed face of the gasket and the spigot using push-on joint lubricant. Do not use lubricant other than that furnished with pipe and fittings.
- D. The fittings and the pipe shall be aligned and the spigot entered into the socket until it just makes contact with the gasket. Joint assembly shall be completed by forcing the spigot of the entering pipe past the gasket (which is thereby compressed) until it makes contact with the bottom of the socket.
- E. If assembly is not accomplished with the application of reasonable force by the methods indicated, the spigot end of the pipe shall be removed to check for the proper positioning of the gasket. The joint shall be kept in straight alignment during assembly.

### 3.05 RESTRAINED JOINT PIPING

- A. Restrained joint piping shall be integrally restrained joint ductile iron pipe of the push-on type with low steel alloy bolting. Installation shall be in accordance with the manufacturer's recommended procedures.

### 3.06 PVC AND CPVC PIPING

- A. PVC and CPVC piping shall be installed in accordance with the manufacturer's recommended procedures.

### 3.07 COPPER PIPING

- A. Solder joints for copper tubing shall be prepared by cleaning the ends of the tubing and the inner surfaces of the fittings with steel wool until they are bright. The cleaned surfaces shall be given

a thin coating of approved soldering flux, and the tubing end inserted into the fitting as far as possible. Heating and finishing of the joint shall be done in accordance with the recommendations of the manufacturer of the fittings, using solid string or wire of lead free solder. The use of cored solder will not be permitted. All joints shall be allowed to self-cool to prevent chilling of solder.

- B. Flared joints for copper tubing shall be cut and deburred. The sleeve nut shall be slipped on the tubing and the end flared with a flaring tool. Care shall be taken in flaring not to crack or slit the flared portion. If inspection reveals such damage, the flare shall be cut off and a new flare made. The flared end shall be squarely seated on the fitting and the nut tightened.
- C. All changes in direction shall be made by using fittings unless other means are approved by the City.

### 3.08 PIPE HANGERS

- A. The Contractor shall furnish all necessary hangers including all clamps, rods, angles, channels, plates, etc., for supporting the various piping installed by him under this Contract. The Contractor shall obtain the City's approval of the method of supporting the piping before installation. Drawings shall be referenced for standard pipe hanger design and material.
- B. Pipes close to the floor may be supported from the floor by structural shapes or by poured concrete blocks or piers as approved by the City. In such cases, care shall be taken to avoid blocking floor drainage.
- C. Building steel, as indicated on the structural drawings, shall be used wherever possible for supporting pipe hangers. Structural members shall not be drilled or welded for hangers without the approval of the City.
- D. Expansion bolts shall be used only upon the approval of the City.
- E. All vertical piping shall be properly supported with suitable steel brackets to prevent swinging or sagging, per the latest edition of UBC, UPC and UMC. A minimum of two supports shall be provided on all vertical piping. Spacing shall be no more than 6 feet on centers.
- F. Heavy valves or fittings shall be supported by hangers, poured concrete blocks or other special provisions that may be necessary to avoid undue line deflection.
- G. A minimum of two hangers shall be provided for steel and cast iron piping.  
The maximum spacing of hangers for steel and cast iron piping shall be in accordance with the following table, except where otherwise indicated on the Contract Drawings.

Pipes 1/2" and 3/4"	-	not more than 6' - 6" on centers
Pipes 1" and 1-1/4"	-	not more than 8' - 0" on centers
Pipes 1-1/2" and 2"	-	not more than 10' - 0" on centers
Pipes 3" and 4"	-	not more than 14' - 0" on centers
Pipes 6" and 8"	-	not more than 16' - 0" on centers
Pipes 10" and larger	-	not more than 20' - 0" on centers

The maximum hanger spacing for all sizes of soil, waste, and vent piping is five (5) feet.
- H. Hose and plastic tubing shall be continuously supported in stainless steel or steel (per Contract Drawings) angle, channel, or tray.
- I. The maximum spacing of pipe supports for PVC piping shall be in accordance with the following table:

Pipes 1" and 1-1/2"	-	not more than 5' - 0" on centers
Pipes 2"	-	not more than 6' - 0" on centers
Pipes 3"	-	not more than 7' - 0" on centers
Pipes 4"	-	not more than 7' - 0" on centers
Pipes 6"	-	not more than 9' - 0" on centers

Pipes 8" - not more than 9' - 0" on centers

- J. Hanger Material
1. Hangers for steel, ductile and cast iron pipe and flanges, shall be clevis type, with adjustable rods or bolts, material, hardware and coating or plating per Contract Drawings.
  2. Hangers for PVC drainage, waste, and vent piping (DWV) shall be stainless steel with adjustable stainless steel rods and hardware per Contract Drawings.
  3. Hangers for copper tubing shall be copper-plated or isolated by thermoplastic elastomer, PVC or felt inserts with adjustable rods or bolts, material, hardware and coating or plating per Contract Drawings.
  4. Hangers for stainless steel pipe and tubing shall stainless steel with stainless steel rods and hardware per Contract Drawings.
  5. Hangers for chromium-plated pipes shall be chromium-plated cast brass, hardware per Contract Drawings.
  6. All thread rods shall not be allowed for rods longer than 8", all threaded rods shall have a minimum of 1" of free adjustment up or down

### 3.09 APPURTENANCES

- A. The Contractor shall furnish and install all valves and piping not mentioned in the piping classification, but shown on the Contract Drawings.
- B. All valves and drains not mentioned in the classification of piping material specifications and furnished under this specification shall be as specified on the Contract Drawings.
- C. Flanged joints shall be made up with approved full-face gaskets and carbon steel ASTM A307 bolts and heavy hex nuts except where otherwise noted in the Specifications or Contract Drawings.
- D. All joints shall be made drop tight under all pressures up to the specified field test pressure of the line in which installed.

### 3.10 FIELD TESTING

- A. All pressure piping shall be subjected to a hydrostatic test pressure of 100 psi. No air testing shall be permitted.
- B. Test of buried piping shall be made only after completion of partial or complete backfill as specified and not until at least 36 hours after the last joint to be tested has been made, and at least 36 hours after the last concrete thrust or reaction blocking has been cast with high early strength cement, ASTM C-150 Type III. Joints shall be left clear for examination during tests on pressure pipe.
- C. Each section of pipeline shall be slowly filled with water and the specified test pressure measured at the point of lowest elevation. Pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the City. The pump, pipe connection, calibrated gauges, pipe taps and all necessary apparatus, shall be furnished by the Contractor. The Contractor shall provide all necessary assistance for conducting the test. The duration of the test shall be 2 hours, unless otherwise directed by the City. All air must be expelled from the pipeline prior to the test period.
- D. During the test, all pipes, fittings, valves, hydrants and joints shall be carefully examined. If found to be cracked or defective, they shall be removed and replaced by the Contractor with sound material in the manner prescribed. The test shall then be repeated until satisfactory to the City.
- E. No pipe installation will be accepted until or unless the leakage for the section of line tested is less than the rate of leakage specified below:  
Flanges, welded or screwed piping - No measurable leakage

Push-on, mechanical joints or caulked - In accordance with AWWA Standard for Installation of Ductile-Iron Water Mains, AWWA C600, Sect. 4.1

- F. Should any test of a section of pipeline disclose leakage greater than that permitted, the Contractor shall, at his own expense, locate and repair the defective joints, and/or pipe until the leakage is within the permitted allowances.

**3.11 PIPE SUPPORT DETAILS**

- A. Pipe supports shall be selected and furnished as required for proper installation.

**END OF SECTION**

**SECTION 33 39 13**

**PRECAST CONCRETE WET WELL**

**PART 1 – GENERAL**

**1.1 WORK OF THIS SECTION**

- A. The WORK of this Section includes providing T-lock lined precast concrete, 8-foot diameter T-lock lined wet well and related appurtenances.
- B. The precast wet well sections shall be manufactured in a plant especially designed for that purpose. All units shall conform to the design shown on the drawings, and all work shall be done under strict controlled supervision.
- C. The precast wet well shall comply with the requirements of the contract drawings and these specifications.
- D. All exterior surfaces for the precast wet well shall be coated with 60 mils of a 2-part epoxy coating system.

**1.2 RELATED SECTIONS**

- A. The work of the following Sections applies to the work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of the work.
  - 1. Section 31 23 19 Dewatering
  - 2. Section 31 23 00 Earthwork
  - 3. Section 03 30 00 Cast-in-Place Concrete

**1.3 SPECIFICATIONS AND STANDARDS**

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
  - 1. ASTM A 48 Specification for Gray Iron Castings
  - 2. ASTM C 478 Specification for Precast Reinforced Concrete Manhole Sections

**1.4 PRECAST WET WELL SUPPLIER**

The project design is predicated upon precast concrete vault products manufactured by Olson Precast Company, Fontana, California; Telephone: (909) 427-1138. Alternate suppliers of the precast concrete vault must be preapproved by the City of El Segundo

Building Department prior to bid. Alternate suppliers will not be allowed after award of the project to the General Contractor.

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with SSPWC 2-5.3.

1. Design calculations and detailed drawings of wet well component sections signed and sealed by a registered engineer in the State of California. Calculations shall be prepared using information from the Project Soils Report. A copy of this report is available through the City of El Segundo Public Works Department. The calculations must consider the high groundwater conditions at the site, and external loading from the lifeguard building, and retaining wall. Live loads shall be H20 per AASHTO. Design wheel load shall be 16 KIPS plus impact.

Calculations will be submitted to the El Segundo Building Department for review and approval (including products manufactured by Olson precast Company).

2. Shop drawings of access hatches and all appurtenances.

1.6 STORAGE AND HANDLING

- A. Manhole and wet well components shall be stored at the site in such a manner as to prevent damage before installations. Storage location shall be subject to the approval of the City's representative.
- B. All precast wet well components shall be lifted and moved by use of suitable lifting slings and plugs that will not damage the precast section lip.
- C. All damage to precast sections that is not cause for rejection shall be repaired. Repair and patching of minor breaks shall be done by chipping and scarifying the defective area before application of grout. Sufficient time shall be allowed for curing before precast sections are listed.

1.7 INSPECTION

After installation, the Contractor shall demonstrate to the Engineer and Inspector that the wet well has been properly installed, level, with tight joints, and at the correct elevation.

**PART 2 – PRODUCT**

2.1 DESIGN AND MATERIALS

- A. Precast concrete wet well sections shall be designed and constructed in accordance with the requirements of ASTM C478.
- B. All cement shall be Portland cement conforming to ASTM C150, Type V, low alkali cement.

- C. The wet well base shall be constructed of cast-in-place, reinforced concrete. The base includes a tapered concrete filled bottom, which is to be coated with an epoxy/polyurethane system. The concrete to be used shall be as specified in Section 03 30 00, Cast-In-Place Concrete.
- D. The top of the base walls, the ends of reinforced concrete risers and bottom ends of precast tops shall be so formed that when risers and tops are assembled with the base they will make a continuous structure. Joints shall be of such design as will permit effective joining and placement without irregularities in the interior wall surface of the wet well.
- E. O-ring gaskets for joints between precast sections shall conform to ASTM C 443-72.
- F. Mortar for joining precast sections shall consist of 1-part cement to 2-1/2 parts of sand by volume.
- G. Plastic joint sealing compound shall conform to Federal Specification SS-S-00210.
- H. All interior surfaces of the wet well (excluding the concrete fillet) shall be lined with T-lock PVC sheet complying with Section 210-2 of the SSPWC.
- I. All exterior surfaces of the wet well shall be coated with 60 mil DFT Carboline Plasite 4500-S.
- J. Exterior wet well joints shall be wrapped with cold applied plastic film. Joint wrap shall be "Rub'R-NEK as manufactured by K-T Snyder Company or equal.

## 2.2 WET WELL STEPS

- A. Wet well steps shall be cast in place 316 Stainless Steel

## 2.3 WET WELL ACCESS HATCH

- A. Access hatch shall be trough type floor access double doors with drainable frames. Unless otherwise indicated, access hatch shall be rated for H20 loading, aluminum type with 48-inch x 72-inch opening.
  - 1. Door leafs shall be ¼+ inch thick aluminum diamond plate reinforced to withstand H20 loading.
  - 2. The frame shall be extruded aluminum channel section with an integral anchor flange on all four sides. A bituminous coating shall be applied to the exterior of the frame.
  - 3. Frame shall drain water out through a 1-1/2 inch pipe coupling.
  - 4. Floor access doors shall be equipped with a flush aluminum drop handle that does not protrude above the cover, and stainless steel hinges with stainless steel tamper proof bolts and nuts.
  - 5. A staple for a padlock shall be supplied for security.

6. All parts of the frame and cover shall be aluminum or stainless steel.
7. Hatch shall incorporate a fiberglass fall protection grating system with stainless steel hardware and rated for 300 PSF. This system shall be easily operated by one person and shall comply with CAL OSHA 1910.23
8. Installation shall be in accordance with the manufacturer's instructions.
9. Manufacturer shall guarantee against defects in materials and workmanship for a period of ten (10) years.
10. Contractor shall submit calculations for the access hatch to the City of El Segundo Building Department for review and approval. Calculations shall be signed and sealed by a registered professional engineer in the State of California.

## 2.5 WARNING SIGNS

The entrance to the wet well shall be fitted with a plastic warning sign, located 12 inches below the top of the access hatch, with the inscription "CAUTION – PERMIT REQUIRED-CLASSIFIED CONFINED SPACE-VENTILATE BEFORE ENTERING" in clear letters no smaller than ½-inch in height. The sign shall be attached to the concrete with four removable Type 316 stainless steel screws and anchors.

## 2.6 MANUFACTURER

- A. Products shall be manufactured by one of the following (or equal):
  1. Precast Sections: Ameron; Associated Concrete Products; Olson Precast
  2. Warning Sign: W.H. Brady Company; Seton Nameplate Corporation
  3. Access Hatch: U.S.F Fabrication Incorporated; BILCO; INRYCO, or approved equal.

## **PART 3 – EXECUTION**

### 3.1 INSTALLATION

- A. Precast concrete products shall be installed in strict conformance with the manufacturer's written instructions, on a well-compacted foundation.
- B. The wet well base shall rest upon and be uniformly supported by a 3-foot mat of compacted screened rock placed over a base of sound, level, undisturbed earth.
- C. Pipes entering precast sections of wet well shall be set securely in the precast opening at the correct line and grade.
- D. Precast sections shall not be set by wedging or placing shims to secure proper level.

- E. In constructing the wet well, all groundwater shall be kept away from newly grouted pipe and rings until cement has properly set and until a watertight job is obtained. Manholes which admit groundwater after completion shall be repaired.
- F. T-lock PVC liner shall be installed in accordance with Ameron International's Application Instructions Including PLD-TL-096 Sealing Penetrations Thru T-Lock Lined Walls and applicable sections of SSPWC Sections 210-2 and 311.
- G. The exterior joints between precast concrete sections shall be wrapped with a 35 mil. Elastomeric protective film. External joint wrap shall be Rub-R-Nek as manufactured by the KT Snyder Company or equal.
- H. The concrete fillet on the bottom of the wet well shall be coated with 125 mils of an epoxy/polyurethane system (Sancon 100 or equal).

### 3.2 INSPECTION

Upon request, the Contractor shall provide the Engineer or Inspector a workman with ladder or other safe and adequate means for inspection access.

### 3.3 TESTING

The wet well shall be hydrostatically tested for leakage after installation, but prior to being backfilled. Prior to hydrostatic testing, the wet well shall be visually inspected for leaks. All leaks or cracks shall be repaired by the Contractor prior to hydrostatic testing to the satisfaction of the Engineer and the Inspector. All pipes entering the wet well shall be sealed at a point outside the wet well walls so as to include testing of the pipe/wet well joints. The wet well shall be filled with water to a level 2 inches below the top of the access hatch. Safety lines shall be secured to all plugs utilized. The wet well may be filled 24 hours prior to time of testing, if desired, to permit normal absorption into the pipe walls to take place. After a period of at least 1-hour to allow the water level to stabilize, the water level shall be checked. The water level shall again be checked after a period of 4 hours. Leakage in the wet well shall not exceed 0.1 gallon per hour per foot of head above the invert. If the water level is reduced by this amount or greater, the leakage shall be considered excessive. The Contractor shall then be required to make all necessary repairs and retest the wet well. The exterior of the wet well shall be inspected during this period for visible evidence of leakage. Visible moisture, sweating, or beads of water on the exterior of the wet well shall not be considered leakage, but any water running across the surface will be considered leakage and shall be repaired to the satisfaction of the City regardless of the volume of water lost.

**END OF SECTION**

**SECTION 33 39 15**

**PRECAST CONCRETE VAULT**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The Contractor shall provide a 6' x 10' precast concrete vault with a full opening access hatch, as shown on the drawings and as specified herein.
- B. All precast structures shall be manufactured in a plant especially designed for that purpose. All units shall conform to the design shown on the Drawings, and all work shall be done under strict controlled supervision.
- C. Units shall conform to the specific size requirements shown on the Drawings.
- D. All exterior sections of the precast vault shall be coated with 60 mils of a 2-part epoxy coating system.

**1.2 REFERENCE STANDARDS**

- A. H-20"AASHTO" Standard Specifications for Highway Bridges with revisions.
- B. SS-S-00210 Federal Specification (GSA - FSS) for cold applied preformed sealing compound.
- C. ASTM C33 Standard Specification for Concrete Aggregate
- D. ASTM C150 Standard Specification for Portland Cement
- E. ASTM C330 Standard Specification for Lightweight Aggregates for Structural Concrete
- F. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- G. ASTM A82 Standard Specification for Cold-Drawn Steel Wire for Concrete Reinforcement.
- H. ASTM A185 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete

**1.3 PRECAST WET WELL SUPPLIER**

The project design is predicated upon precast concrete vault products manufactured by Olson Precast Company, Fontana, California; Telephone: (909) 427-1138. Alternate suppliers of the precast concrete vault must be preapproved by the City of El Segundo

Building Department prior to bid. Alternate suppliers will not be allowed after award of the project to the General Contractor.

#### 1.4. SUBMITTALS

The following shall be submitted in compliance with SSPWC 2-5.3.

- A. Contractor shall submit for review and approval detailed calculations and drawings, sealed by a Registered Professional Engineer in the State of California. Calculations shall be prepared using information from the Project Soils Report. A copy of this report is available through the City of El Segundo Public Works Department.

Calculations will be submitted to the City of El Segundo Building Department for review and approval (including products manufactured by Olson Precast Company).

### **PART 2 - PRODUCTS**

#### 2.1 DESIGN LOADS

Design loads shall consist of dead load, live load, impact, and in addition, loads due to water table, lifeguard building, retaining wall, and any other loads which may be imposed on the structure.

Live loads shall be H-20 per AASHTO. Design wheel load shall be 16 kips plus impact. The live load shall be that loading which produces the maximum shears and bending moments in the structure.

#### 2.2 FORMS

All forms used in placing concrete shall be of metal and sufficiently designed and braced to maintain their alignment under pressures of the concrete during placing.

#### 2.3 CONCRETE

- A. **Aggregates:** All aggregates fine and coarse, other than lightweight aggregate shall conform to specifications out-lined by ASTM C33. Lightweight aggregates fine and coarse shall conform to the specifications outlined by ASTM C330. Aggregates shall be free of deleterious substances causing reactivity with oxidized hydrogen sulfide. Both types of aggregate shall be graded in a manner so as to produce a homogeneous concrete mix. All materials are to be accurately weighed at a central batching facility for mixing.
- B. **Cement:** All cement shall be Portland Cement conforming to ASTM C 150, Type V. Low alkali cement.
- C. **Placing:** All concrete shall be handled from the mixer or transport vehicle to the place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients, until the approved unit operation is completed. Concrete shall be placed in layers not over two (2) feet deep. Each layer shall be

compacted by mechanical internal or external-vibrating equipment. Duration of the vibration cycle shall be limited to the time necessary to produce satisfactory consolidation without causing objectionable segregation.

- D. Curing: For purposes of early re-use of forms, the concrete may be steam cured after an initial set has taken place. The steam temperature shall not exceed 160 degrees, and the temperature shall be raised from normal ambient temperatures at a rate not to exceed 40 degrees per hour.

The steam cured unit shall not be removed from the forms until sufficient strength is obtained for the unit to withstand any structural strain that the unit may be subjected during the form stripping operation. After the stripping of forms further curing by means of water spray or a Membrane Curing Compound may be used, and shall be of clear or white type, conforming to ASTM C 309-58.

#### 2.4 REINFORCING STEEL

All reinforcing steel, including welded wire mesh, shall be of the size and in the location as shown on the Plans. All reinforcing shall be sufficiently tied to withstand any displacement during the pouring operation. All bars shall be grade 60 conforming to ASTM A 615.

#### 2.5 ACCESS HATCHES

The valve vault access hatch shall be H-20 traffic rated, 6'W x 10'L, 4-door, aluminum and spring assisted with removable aluminum I-beam supports as required. Hardware shall be 316 stainless steel and shall include, but not be limited to hinges, hold-open arms, springs, and spring covers. Hatches shall be equipped with extruded aluminum channel trough frames with 1½-inch drain coupling, flush aluminum drop handles, which do not protrude above the cover, a recessed padlock box and stainless steel staple sized for a No. 6 padlock, and shall be as manufactured by BILCO, U.S. Foundry, INRYCO, or approved equal. Hatch shall incorporate a fiberglass fall protection grating system with stainless steel hardware and rated for 300 PSF. This system shall be easily operated by one person and shall comply with CAL OSHA 1910.23.

The Contractor shall submit detailed calculations and drawings, sealed by a registered professional engineer in the State of California for review and approval by the City of El Segundo Building Department.

#### 2.6 JOINT SEALING COMPOUND

The joint sealing compound shall be permanently adhesive flexible plastic material complying in every detail to Federal Specification SS-S-00210 (GSA-FSS). Joint sealing compound shall be Quickseal by Associated Concrete Products, or approved equal. Exterior manhole joints shall be wrapped with cold applied plastic film. Joint wrap shall be "Rub'R-NEK as manufactured by K-T Snyder Company or equal.

#### 2.7 EXTERIOR COATING

All exterior surfaces of the vault shall be coated with 60 mils DFT of carbolime plasite 4-500-S or equal.

2.8 MORTAR

Mortar for filling interior joints shall consist of 1-part cement to 2½-parts of sand by volume.

**PART 3 - EXECUTION**

3.1 FIELD PREPARATION

The Contractor shall prepare a hole large enough to accommodate the outside dimension of the structure as shown on the Drawings. Prior to setting, the Contractor shall provide base material as shown on the Contract Drawings to receive the unit. The base material shall be compacted and graded level and at proper elevation to receive the structure in relation to the conduit grade or ground cover requirements as designated in the Plans.

3.2 INSTALLATION

Precast concrete structures shall be installed in strict conformance with the manufacturer's written instructions.

After installation, wrap all exterior joints with polyethylene film (RUB-R-NEK). Place mortar in all interior joints and trowel to a smooth finish.

3.3 INSPECTION

Upon request, the Contractor shall provide the Engineer / Inspector a workman with ladder or other safe and adequate means for inspection access.

**END OF SECTION**

**SECTION 33 7173**

**ELECTRICAL UTILITY SERVICES**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section includes arrangement with Utility Company for permanent electric service; payment of Utility Company charges for service; service provisions; and utility metering equipment.
- B. Related Sections:
  - 1. Section 03 30 00 - Cast-In-Place Concrete: Concrete pads.

**1.02 SYSTEM DESCRIPTION**

- A. Utility Company: Southern California Edison (SCE).
- B. System Characteristics: 208Y/120 volts, three phase, four-wire, 60 Hertz.
- C. Service Entrance: Underground.
- D. Underground Service Provisions: Underground service entrance to building service entrance equipment.
  - 1. Utility Raceway Connection: At Utility Company's terminal pole.
  - 2. Utility Service-Entrance Conductor Connection: At Utility Company's pad-mounted transformer.

**1.03 SUBMITTALS**

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Submit Utility-Company-prepared drawings.

**1.04 QUALITY ASSURANCE**

- A. Perform Work in accordance with Utility Company written requirements.
- B. Maintain one copy of each document on site.

**1.05 FIELD MEASUREMENTS**

- A. Verify field measurements are as indicated on Drawings.

**1.06 COORDINATION**

- A. Coordinate with utility company, relocation of overhead or underground lines interfering with construction. Where power lines are to be relocated, bill utility costs, directly to Owner.
- B. Contact utility company regarding charges related to service installation. Include utility charges in this contract.
- C. Utility charges for service installation will be paid by Owner and are not part of this contract.

**PART 2 PRODUCTS**

**2.01 UTILITY METERS**

- A. Furnished by Utility Company.
- B. Product Description: Self-contained watt-hour meter, CT-rated 200 amperes at 208Y/120 volts, three phase.

**2.02 UTILITY METER BASE (WITH UTILITY'S REVIEW AND APPROVAL)**

- A. Furnished with Building Service Entrance Equipment.
- B. Manufacturers: Same as Building Service Entrance Equipment.
- C. Product Description: CT rated 200 amperes continuous duty with 13 jaws, manual circuit closing type with screw type bypass.

**2.03 METERING TRANSFORMER CABINET**

- A. Manufacturers: Same as Building Service Entrance Equipment.
- B. Size: As required.
- C. Include provisions for padlocking and sealing.

**2.04 TRANSFORMER PAD**

- A. Manufacturers:
  - 1. Utility vault by Old Castle Precast.
  - 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Product Description: Precast concrete transformer pad with cable pit sized as indicated on Drawings.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify service equipment is ready to be connected and energized.

**3.02 INSTALLATION**

- A. Install service entrance conduits to building service entrance equipment. Utility Company will connect service lateral conductors to service entrance conductors.
- B. Install cast-in-place concrete pad for Utility Company transformer, in accordance with Section 03 30 00.

**END OF SECTION**